FAO FORESTRY PAPER 43

# forest revenue systems in developing countries

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS ROME

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# forest revenue systems in developing countries

## their role in income generation and forest management strategies

by

john w. gray

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 1983

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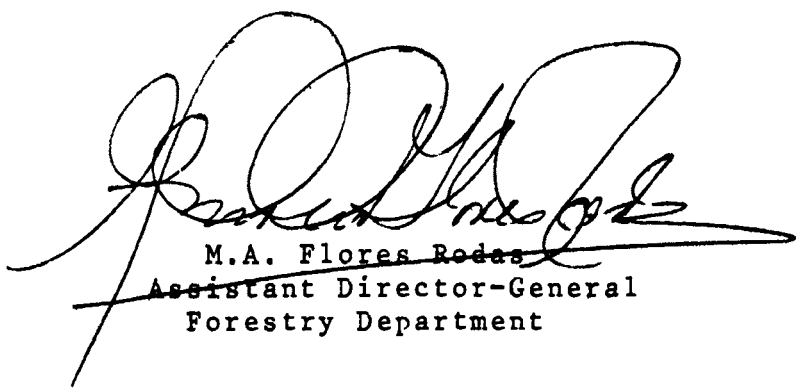
M-36
ISBN 92-5-101340-3

# FOREWORD

This study was commissioned by the Forestry Department of the Food and Agriculture Organization of the United Nations to review economic aspects of pricing and method of sale of products from the forests of developing countries. The work complements the earlier study of Forest Utilization Contracts on Public Land, FAO Forestry Paper 1, Rome 1977.

It is appropriate to re-emphasise the statement of the foreword to the earlier study that forest utilization contracts are of major importance in enforcing national wood utilization policies in developing countries. Pricing and method of sale are basic considerations in the formulation of such contracts. Good design in these areas will ensure a proper recovery of value and revenue for the community and for the nation, will promote the sound utilization of the existing forest resource and conservation and renewal of its potential to contribute to future generations, and will stimulate appropriate growth of forest industries and trade and the contribution of the sector to the national economy.

The generous assistance of the large number of people in many countries met and consulted by the author in the course of preparation of this study is gratefully acknowledged.



M.A. Flores Rodas
Assistant Director-General
Forestry Department

To secure the value of the tropical
forest resource for the community
and the nation

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## Readership

The paper is addressed to senior forestry personnel as well as others involved in forest policy, forest revenue collection, the administration of forest concessions and forest management.

The paper will also be of interest to personnel in ministries of finance or planning agencies concerned with the forestry sector, forest revenues and the revision of charges. Although these readers will not be familiar with technical forestry or perhaps with the forest industries, the paper can introduce them to the issues and factors involved in evaluating a forest revenue system and in choosing among alternative forest charges.

The paper will also be useful in forestry education and thus to a third group, forestry students and educators. There is a shortage of material on forest economics applicable to developing countries. The paper provides material and examples in the area of forest valuation, fees and stumpage pricing, for courses in both forest management and forest economics.

Although important economic concepts and forest economics terms are used throughout and an understanding of them is presumed, experience in administration and forest management provides related experience in applied economics, aids in understanding of forest economics concepts, and substitutes in some measure for formal training in forest economics. While the forest economist will probably find little in the following pages that he does not already know, the paper should serve as a useful review of the concepts in practical applications. The economist trained in other areas will likely find little that is original, that he will learn something of the practical application of economic concepts to forestry. The design of forest revenue systems is very much an exercise in applied economics.

## Organization of the Paper

As indicated, the paper is designed to serve not only senior forestry officials who have extensive experience and broad understanding of the issues and policy, as well as foresters, economists and others involved in the administration of existing forest revenue systems and the design of new systems. To accommodate this range of readers with their diverse interests and backgrounds is something of a challenge, requiring a flexible organization of the paper. To achieve this, the paper is structured in three parts, each of which can be read independently.

Part I, which consists of Chapters 1 and 2, provides a self-contained overview of the problems and issues of forest revenue systems and of the study itself. Chapter 1 introduces the problems and issues. Chapter 2 provides an overview of the rest of the study, a summary of the following chapters, a synthesis of the analysis, highlights and important conclusions, and directs readers to the relevant chapters. For those with limited time, Part I serves to identify key issues and conclusions. For others, it serves as a useful introduction to the rest of the study.

The main body of the paper is organized with the conceptual framework developed in Part II and applied in Part III. It is structured so that readers with a primary interest in the applied aspects of forest charges, or with time constraints, can read Part III or individual chapters without difficulty and with only minor loss of rigor and depth of understanding.

Part II consists of Chapters 3, 4, 5 and 6. It presents the conceptual framework for the analysis of forest revenue systems and forest charges. Chapter 3, which is concerned with timber values, introduces a simple exchange model which is used to identify timber values to buyers and sellers and prices of stumpage, logs or processed products within a bargaining framework of price setting. Market values and economic values are also distinguished in Chapter 3. This chapter provides a basic framework for the study.

In Chapter 4, the buyer's side of the exchange model is developed. A conceptual model of stumpage value is developed and the factors determining stumpage value are identified within the model. This model and the factors affecting stumpage values are utilized in Part III in evaluating a wide range of alternative forest charges (in Chapter 9) and as a framework for timber appraisal (in Chapter 10). In Chapter 5, the other side of the exchange model is developed. The factors affecting the seller's value, the value to the government of timber in alternative uses, are identified and applied in establishing minimum forest charges for timber.

Timber concessions and other cutting rights provided by forest utilization contracts have value in addition to the stumpage value of the timber thereon. Chapter 6 identifies factors which determine or influence the value of these timber rights, both to the concession holder and to the government. These values provide a basis for concession charges.

In Part III the theoretical framework and the concepts developed in Part II are applied to the evaluation of alternative forest charges and methods of setting the level of charges, and are utilized in the design of forest revenue systems. First, in Chapter 7, four broad objectives of forest policy and two general constraints are identified. Under each objective, specific criteria are developed.

Following a review of alternative forest charges in Chapter 8, illustrated by their applications in selected tropical countries, the alternative charges are each reviewed and evaluated in Chapter 9 against these four objectives and the specific criteria from Chapter 7, utilizing the theoretical framework and the concepts developed in Part II.

In Chapter 10 alternative methods of setting the level of charges are similarly evaluated. The process of stumpage appraisal, through which stumpage values are estimated, is reviewed in Chapter II. The methodology, data requirements and problems involved are surveyed and from these some practical approaches suggested.

Finally, in Chapter 12, the structure of forest revenue systems is considered, drawing upon the conclusions of previous chapters, the evaluations of individual charges and of methods of setting the levels of charges. The inter-relationships among charges are considered, and suggestions offered for sets of charges that could be combined into a forest revenue. Thus Chapter 12 represents a synthesis of the analysis and implications of previous chapters.

## Reader's Guide

For those with very limited time available, Part I (i.e., Chapters 1 and 2) will provide a reasonable overview of the issues and implications.

Following Chapters 1 and 2, those interested in acquiring a general appreciation of alternative revenue arrangements, the factors involved in choosing among them and issues in setting the level of charges might read Chapters 7, 8, 9 and 10, finishing with Chapter 12. A reading of these chapters might also suffice for those interested in the practical aspects of forest revenues and willing to forego the more thorough development of the concepts and principles behind the analysis.

Those directly involved in the establishment, evaluation and updating of forest charges as well as those involved in the ongoing administration of forest revenue arrangements will likely wish to read the complete paper; the conceptual chapters of Part II (Chapters 3, 4, 5 and 6) as well as most or all of the chapters of Part III (Chapters 7, 8, 9, 10, 11 and 12).

It is possible to read chapters outside of the normal order. The chapters in Part III can be read prior to those in Part II, if one is willing to accept certain concepts without demonstration.

# PART I

# ISSUES AND OVERVIEW

## Chapter 1

## ISSUES IN FORESTRY AND FOREST REVENUE SYSTEMS IN DEVELOPING COUNTRIES

### 1.1 INTRODUCTION

Developing countries are becoming increasingly concerned about their forest revenue systems, as suggested in the Preface. This study is written to provide both guidance to developing countries in reviewing and evaluating their present system of forest charges, and assistance in revising and updating the structure and levels of forest charges.

The objectives of the study are: (a) to develop a conceptual framework and criteria which countries can apply in the review and evaluation of their own forest revenue systems and the component charges, and (b) to utilize this conceptual framework and these criteria in an evaluation of the alternative forest charges and the alternative means of setting the level of charges. The study provides countries with a general evaluation of alternatives which they can use to revise and update their forest revenue system. The paper focuses on the concepts and criteria involved in choosing among forest charges and in designing a system of charges.

This introductory chapter provides the background to the review and design of forest revenue systems in developing countries. Recent and prospective developments in tropical timber, their implications for forest revenue arrangements, and the issues and problems faced in the design of forest revenue arrangements are surveyed. The focus and scope of the study are identified along with the limitations.

One of the important themes of this paper is that forest charges in principle should be based on, and reflect as fully as possible, the stumpage value of the timber cut and the value of concessions.1/

1/ Key terms are defined in the Glossary. Stumpage value is defined as the value of the standing timber. It is determined by deducting from the price of the logs, or processed products, the costs of production, transportation, logging, and allowing a normal return on investment. Stumpage value reflects the economic rent of the forest resource. Analogous concepts are involved in the valuation of mineral and petroleum resources. The conceptual basis of stumpage values and for forest charges is developed in Chapter 4. Concessions and other forest utilization contracts can have value based on the security of timber supply. These concepts are developed in Chapter 5.

For most countries, a primary objective in designing a forest revenue system is to maximize forest revenues collected. To do so, forest charges must closely reflect the stumpage values of the timber cut, as we shall see in Chapters 3 and 4. Forest revenue charges are often narrowly and incorrectly viewed merely as taxes designed to raise revenue rather than as proxy for the stumpage value of timber cut.

Where forest charges do not fully reflect the stumpage value of the timber, part of this value may be collected by those harvesting or processing the timber. Thus if they are foreign-owned or transnational corporations, part of the value of the timber may be transferred out of the country via profits or through lower prices of timber exports. On the other hand, if forest charges are set too high, exceeding the stumpage value of the timber, timber may be left uncut, and timber values again lost, this time through under-utilization. In either case forest revenues will be less than the maximum.

A second important theme of the paper is that forest charges can serve as an important and useful tool of forest management and thus as an instrument both of forest policy and of economic development policy. As we shall see in subsequent chapters, forest charges, if set at appropriate levels can be used to influence logging activities and the utilization of the forest and so support forest management objectives. They can be used to encourage the utilization of currently under-utilized species, shift harvesting pressures away from species that are overcut, discourage the export of logs, or encourage the further processing of logs.

On the other hand, forest charges can equally have perverse, unintended or unanticipated effects on forest management, utilization and further processing. Thus a certain degree of caution is required in setting forest charges. Some of these perverse effects and some cautionary guidelines are developed in the examination of the individual forest charges.

A third important theme is that forest charges can have important equity or distributional effects, not only on the distribution of revenue between government and timber buyers, but also through their impact on timber production, utilization and local processing, on forest product prices, employment and incomes of forest workers.

The administrative feasibility and cost of establishing and administering forest charges is equally important in the choice among alternative charges and in the design of a forest revenue system.

In designing an effective forest revenue system, or in modifying existing charges, developing countries face a challenging task. They face greater challenges than do temperate countries. The tropial forests of developing countries are diverse in species composition, tree quality and diameters. Species may range from the extremely valuable and well known tropical woods to as yet unused species of little current value. Forest inventory is difficult and frequently unreliable with the result that the value of the forest is hard to estimate. In addition, uncertainties of stand conditions and of ground conditions lead to uncertainties about logging costs.

Developing countries face further uncertainties about the value of their diverse species of tropical timbers in world markets. Imperfections in timber markets which distort competitive market prices can result from the presence of transnational corporations, transfer pricing arrangements between subsidiaries and parent companies and recognition of interdependence among buyers. In addition, competition for timber within tropical countries may be limited, either because there are few firms involved, or because government timber disposal policies have already allocated exclusive cutting rights to firms through timber concessions.

Beyond these issues, developing countries face forest policy objectives and economic development objectives which are commonly more important and carry greater weight in planning and decision making than in temperate countries. For example, establishment of local processing to encourage economic development is an important objective for many developing countries.

Finally, developing countries need to design revenue systems to respond to the changing circumstances in tropical timber production discussed in the next section--increased demands and changing demands, rising prices, world inflation and potential future scarcities.

Constrained by these imperfections of information, uncertainty of future trends of inflation, prices and values, imperfections of markets and competition, and faced with additional objectives beyond the maximization of forest revenues, the choice of the best forest revenue system for a particular country is difficult. For any particular country it involves the comparison of each alternative forest charge in terms of the objectives of revenue maximization, forest management and utilization, other forest policy objectives, as well as broader economic development objectives. The advantages and disadvantages of alternative forest charges as well as the interrelationships among alternative charges, must then be compared and balanced.

As a result, it is unlikely that one can define an ideal set of forest revenue charges for any particular country. Consequently in this study, a wide range of alternative forest revenue charges are surveyed and evaluated. Application of this evaluation provides an opportunity for countries to weigh alternatives in terms of their own particular objectives and circumstances and from these choose the most appropriate forest revenue system. The practical experiences of a number of developing countries with some of these alternatives are also used to illustrate the virtues, problems and practicality of alternative forest charges.

## 1.2 DEVELOPMENTS IN TROPICAL TIMBER PRODUCTION

Tropical forests are of importance in close to eighty developing countries with a population of around 1.8 billion people in Latin America, Africa and the Asia-Pacific regions. Tropical forests make a substantial contribution to the development of a large number of these countries. The contributions are almost as diverse as the tropical forests and the countries themselves. For these countries, tropical forests represent a valuable resource, producing not only fuelwood, charcoal and local building materials (the major forest products in many tropical countries) but also logs and other

industrial roundwood. For many developing countries, production of industrial roundwood yields government revenues, export earnings and a base for economic development through further processing. For such countries, forest charges on concessions and on timber cut or exported represent the means by which the government collects revenues from these resources and influences harvesting activities.

### 1.2.1 Growth in tropical timber production, exports, timber concessions and timber prices

Over the decades of the 1960's and 1970's, tropical timber producing countries have experienced increased demands for and production of tropical timber. The increase in production has been accommodated by a substantial expansion in concessions granted. Prices of tropical timber have risen, both in nominal terms and in real terms, although somewhat unsteadily. However, the trends in demand for individual species and timber qualities, as well as among individual countries and regions, have varied from these general trends.

Total roundwood production from the hardwood forests of tropical countries grew by 3.2 per cent per year over the decades of the 1960's and 1970's, rising from 700 million cubic meters in 1961 to 1,280 million cubic meters in 1979 (FAO Yearbook of Forest Products). Although fuelwood is, of course, the major component of total roundwood production and an important factor in its growth, production of industrial roundwood increased more rapidly, rising by 4.5 per cent per year over the two decades, from 80 million cubic meters in 1961 to 180 million cubic meters in 1979 (FAO Yearbook of Forest Products). Production of tropical hardwood logs increased still more rapidly, growing by 5.3 per cent per year and rising from 49 million cubic meters in 1961 to 123 million cubic meters in 1979 (FAO Yearbook of Forest Products). This growth rate in volumes, which implies a doubling of the production of tropical logs every 14 years, has put great strain on forest revenue systems.

Some countries, of course, have experienced above-average growth in production. Production of hardwood logs in the Asia and Pacific regions grew more rapidly than in the African and Latin American regions. In some countries production of hardwood logs grew very rapidly indeed, by 15 per cent per year in Indonesia, 10 percent per year in Malaysia, 16 per cent per year in Papua New Guinea, 8 per cent per year in the Ivory Coast and 18 per cent per year in Liberia (FAO Yearbok of Forest Products).

A large proportion, almost 60 per cent, of the hardwood log production of the tropical countries is exported, either as logs or as processed wood products. About 40 per cent is exported in log form while about 20 per cent is exported as processed products. Exports of hardwood logs (sawlogs and veneer logs) from tropical countries increased at a rapid rate over the 1960's and 1970's, rising from 13 million cubic meters in 1961 to 45 million cubic meters in 1979, a growth rate of 7.1 per cent a year (FAO Yearbook of Forest Products). This growth rate implies a doubling in exports every nine years. The rate of growth might have been higher still, had it not been for export restrictions and quotas on log exports introduced by a number of tropical countries in the late 1970's. Exports of logs have grown in spite of incen-

tives to encourage domestic processing of logs and higher charges on export logs.

Exports of processed tropical hardwood products, although initially small, grew rapidly over the 1960's and 1970's. Exports of hardwood lumber grew by 9 per cent per year, exports of hardwood veneer by 9 per cent per year and exports of tropical hardwood plywood by 17 per cent per year (FAO Yearbook of Forest Products).

In spite of this rapid growth in processed wood exports, by 1979 only one-third of the volume of exports of tropical logs were exported as processed wood products. Two-thirds were still exported in log form.

Alongside this rapid growth in exports of logs and processed products, there has been a shift in exports from the traditional exporting countries toward the newer exporting countries, primarily but not exclusively in South East Asia (Pringle 1979 The Outlook for Tropical Wood Imports Unasylva: 10-18).

This growth in the production and export of tropical hardwood logs and processed wood products was accommodated by the rapid expansion of timber concessions over the two decades (Schmithüsen 1977 Forest Utilization Contracts on Public Lands; Schmithüsen 1980 Forest Utilization Contracts). By 1980 concessions had been granted to roughly 120 million hectares of tropical forests during the preceding two decades, and an additional 30 to 40 million hectares was requested by concessionaires or under consideration by governments (Schmithüsen 1980 Forest Utilization Contracts :15).

In spite of these increases in production and exports of tropical timber accommodated the increased world demand, the prices of both tropical logs and processed timber products also increased over the 1960's and 1970's. The average value of tropical log exports increased by more than three times between 1961 and 1979, but with most of the increase occurring in the 1970's (FAO Yearbook of Forest Products; FAO 1981 Forest Product Prices 1961-1980: 46-58; World Bank 1979 Commodity Trade and Price Trends: 84-85). This represents an average annual price increase of about 7 per cent per year (6.8 per cent per year based on export values, 7.5 per cent per year based on import values) (FAO 1981 Yearbook of Forest Products).

The bulk of this increase in the prices of tropical logs is due to inflation, particularly the inflation of the 1970's. Real price increases averaged about 2 per cent per year over the period in spite of a shift of lower quality logs (FAO 1981 Forest Product Prices 1961-1980: 46-58; World Bank 1979 Commodity Trade and Price Trends: 84-85).

Prices of processed tropical timber products, sawnwood and plywood, also increased over the period of the 1960's and 1970's. From 1961 to 1980 the prices of tropical sawnwoods increased by between two and four times, the prices of tropical plywood increased by between two and three times (FAO 1981 Forest Product Prices 1961-1980: 71-80; World Bank 1979 Commodity Trade and Price Trends: 86-89). As with logs, most of the price increase took place in the 1970's and was due to inflation. In real terms, net of inflation, prices of sawnwood were nearly constant or even declined over the period, but with some variation among species, and with substantial short term fluctuations (FAO

1981 Forest Product Prices 1961-1980: 71-80; World Bank 1979 Commodity Trade and Price Trends: 86-89).

Combining the increases in price and the increases in quantity of production measures the increase in the value of timber production. With the volume of tropical log production increasing by about 5 per cent per year and prices rising by roughly 7 per cent per year over the 1960's and 1970's, the growth in the total value of tropical log production was over 12 per cent per year (the multiplicative combination of the two growth rates 1.05 x 1.07 = 1.123 or 12.3 per cent per year). The value of tropical timber production, the product of both timber volumes and prices, consequently grew even more rapidly than the volume of production or timber prices alone. This growth rate in value implies a doubling in value in six years, a redoubling after 12 years, and a redoubling once more after 18 years, an eight-fold increase in the value of tropical timber production over the two decades of the 1960's and 1970's.

### 1.2.2 Implications for forest revenue systems

The substantial expansion both in the production of tropical timber and in tropical timber exports, sustained over two decades, reflects the equally substantial growth in world demand for tropical timber and timber products over the period. The increase of demand was accommodated by a rapid and substantial increase in the short term supply of timber both through the expansion of concessions and through the development of new timber producing areas. As a result the substantial increase in demand was accommodated with price increases only slightly above the rate of inflation, and thus a modest increase in the real price of timber. However, future increases in demand may not be so easily accommodated.

Thus, the forest revenue systems of tropical countries have had to respond to very substantial increase in the volumes of timber cut, especially in those regions and countries which have expanded concession areas and experienced increased harvesting. This has placed increased pressures on the forest administration of those countries.

Forest revenue systems have also had to respond to price increases, even where these have resulted primarily from inflation such as that of the 1970's.

This growth in production, exports, prices and values, and the expansion of concessions have had different impacts on the various types of forest charges. Volume-based charges have to adjust to increases in timber production, putting strains on scaling, supervision and administration, export charges to the rapid growth in exports, area charges to the growth in concessions.

Charges based on prices have to adjust to price increases and those based on values to the increases in total values. As we have seen, increases in total values, which reflect the combined increases in both volumes and prices, have been sizable. Thus charges, such as ad valorem export taxes, based on values of timber exports, must adjust to rapid changes in export volumes and export prices and to their combined impact.

For the most part the response of forest administrations has been to deal with problems as they have arisen and as stresses have built up. Forest revenues for many countries have increased, but primarily as a result of the increased volume of the harvest rather than from the increased stumpage values. Forest charges have been raised as timber prices have increased, but they have commonly not been adjusted rapidly enough, nor sufficiently to fully reflect the effect of price increases on stumpage values. Another response has been to increase revenues by adding additional forest charges to the existing charges. Where this has happened the result is a multiplicity of charges leading to an increasingly complex forest revenue system.

### 1.2.3 Future developments in tropical forestry, the long term supply of tropical timber and implications for forest revenue systems

Up to the present increased demands for tropical timber have been accommodated by expansion in production. In the long term, increases in demand for tropical timber, or even the present level of demand, may not be so easily accommodated as in the past through expansion of concessions or the opening up of new forest areas. Thus in the future, and over the longer term, forest revenue systems may not have to respond to such rapid increases in timber harvesting and production. Instead, they will likely have to respond to increasing scarcity of natural forest timber and rising real prices, with prices that substantially outpace inflation. Greater variation in prices among species, reflecting relative scarcity can also be expected. Finally, with scarcity of natural forest timber, a more prominant role for forest plantations and consequently a need for improved plantation charges can be expected.

In most tropical timber producing countries much of the forest, or at least the more accessible forest, has already been cut-over in one or more rounds of exploitation (Pringle 1978 Quantity and Quality of the Tropical Forests). Countries in which the forest has been largely worked-over might include Nigeria, Ghana and The Ivory Coast in West Africa; India, Thailand and the Philippines in Asia. Countries in which the more accessible lowland forests have been cut-over might include Gabon, Congo and Zaire in Central Africa; Burma,Cambodia, Indonesia and Malaysia in South East Asia; and Brazil, Columbia, Ecuador and Venezuela in Latin America (Pringle 1978; Pringle 1979 The Outlook for Tropical Wood Imports, Unasylva: 13-14).

Consequently, expansion in production of tropical hardwood logs or industrial roundwood is likely to be slowed. The supply of the more valuable species and higher quality material currently utilized may even decline. If so, significant increases can be expected in the prices of tropical logs and of processed wood products, especially those derived from large logs of high quality (Pringle 1979: 18; Spears 1979: 173-4). Any rise in the prices of such tropical timbers will of course encourage harvesting in hitherto less accessible forest areas with higher logging costs or lower yields of desired species and in countries in which the forests have not been extensively exploited (Congo, Zaire, Papua New Guinea, Burma, Brazil and other South American countries, for example). Price rises may also be expected to stimulate the production and use of secondary, currently less valuable species, in countries currently producing timber (Pringle 1979: 13, 18; Spears 1979: 173-4).

The first signs of scarcity of high quality, more accessible timber and more valuable species and of price increases for tropical timbers may begin to appear early in the 1980's (Spears 1979: 174). Should these signs appear, they will have important implications for forest revenue systems. They will signal a new era for tropical forestry and a more demanding role for forest revenue systems.

This more demanding role for forest revenue systems will require forest charges that reflect the increasing stumpage value of the more valuable timber, and charges that are more responsive to the price changes of tropical timbers. Forest charges will need to accommodate a wider range of timbers and timber values, from high quality timber and valuable species, to a growing number of lower valued secondary species. As logging activity extends into more distant, less accessible areas, forest charges will need to reflect more adequately differences in accessibility, logging costs and other cost factors.

### 1.2.4 Deforestation and implications for long term timber supply and forest revenue systems

Forest clearing for the expansion of permanent agricultural activity has provided a large proportion of the harvest in a number of countries (Pringle 1979: 15). Clearing of tropical forests for agriculture has therefore contributed to increased short-term supply of timber. However, forest clearing for agriculture can lead to a decline in the long-term timber supply through deforestation.

Deforestation resulting, not only from conversion of forest to permanent agriculture, but also from shifting cultivation, fuelwood cutting and other pressures has raised concerns about the future of tropical forestry and about long-term timber supplies and sparked lively debate.1/

The rate of deforestation of closed tropical forests has been variously estimated at between 5 to 20 million hectares per year, from 1 to 2 per cent of the present area of closed tropical forests each year.2/

Recent work by Lanly and Clement for FAO estimated that natural tropical closed forests would shrink over 100 million hectares from 1980 to 2000, a loss of about 10 percent of the present area of tropical forest (Lanly and Clement 1979 Present and Future Natural Forest and Plantation Areas in the Tropics, Unasylva: 35). This estimated loss of forest area is less alarming than other estimates, but nonetheless represents a significant worldwide

1/ A comprehensive survey of the issues and concerns in the debate is provided by Spears 1979 Can the Wet Tropical Forests Survive? Commonwealth Forestry Review.

2/ See for example U.S. Interagency Task Force 1980 The World's Tropical Forests: 15; Spears 1979: 165-167; Saouma 1978 Keynote Address to the Eight World Forestry Congress; Meyers 1980 Conversion of Tropical Moist Forests; World Bank 1978 Forestry Sector Paper: 15).

decline in tropical forests. This work has been followed up by more detailed regional analyses for Latin America, Africa and Asia but the general conclusions remain. (FAO 1981 Tropical Forest Resources Assessment Project, Forest Resources of Tropical Africa; FAO 1981 Proyecto de Evaluacion de Los Recursos Forestales Tropicales; Los Recursos Forestales de la America Tropical).

Deforestation trends have several significant implications for timber supply, timber prices and forest revenue systems, both short-term and long-term implications. Deforestation in the short-term will increase timber supply and keep prices from rising too rapidly, but in the long-term it will lead to just the reverse; scarcity of timber and significantly higher prices. Forest revenue systems will need to be prepared to respond to this reversal, to perhaps relatively sudden timber scarcities and substantial increases in timber prices and stumpage values.

Deforestation and the resulting scarcity of timber and price increases are also likely to stimulate increased plantation establishment. Forest revenue systems will need to provide for charges on plantation timber requiring perhaps quite different types of charges from those applied to natural forests.

## 1.3 FOCUS AND SCOPE OF THE PAPER

As indicated by the Preface, the paper focuses on forest revenues levied on the production of industrial roundwood from public forests on public lands. In most developing countries both forests and forest lands are owned by the central government, by state governments, or are communally or tribally owned. Thus, governments, communities or tribal organizations have a proprietory interest in the forest and the produce of forest land and thus an interest in maximizing forest revenues. Where forests are traditionally, communally, or tribally owned, they are commonly administered and managed by the state or central government, perhaps under some form of revenue sharing arrangement.

Where public ownership of the forest is less common or less clearly defined, as in some Latin American countries, the government may still retain a proprietory interest in the forest and thus an interest in forest revenue arrangements as well. The paper is not concerned with forest revenues from forest lands that are under strictly private ownership, as in European countries. Maximization of such revenues is the concern of the private landowner.

The present study focuses on forest revenues from industrial roundwood. Industrial roundwood is the major forest revenue source for most developing countries. Fuelwood and charcoal production are important forest products for many countries (in volume and perhaps also in terms of economic values) but they are usually not a significant revenue source.

The paper is concerned with public timber allocated through annual or short-term agreements or sales, longer-term timber concessions over large blocks of timber, and other forest utilization contracts (Schmithüsen 1977 Forest Utilizatin Contracts on Public Lands). Consequently, it is concerned both with forest charges on timber harvested, and with charges levied on the concessions and forest utilization contracts themselves.

Forest charges as understood in this paper include area based fees and charges on concessions and short-term cutting areas; stumpage charges, silvicultural charges, royalties and other charges based on the volume cut; charges on processed products, and export taxes on logs or processed products. Taxes such as log export taxes or taxes on processed products which are applied only to forest products are included as forest charges. As we shall see, such taxes can serve as a proxy for stumpage charges if carefully designed.

Except for the corporation income tax, general taxes which apply broadly to all products, industries, or activities are excluded from the evaluation. The corporation income tax is discussed because it is often proposed, although incorrectly, as a substitute for forest charges such as stumpage prices or royalties.

This paper focuses on forest revenue systems, because few, if any countries rely on a single forest revenue source, but instead depend on a combination of several forest charges--area fees, royalties, silvicultural charges, stumpage prices, processed product royalties, log export taxes, etc. These forest charges in combination may be designed to complement each other in their cumulative impact and incentive effects on forest management and utilization. However, individual charges can just as easily conflict, working at cross-purposes.

The paper focuses on two main dimensions of forest revenue systems, the structure of forest revenue systems and charges, and the level of charges. The structure of forest revenue systems is concerned with the types of forest charges, the base (volume, area, etc.), how levied, relationship to other types of charges, etc. Such aspects can be evaluated independently of the more contentious issues related to the level of charges. The following chapters therefore treat these independent questions of structure and level of forest charges separately.

# Chapter 2

## FOREST REVENUE SYSTEMS FOR DEVELOPING COUNTRIES: OVERVIEW AND SUMMARY

### 2.1 INTRODUCTION

This chapter is intended both as a summary and as an overview to guide the reader through the rest of the study. To assist in this comparison, the organization of this chapter parallels that of the rest of the paper and is keyed to the chapters and chapter sections that follow. The reader should then refer to subsequent chapters and to the relevant sections before making a final choice of forest charges or methods of setting their level.

### 2.2 THE ROLE OF FOREST REVENUE SYSTEMS

Two important characteristics of tropical forestry, identified in Chapter 1, suggest that governments should play a significant role in establishing forest charges. First, tropical countries face conditions which are far from competitive in the sale of timber and timber rights. Where competitive conditions are not attained in the disposal of timber and timber rights, forest charges will not maximize forest revenues, unless set appropriately, and the government must necessarily play an active role in choosing the appropriate forest charges, and in establishing their level.

Second, the objectives of government policy may extend beyond that of revenue maximization alone, to concern about the impact of forest charges on utilization and forest management, on other forest policy objectives, on economic development objectives and on employment and income distribution. These additional objectives, important in developing countries, also require a more active role for government in choosing and structuring forest revenue charges to balance these objectives against the objective of revenue maximization. This active governmental role demands considerable art and skill in the design of forest charges, and requires a clear understanding of the concepts involved.

## A FRAMEWORK FOR FOREST VALUATION AND PRICING (PART II)

### 2.3 TIMBER VALUES AND PRICES (Chapter 3)

The distinction between value and price is often overlooked in analysing forest charges. The value of the timber and the price charged for it need not be the same. In Chapter 3, a simple model of exchange is used to distinguish values to buyers and values to sellers. The exchange model is illustrated first with a single buyer for a given block of standing timber containing a set volume of timber. The timber buyer is portrayed as having a range of financial values which he is willing to pay for the timber. These

values will depend on the use to which the timber is put, whether it is used to produce lumber, or veneer and plywood, for example, and whether utilized efficiently, or not. The buyer's maximum willingness to pay is represented by his most efficient and valuable use of the timber.

The government, as seller, can also be portrayed as having a range of financial values it is willing to accept, stretching downward and bounded by a minimum value based on the alternative uses of timber to the government and the economic value of timber in those alternative uses.

When the buyer's range of willingness to pay values overlaps the seller's range of values (willingness to sell), then it is possible to establish a price, that is, a forest charge for the timber at a mutually acceptable level. There is a range of values to the buyer and to the seller, but only one price is established.

It may be that the buyer's range of value and the seller's range of values do not overlap, in which case it will not be possible to find a mutually acceptable price. Sale of the timber would then not be possible unless circumstances change; the value of timber products rises, costs are reduced, or the government reassesses its minimum acceptable price.

When the exchange model is extended to a number of buyers, the range of willingness to pay values, and the maximum willingness to pay of each buyer, will depend on the uses and products produced, and on the logging, production costs and product prices experienced by each buyer. The maximum willingness to pay will then be established by that of the lowest cost, or most advantageously placed buyer. Consequently, by encouraging more buyers to enter, the government can raise the range of values and achieve a higher forest charge for the timber.

This exchange model provides a useful basic framework for much of the rest of the study. The buyer's willingness to pay is developed into a derived demand model of stumpage value of standing timber. The components of the seller's value of timber are elaborated. The components of both the buyer's value and the seller's value of concessions are identified. These extensions are then applied to the evaluation of alternative types of forest charges on timber and on concessions, to the evaluation of alternative methods of establishing the level of forest charges from administratively set charges to auctions, and to the choice of recommended charges for a forest revenue system.

## 2.4 TIMBER VALUES AND STUMPAGE VALUES TO BUYERS (Chapter 4)

### 2.4.1 The Derived Demand Stumpage Value Model (Section 4.2)

The stumpage value model develops the derived demand for standing timber from the value of the logs or processed products, and from the logging and processing costs involved. The stumpage value model is illustrated first for the situation in which logs are sold in a domestic or export log market. The actual or anticipated price for the given species and grade of logs is the

starting point. From this expected price are deducted handling costs and log transport costs, to derive the value of logs at roadside. Next, logging costs are deducted to arrive at the stumpage value, the value of the standing timber. Also included in the deductions is an allowance for profit and risk, based on a normal rate of return on the investment, the rate of return that could be earned on alternative investments of equal risk.

This derived stumpage value represents the maximum price the buyer of standing timber would be willing to pay for timber of given species and grade, while covering his costs and making a normal return on his overall investment. As we shall see below, the buyer may be willing to pay more for additional incremental timber.

This derived demand model is illustrated in Chapter 4 (Table 4.1) using hypothetical prices and costs. The reader is invited to apply prices and costs for situations with which he may be familiar and derive stumpage values representative of these situations.

The derived demand model of stumpage values serves to identify the factors affecting stumpage values and their impact. It provides a theoretical basis for forest charges on the timber cut. In addition, the stumpage value model is used to introduce the concept of marginal stumpage value, useful in understanding the factors affecting utilization, the effect of forest charges on utilization and the means of encouraging utilization. The derived demand stumpage value model also provides the theoretical foundation for stumpage appraisal, examined in Chapter 11.

As stumpage values are residually determined, a given increase in the prices of logs, or processed products, would result in a more than proportional increase in stumpage values. Consequently, forest charges would need to be adjusted more than proportionately for price increases in logs or processed products if they are to continue to reflect stumpage values.

Species and grades of logs likewise influence stumpage values, as more valuable species and higher grades command higher log prices. Similarly stumpage values vary more than proportionately to variations in log prices among species or grades. Again, forest charges would need to vary more than proportionately to log prices if they are to reflect stumpage values.

The derived demand model of stumpage value can be based on processed products rather than logs. In principle, the stumpage value model is the same, but it involves additional steps. Processing costs (overhead, depreciation and operating costs), as well as a normal return on capital invested in processing, must be deducted from the price of the processed products (sawnwood, plywood, or other products). These additional steps, and the increased complexity which results, may be necessary if log markets are not competitive, or do not adequately reflect log values. Basing stumpage values on processed products could result in higher stumpage values if processed products reflect a more valuable use than logs, and if processing costs are not excessive. Alternatively, logs might yield a higher stumpage value, and thus represent the most valuable use.

### 2.4.2 Factors Influencing Stumpage Values (Section 4.3)

The derived demand model serves to identify both the factors determining stumpage values and the response of stumpage values to changes in these factors. The prices of logs, or forest products, produced from the timber is the first and most obvious factor affecting stumpage values. Based on the derived demand model, higher prices yield higher stumpage values. Stumpage values are sensitive to changes in the prices of logs or processed products.

Log transportation costs and log production costs are deductions in estimating stumpage values. Because log transportation costs are a significant cost in many tropical countries, and vary with distance, stumpage values will likewise vary significantly with distance. Log production costs depend on logging conditions and, in turn, on such factors as ground conditions, slope and stand conditions. Consequently, stumpage values will be influenced by ground conditions, slope and stand conditions.

Identification of the factors affecting stumpage values provides the basis for identifying possible variables to include in forest charges.

### 2.4.3 Marginal Stumpage Values (Section 4.4)

The concept of the marginal stumpage value of additional timber is an important extension of the basic stumpage value model. It is a useful concept in setting forest charges to encourage more complete utilization of the forest. Where some of the logging, transportation or processing costs are already covered (fixed costs such as road construction costs or overhead cost of logging, for example), the cost of logging additional timber will be less, and thus the stumpage value of the additional timber higher. Similarly, if capital investments in logging equipment or processing plants have already been made, the firm may be willing to accept a lower profit and rate of return in the short run, and consequently willing to pay a high price for additional timber.

This concept of marginal stumpage value is useful in evaluating the effects of forest charges on the utilization of marginal timber, or additional timber, on lower valued species and on marginal timber stands. It is also useful in explaining why stumpage prices bid in auctions may sometimes exceed estimated average stumpage values.

## 2.5 STUMPAGE VALUES TO THE SELLER AND MINIMUM CHARGES (Chapter 5)

The value of timber to the seller is the other side of the exchange model. Just as buyers have a range of values and a maximum value, so the government , as seller, has a range of values and, in this case, a minimum. The buyer's range of values and his maximum are based on the uses of the timber and prices obtained. On the other hand, the seller's range of values and his minimum charge are based on costs, administrative costs and opportunity costs.

The government will normally wish to cover at least the administrative costs involved in selling the timber and in supervising cutting activities, otherwise the government will be out of pocket, and it then would be

better to let the timber remain uncut. Minimum charges should therefore cover the actual costs of selling the timber; that is the costs involved in making the sale, in supervision of harvesting operation, in enforcing girth limits, in scaling the output, in billing and collecting the revenue, and a proportion of the administrative overhead attributed to the sale of standing timber.

In addition, the seller's value will reflect the alternative uses, the opportunities foregone in cutting the timber, or the costs of regenerating the area. Depending on the circumstances, the minimum charge should reflect one or other of these alternatives, and the higher of the alternatives where more than one is applicable. Where timber values in the future are expected to rise substantially, perhaps because a strong demand for timber products is anticipated in the future or because of a possibile shortage, then the government should be willing to sell the timber today only if it can get more for it now than it can by selling it later. Future timber values will be an important factor to consider in setting minimum forest charges when the values of forest products are rising rapidly, or are expected to rise rapidly in the future.

If alternative uses of timber for fuelwood or non-marketed uses such as for food, game, wildlife, medicines, erosion control, watershed protection, or other uses, then the seller's value of the timber should also reflect these alternative uses. If minimum charges reflect these values then stands will be logged for timber only if the industrial use is of greater value than these alternative uses.

Conversely, there may be benefits from harvesting the timber, benefits from salvage logging prior to plantation establishment, silvicultural benefits and benefits from improved utilization. In such cases the seller's minimum value will be reduced, and minimum charges should be lowered.

Of course the government in all cases should try to achieve charges close to the buyer's maximum price.

Where the government is committed to replacing the forest after cutting, then it can be argued that the seller's value should reflect the cost of regeneration of the area cut-over, and this could become a basis for minimum charges. The argument is a tricky one. It can be made only if the government will actually incur regeneration costs. In such cases, it would be unwise for the government to encourage the harvesting of timber through low forest charges, which yield insufficient revenue to finance regeneration, if the government will be committed to spending substantially more on reforesting the area. However, should the buyer's maximum willingness to pay be below the cost of regeneration, the government will face a difficult decision in setting minimum charges. If it sets charges to reflect regeneration costs, buyers will be unwilling to pay such charges, harvesting will be reduced and timber left uncut.

## 2.6 THE VALUE OF CONCESSIONS AND TIMBER RIGHTS (Chapter 6)

### 2.6.1 The Value of Timber Rights to Concession Holders (Section 6.2)

Forest concessions or other forms of timber rights have value to the forest industry, in addition to the timber contained thereon. They provide security of timber supply into the future at established forest charges. Therefore where a concession provides future timber supplies at forest charges that are less than the stumpage value of the timber, the concession can be of considerable value. Concessions also provide security for the expansion of processing plants as well as bargaining power in obtaining additional timber, in the purchase of logs, or in negotiations with logging contractors. These values are in the nature of an insurance value.

Based on the value of concessions to buyers, a case can be made for charges on concessions in addition to charges on the timber cut. To reflect these values, charges on concessions could be based on the area of the concession, the volume of timber, or the allowable cut. An annual charge based on the total area of the concession is a simple alternative related both to the size of the concession and to the length of tenure.

### 2.6.2 The Seller's Value of Concessions and Minimum Concession Charges (Section 6.3)

The Government, as seller, will have a range of values and a minimum value for concessions. The seller's minimum value is based on the administrative costs of supervising the concessions. In addition, it incorporates the higher of the future value of the concession, or the foregone opportunities in allocating the area to timber harvesting. These seller's values provide a basis for minimum charges on concessions, in addition to minimum charges on the timber cut.

## APPLIED FOREST VALUATION AND PRICING: THE CHOICE OF FOREST CHARGES AND THE DESIGN OF A FOREST REVENUE SYSTEM (PART III)

In Part III the analytical structure, outlined above is applied to the evaluation of forest charges and forest revenue systems, first to the evaluation of a range of alternative forest charges, then to several methods of determining the level of these charges, and then to practical questions and problems of stumpage appraisal. Finally, the analysis is synthesized in discussion of forest revenue systems. Four criteria for the evaluation of forest charges are first identified.

## 2.7 CRITERIA FOR EVALUATING FOREST CHARGES AND FOREST REVENUE SYSTEMS (Chapter 7)

Forest charges serve not just to collect forest revenue, but also as tools for other forest policy and economic development objectives. In the

evaluation of forest charges and forest revenue system four broad objectives are applied to the individual forest charges.

These four broad objectives are: (1) financial revenue to the government, (2) administrative costs and practicality, (3) economic efficiency in utilization and forest management and, (4) distribution of economic effects, revenue and income.

In addition, two broad general constraints are identified: (1) physical and biological feasibility, and (2) social and cultural acceptability. Together, the four objectives and two constraints provide a comprehensive framework for the evaluation of forest charges or forest revenue systems. While policy objectives may vary among countries, these four broad objectives and two general constraints can be widely accepted. The importance, or weight, placed on these objectives by particular countries is likely to vary more widely than the objectives themselves, while the constraints may be of more importance in some countries than in others.

### 2.7.1 Financial Revenue to the Government (Section 7.3)

Financial revenue to the government is the first and most obvious objective. It may also be the most important criteria for many countries. Revenues can be evaluated in terms of revenue per cubic metre of timber, or in terms of total revenues collected. Additional factors to consider are the variability of revenues and the timing of revenues.

Forest charges can also be evaluated by comparing the actual revenue generated (per cubic metre or in total) with the potential revenue. The stumpage value model developed in Chapter 4 provides the framework for identifying potential stumpage revenue from timber cut, based on the willingness to pay of timber buyers. The value of timber rights and of concessions, discussed in Chapter 6, provides the basis for identifying the potential revenues from ground rental charges and other concession charges.

Forest charges which reflect, as closely as possible, the stumpage value of timber and the value of concessions will mean that the actual revenues from the forest charge approach potential revenues, and consequently maximize revenues.

### 2.7.2 Administration Cost and Practicality (Section 7.4)

Some forest charges are simple and easy to administer, requiring few forestry personnel and involving little in the way of administration costs. Others are much more complex and costly, even though they may generate more revenue or achieve better utilization.

Administrative costs are measured in terms of the initial or "once only" costs involved in the introduction of new forest charges (or in a change in existing charges), and the ongoing annual operating costs of the charge. Administrative practicality is measured most conveniently in terms of the

manpower requirements for supervision, wood measurement and collection of revenues.

Evasion of forest charges is another dimension of administration which affects both administration costs and practicality. Evasion of forest charges can be of significance in forestry activities, which are by nature carried out in rural and remote areas, are difficult to oversee and are not always amenable to cross-checking through other transactions.

The costs and practicality to the forest industry in complying with alternative charges should also be considered under administration costs and practicality. Even though such costs are not borne by the government, they affect the overall economic efficiency of each alternative charge. The certainty of liability is another dimension of concern to the forest industry.

### 2.7.3 Economic Efficiency in Utilization and Forest Management (Section 7.6)

Forest revenues can serve to complement forest management activities, encourage utilization, restrict overcutting, and thus can serve to achieve economic efficiency in the use of the forest resource and forest management. On the other hand, if charges are improperly set they can cause difficulties for forest management and impose additional burdens in the enforcement of regulations.

### 2.7.4 Equity in The Distribution of Economic Effects, Revenue and Income (Section 7.7)

Forest charges through their effects on harvesting activities, utilization, local processing, etc. can have important effects on employment, the availability of forest products and prices, and hence on income distribution. Since income distribution is of increasing importance as a policy objective in many countries, it is important that these impacts of alternative forest charges be considered.

### 2.7.5 Constraints (Section 7.8)

The two basic constraints complete the set of criteria for the evaluation of forest charges and forest revenue systems. They are (a) physical and biological feasibility and (b) social, cultural and ideological acceptability. They are both broad and obvious, as well as important. They may significantly limit the choice of forest charges in the forest revenue system.

### 2.7.6 Balancing Objectives in The Choice of Forest Charges (Section 7.9)

These four objectives and the two basic constraints provide a broad set of criteria for the evaluation of the wide range of forest charges introduced below and evaluated in the following chapters.

Some forest charges may measure up well in terms of one or more of the objectives, although not in terms of others. In choosing among alternative forest charges, trade-offs among the objectives must be identified. The final choice of a forest revenue system for a particular country is a policy decision, which will depend on the weight, or importance, placed on each objective. The choice is not for the analyst to make. Rather, the role of the analyst is to identify the alternatives and the trade-offs.

## 2.8 SURVEY OF ALTERNATIVE FOREST CHARGES CLASSIFIED BY BASE (Chapter 8)

The survey of forest charges from a selected group of eight major tropical forest countries in West Africa and South East Asia reveals a diversity of forest revenue arrangements and experience. Yet it also illustrates some common problems, approaches and responses to forest revenue arrangements.

This survey is intended to contribute to the sharing of the experience with and ideas on alternative forest revenue arrangements among developing countries. Much can be learned from the practical experience of other countries.

### 2.8.1 Classification of Forest Charges (Section 8.2)

Forest charges vary by the base upon which they are levied (area, volume, value, profits, etc.), the point or location at which they are levied (in the forest, at roadside, at a processing plant, at port, etc.), how they are determined (by negotiation, competitive auction, administrative decision), the timing of the charge (initial, annual, as timber is cut, etc.), and finally but most commonly, by the rationale for the charge; the purpose of the charge or the use to which the funds are put (stumpage fees, royalties, reforestation fees, silvicultural cess, research fund contributions, public works charges etc.). In fact, the rationale for the charge by which it is named is the least useful basis for classification and analysis of forest charges.

To facilitate a comparison of forest charges among developing countries and to enable countries to draw on the experience of other countries, forest charges and alternative forest revenue arrangements are classified in terms of the base upon which they are levied and surveyed under fourteen broad types of forest charges or forest revenue arrangements.

These fourteen classes under which forest charges and forest revenue arrangements surveyed are:

On Concessions

- Licence Fees.
- Annual Ground Rentals
- Fees Based on Standing Timber, The Annual Allowable Cut, or Property Values.

On Timber Harvested

- Per-Tree Charges
- Volume Based Charges
- Charges Based on Area Logged

On Forest Products Production

- Charges on Processed Forest Products
- Charges on Minor Forest Products

On Foreign Trade

- Export Charges on Logs and Forest Products

For Services

- Fees for Services Provided

On Productive Factors

- Charges in Equipment and Workers

On Companies

- Corporation Income Tax
- Profit Based Royalties

Governement Partipication in Concessions, Harvesting and Processing

- Joint Ventures or Full Government Ownership of Concessions, Logging Operations or Processing Plants.

These cover a full range of possible charges and alternative forest revenue arrangements. In subsequent chapters they are evaluated in terms of two dimensions: (a) The type of charge, classified by the base upon which they are levied (in Chapter 9), (b) The level of forest charges and the methods of establishing the level (in Chapter 10).

## 2.9 EVALUATION OF FOREST REVENUE CHARGES CLASSIFIED BY BASE (Chapter 9)

The fourteen types of forest charges surveyed in Chapter 8 are evaluated in terms of the four objectives established above (and in Chapter 7). The choice of the base as the criterion for the classification facilitates their evaluation since their economic effects on utilization, forest management, employment and production, as well as financial revenues to the government, are determined by the base upon which the charge is levied.

The evaluation builds on the review of forest charges in the previous chapter and draws on the experience of the countries surveyed. The evaluation of these fourteen types of charges is summarized in Table 9.1, at the beginning of Chapter 9 (see pages 118-123). Table 9.1 provides a convenient overview of the evaluation. For the detailed evaluation, the reader is referred to the relevant sections of Chapter 9.

## 2.10 SETTING THE LEVEL OF FOREST CHARGES (Chapter 10)

The structure of forest revenue systems and the choice of types of forest charges, discussed in Chapter 9, is conveniently separated from the more contentious issues related to the level of charges dealt with in Chapter 10. Chapter 10 evaluates six methods of setting the level of forest charges: administratively set fixed-rate charges, value related (ad valorem) charges, formula approaches, negotiation, open-bid or sealed-bed auctions, and public log markets.

Each of the six methods is described, reviewed and evaluated in turn, along with examples drawn from the countries surveyed. Each method is evaluated in terms of the four objectives and criteria established above (and in Chapter 7). The results of the evaluation of methods of setting the level of charges are summarized in Table 10.1 at the beginning of Chapter 10 (see pages 168-170). Table 10.1 provides a convenient overview of this evaluation. For the detailed evaluation, the reader is referred to the relevant sections of Chapter 10.

## 2.11 STUMPAGE APPRAISAL (Chapter 11)

Stumpage appraisal is the estimation of the financial value of the standing timber to be harvested as logs or converted into processed products. It represents a practical application of the derived demand model developed in Chapter 4.

Stumpage appraisal, in some form, is an element in establishing the level of charges under several of the methods identified above. It is a necessary step in establishing the level of administratively set charges, in setting the ad valorem rates for value related charges, and in setting the parameters in formula approaches. It provides important information for negotiation of the level of charges, and it is desirable in establishing upset prices in auctions of standing timber and in public log markets.

The stumpage appraisal systems of the United States Forest Service, the United States Bureau of Land Management and the British Columbia Forest Service in Canada are examples of well developed and sophisticated stumpage appraisal systems. Each system benefits from detailed information on prices and costs gathered from generally competitive markets, and from a well trained staff operating an appraisal systems refined over a number of years. In addition, the large volume of timber sold by each agency warrants the investment of time, effort and staff in information gathering and in the refinement of the system.

Stumpage appraisal in developing countries faces greater problems than these appraisal systems. Tropical forests, of course, are more complex and variable. Both logging costs and timber values are more difficult to estimate because of this. Markets for logs and processed production are commonly less competitive and prices less reliable. Logging costs are more variable. In addition, the skilled personnel to undertake appraisal are scarce.

The solution to these problems lies in the application of more basic and simpler appraisal methods that can be operated with fewer personnel and are less demanding in data requirements. The solution also lies in greater reliance on other methods of establishing forest charges, and in the encouragement of competition for timber, both to provide data for appraisals and to reduce the reliance on appraisals.

Examples of appraisal systems from several developing countries are reviewed, along with examples of the necessary studies of logging costs.

## 2.12 FOREST REVENUE SYSTEMS: STRUCTURE AND PROPOSALS (Chapter 12)

The study develops a systematic approach, which has emphasized the interrelationships among forest charges. In the final chapter the conclusions on types of forest charges and on means of establishing the level of charges are drawn together, and some important interrelationships emphasized. The broad outlines of a general forest revenue system and alternatives are presented. The special circumstances of individual countries would, of course, require substantial adjustment to this basic system and choices among the alternative charges.

### 2.12.1 Outline of a Basic Forest Revenue System (Section 12.2)

The suggested framework of a basic forest revenue system consists of the following:

1. Annual Ground Rentals on Concessions, based on the area of the concession, administratively set or established by bidding.

2. Volume Based Charges on the Timber Cut, levied on all timber cut, whether used domestically or exported. Charges should incorporate a number of key factors such as species, distance, log diameters or grades.

3. Export Charges and Domestic Processing Incentives. A uniform export tax on logs, to provide an equal incentive for domestic processing of all species, sizes, grades and qualities of logs.

### 2.12.2 Annual Ground Rental Charge (Section 12.3)

It is suggested that annual ground rentals play a more significant role in forest revenue systems, and that their levels reflect the value of the

concessions generated by the security of timber supply as well as by forest charges which are below stumpage value (as discussed in Chapter 6).

The level of annual ground rentals could be administratively set, or where competition can be achieved, established through auctions of concessions. Charges established by auctions would then aid in setting the level of administratively set ground rentals in non-competitive situations.

Minimum annual ground rentals should be established to cover the administrative costs related to concessions and their opportunity cost (values in alternative uses).

An initial lump-sum licence fee can serve as an alternative, or as a supplement to annual ground rental charges. The initial lump-sum licence fee could, for example, take the form of a bonus bid on concessions allocated by auction or negotiation.

2.12.3 Volume Based Charges on the Timber Cut (Section 12.4)

Volume based charges on the timber cut should be the major charge in the forest revenue system, and levied on all timber cut, whether used domestically or exported. The level would be based on stumpage values in domestic markets, with domestic processing incentives provided by the additional export charges levied on log exports.

Volume based charges should reflect differences in stumpage value, and where feasible vary with several of the key factors, such as species group, log diameter, log grade and distance. The choice should be limited to the most important of these, in order to facilitate administration, and to avoid a too complex set of volume based charges.

Alternative charges on the timber cut include a charge based on the area logged, or a per-tree stumpage charge. Area based charges on the timber cut are recommended for plantation stands or high forest stands allocated by auction. Per-tree stumpage charges are recommended only for small scattered logging operations where scaling and supervision would be difficult.

A two-part charge on the timber cut, consisting of a fixed, uniform area based charge, and a lower volume based charge, is an alternative with some advantages. The fixed, uniform area based charge is administratively simple, collects revenue early and allows a lower volume based charge. The lower volume based charge encourages utilization, minimizes scaling problems and reduces evasion.

2.12.4 Export Charges on Logs and Domestic Processing Incentives. (Section 12.5)

Export charges, in addition to volume based charges, are recommended (a) to reflect higher stumpage values in export markets and (b) to provide incentives for domestic processing. Ideally, the volume based charge should reflect the differences in stumpage value by species, etc., and the export

charge would then be a uniform additional charge. The uniform export charge would provide an equal domestic processing incentive on all timber.

An alternative approach consists of a higher volume based charge based on stumpage values derived from export log prices, combined with a rebate, based on the output of processed products. The higher charge on logs, plus the rebate based on the output of processed products, would encourage full recovery of processed products, and the two components would provide a cross-check on scaling and minimize evasion.

Export charges on processed products are generally not recommended except for special purposes, as they tend to offset the domestic processing incentives.

Export quotas and domestic processing requirements are better replaced by higher export charges. Higher export charges can generally do as well and, in addition, yield additional revenue.

### 2.12.5 Charges for Special Situations (Section 12.6)

Some of the other charges reviewed and evaluated in Chapters 8 and 9 can be useful for special situations, or as components of a two-part charge. Profit based royalties might be applied to new, large forest industry projects. Joint ventures or full government ownership of concessions, harvesting and processing operations may be advantageous for certain areas. Such operations can provide useful information on market prices, logging costs and hauling costs.

### 2.12.6 Establishing the Level of Forest Charges (Section 12.7)

A forest revenue system should perferably include more than one method of setting the level of charges. One method can assist in establishing levels under another method. For example, open-bid or sealed-bid auctions in competitive situations can yield information on stumpage values of use in establishing charges by other methods. Public log markets can yield information on log prices, logging costs, hauling costs and stumpage values.

A strategy for establishing and adjusting the levels of forest charges is suggested. It includes the following components:

- The annual adjustment of administratively set, fixed-rate charges by means of a simple escalation formula based on a readily available price index (the country's consumer price index, national accounts price index, or forest product prices).

- Development and introduction of formula approaches, where feasible.

- Increased use of open-bid or sealed bid auctions where competition for timber and concessions can be encouraged, in order to test their feasibility, to develop administrative procedures and to provide information for setting charges by other methods.

- Limited introduction of public log markets, initially in the most suitable locations, to test their feasibility, measure their benefits, as well as to provide information for setting charges by other methods.

- Surveys of forest product prices, to provide information for the setting and adjusting of charges.

- Surveys of contractor rates for logging and hauling, to provide information on logging and hauling costs and for setting and updating of charges. Where custom sawing of logs is common, custom sawing rates should be surveyed as well.

2.12.7 A Cautionary Note on Things to Avoid in Forest Revenue Systems (Section 12.8)

Finally to complete the discussion of the structure of a forest revenue system some things to avoid are mentioned. These include:

- Avoid too many different charges in the forest revenue system. Use a basic system consisting of only two, three, or at most four charges.

- Avoid several separate charges levied on the same base.

- Avoid including too many factors in forest charges. Include only the two or three key factors affecting stumpage values.

- Avoid charges based on criteria that are difficult to define, measure or verify, or are subject to interpretation or manipulation.

- Avoid charges established by statute, as these are often difficult to up-date.

- Avoid administratively set, fixed-rate charges which do not include a mechanism for adjustment and review.

- Avoid value related (ad valorem) charges based on prices which are under the control of individual firms, such as export charges based on the declared value of individual shipments.

- Avoid using export charges on logs to both reflect stumpage values and to encourage domestic processing. A single charge can not adequately serve two functions.

- Avoid using export quotas or domestic processing requirements to encourage domestic processing. Instead use higher export charges on logs.

- Avoid the use of the corporate income tax as a substitute for forest charges on concessions or on timber cut. Charges on the timber cut should be levied in addition.

Avoid creating uncertainty in forest revenue systems. The basic structure of the forest revenue system and the methods of setting the level of charges should be clearly established. The individual charges and levels should be certain. If uncertainty is reduced, higher charges can be achieved and increased revenues realized. As well increased investment and improved utilization can be encouraged.

# PART II

# A FRAMEWORK FOR FOREST VALUATION AND PRICING

## Chapter 3

## TIMBER VALUES AND PRICES

### 3.1 INTRODUCTION

The concepts of value and price are central to the establishment of a system of forest revenue charges. While most people recognize that the value of commodities and the price of commodities differ, and that values can vary between users and used, in everyday discussion these distinctions are commonly overlooked.

The objective of this short chapter is to identify, define and carefully distinguish the concepts of value and of price as they apply to standing timber, forest products or timber rights. A simple model of exchange is used to identify the range of values to buyers and sellers and to distinguish these from timber prices. This model of exchange provides a basic framework for much of the remainder of the paper.

Stumpage values to the buyer and the factors affecting these values are identified in Chapter 4 using a derived demand model, and the concepts are then applied in Part III, in the evaluation of alternative charges and in the discussion of timber appraisal. Stumpage values to the seller, the government, are examined in Chapter 5. They serve as a basis for the establishment of minimum forest charges.

The model of exchange is also used to introduce the price setting process. It provides a basis for evaluation of negotiation, auctioning and administered price setting in Part III, comparing prices established by forest charges under these arrangements against the stumpage value of the timber.

Thus, the distinction between values and prices is an important theme throughout the paper. Forest charges commonly do not reflect the stumpage value of the timber to buyers, although the paper argues that they should.

### 3.2 VALUES AND PRICES OF TIMBER

The distinctions between the value and price of marketed commodities are commonly blurred. In day-to-day discussion we often take value and price as equivalent. Values, that is financial values, and price coincide only in certain special circumstances, as for example, in competitive markets with many buyers, sellers and transactions. Under less competitive situations, in which

many commodities including timber are commonly sold, financial values and prices are likely to diverge.

The financial value and price of a commodity or service can be defined and distinguished as follows:

Financial value to a buyer is the estimated range of potential prices he would be willing to pay, based on the alternative uses to which the commodity or service can be put. It is bounded by the estimated maximum price the buyer would be willing to pay for a given quantity of the commodity or service based on its best use (Beuter 1971 Timber Value:2; Boulding 1955 Economic Analysis:31-33). Financial values to the buyer, based on willingness to pay, are dependent on the user, the perceived uses to which the commodity or service can be put, and the perceived revenues and costs involved.

Financial value to the seller is the estimated range of potential prices the seller would be willing to accept, bounded by the estimated minimum price he would be willing to accept. Willingness to sell values are dependent on the seller, on the perceived alternative uses, and on the revenues and costs of these alternative uses.

Market price is the amount actually paid by the buyer and accepted by the seller for the commodity or service when the transaction takes place (Beuter 1971: 2; Boulding 1955: 31-33).

Thus there is but one market price established for a given transaction, but a range of values based on the values to potential buyers and sellers. The value of the commodity or service depends on the potential uses and the circumstances of potential buyers. The value depends also on the costs and limitations or constraints faced by the buyer as well as on the assumptions and judgement of the buyer. For example, high quality tropical logs have different values as sawlogs for lumber production, as peeler logs for veneer and plywood production, or as export logs. A stand of timber may have a higher stumpage value to a conveniently located processing plant than to one located a hundred kilometres further away. The value of logs to a locally owned processing plant may differ from that to a transnational corporation with marketing subsidiaries in consuming countries.

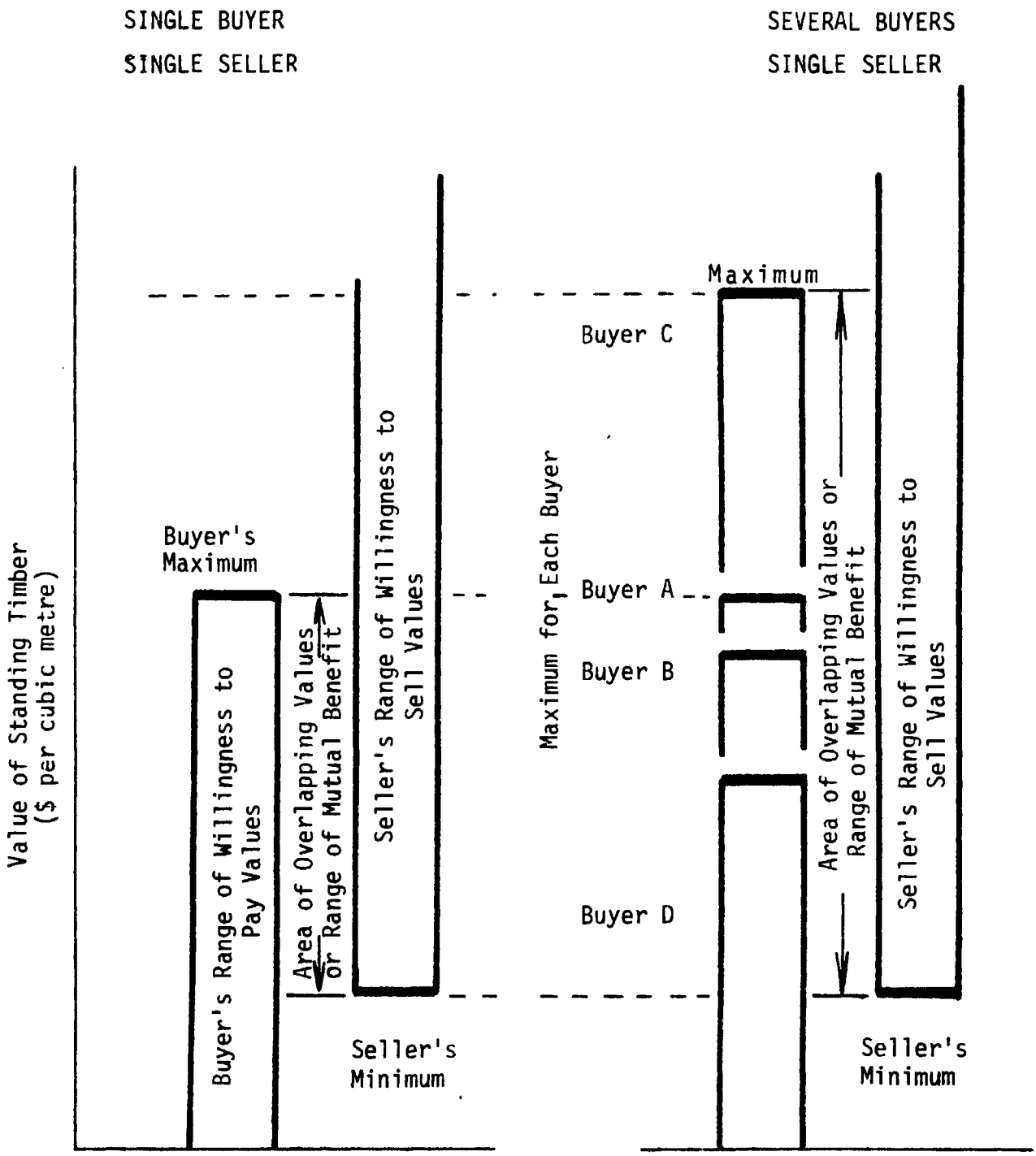
## 3.3 A SIMPLE MODEL OF EXCHANGE

The simple theory of exchange, illustrated in Figure 3.1, provides a useful framework within which to identify and distinguish values to buyers and sellers of timber, to distinguish them from the price and to introduce the price setting process.

The exchange model is illustrated digramatically for a single buyer of a given block of standing timber containing a given volume of timber in the left hand panel of Figure 3.1. The timber buyer will have a range of financial values which he is willing to pay for the timber. These values will depend on the use to which the timber is put, whether it is used to produce lumber or veneer and plywood, for example. It will also depend on logging and processing costs, whether utilized efficiently or not, and whether used in an efficient or

FIGURE 3.1

DIAGRAM REPRESENTING THE RANGE OF FINANCIAL VALUES TO BUYERS OF STANDING TIMBER AND A SINGLE SELLER



inefficient mill. The buyer's maximum willingness to pay is represented by his most efficient and valuable use of the timber.

The government as seller also has a range of financial values it will be willing to accept, stretching downward to a minimum acceptable price. The range of values for the seller reflects the government's range of prices which it would be willing to accept for the standing timber. The seller's minimum price reflects the lowest price the governement would accept. At prices below this minimum the government would rather leave the stand uncut. This minimum acceptable price reflects the administrative costs involved in selling the timber plus the higher of (a) the economic costs imposed by cutting the stand (soil erosion, watershed losses, etc.), or (b) the present value (value today) of revenue which could be obtained by holding on to the timber for future cutting, or (c) the cost of regenerating the forest. Although the government's minimum price could of course be zero, there are good reasons why it should not be higher.

Agreement on the sale of standing timber is possible when the buyer's range of willingness to pay values overlaps the seller's range of willingness to sell values, as in Figure 3.1. Buyer and seller are then able to reach an agreement and establish a price (the forest charge) for the timber within this range of overlapping values, whether by negotiation, auction, adiministered prices established by the seller, or by other means. Although the transaction involves a range of values to buyers and sellers, only one price is established.

It may be that the buyer's and seller's range of values do not overlap, in which case it will not be possible to find a mutually acceptable price and so no transaction is possible. This situation can occur where the buyer's range of willingness to pay is lower than that illustrated in Figure 3.1, perhaps because of lower forest products prices, lower quality of the stand, or because the logging or processing costs are higher. No overlap may also result from a higher seller's minimum price, reflecting perhaps higher value of alternative uses or higher expected future prices.

Extension of this simple model of exchange from one buyer to a number of buyers is likely to increase the range in willingness to pay and to raise the maximum as new buyers are introduced who are more efficient or have more valuable uses for the timber. This is illustrated in the right hand panel of Figure 3.1. The range of willingness to pay of four buyers and their maximum values are shown. Those buyers with low logging or processing costs or with the ability to utilize the timber for high valued products will have higher maximum prices within the range, others lower maximum prices. Thus by encouraging more buyers to enter, the government can widen the range of values and perhaps achieve a higher forest charge.

This framework of values and prices can also be used to portray for example the sale of logs at roadside or at a port, the sale of forest products at processing plant or at a port, sales between either government or private buyers, or between private sellers and buyers. It can also be used to portray the sale or disposal of timber concessions or other forms of rights to timber, sold by negotiation, auction, or other means. In all cases a range of values

to buyers and sellers is involved and a price can be established if the ranges of values overlap.

## 3.4 THE LEVEL OF FOREST CHARGES

If the buyer's range of willingness to pay values and the seller's range of willingness to sell values overlap, as in Figure 3.1, there is opportunity to establish a mutually acceptable price, or forest charge, within the area of overlapping values. Within this area of mutual benefit, buyers would obviously prefer a low forest charge, approaching the seller's minimum. The seller would obviously prefer a forest charge that approaches the buyer's maximum willingness to pay.

The level of the forest charge (a single price) can be established within this range of mutual benefit by one of several approaches: by negotiation between the two parties where only one buyer and seller are involved, by open bidding auction or sealed tender if more than one buyer is involved, by market pricing if an active market exists, or by administratively established prices. These and other means of establishing the level of forest charges are examined in Chapter 10, and their applicability to different situations and effectiveness evaluated.

## 3.5 MARKET AND ECONOMIC VALUES

The simple model of exchange and price setting has been developed in terms of financial value based on market values, monetary costs and prices. This is appropriate since forest charges primarily involve financial pricing arrangements. To the private industry utilizing the timber, financial values are all that count, since they are concerned with monetary prices, costs, and profits.

The government too is concerned with financial values. It is concerned with maximizing forest revenues, and therefore with achieving forest charges that reflect the willingness to pay of buyers, and approach the buyers' maximum willingness to pay. However, the government is also concerned with broader economic values, both in pursuing other forest policy and economic development objectives in addition to revenues, and in the establishment of minimum forest charges.

Economic values involve financial values derived from market values but adjusted for market distortions such as monopoly, unemployment, shadow pricing of foreign exchange, etc. and for non-market factors such as pollution, or other external costs or benefits. Economic values also include the value of non-marketed goods and services such as erosion control values, the value of food and game produced, etc.

In pursuing forest policy objectives such as efficiency in the utilization of the forest resource, or economic development objectives, such as encouraging further processing, it is economic values rather than financial values which are of concern to the government.

Likewise, in establishing minimum forest charges to reflect alternative non-market uses such as watershed protection, etc., it is economic values rather than financial values which are of concern to the government.

## 3.6 SUMMARY

This chapter has served to identify the introduce a number of concepts which will be developed and applied in subsequent chapters. The simple model of exchange introduced in this chapter will serve as a basic framework for much of the rest of the study.

The concept of the buyer's willingness to pay is developed into a derived demand model of timber value in the next chapter and the model used to identify the factors which influence the willingness to pay.

In Chapter 6, the willingness to pay concept of value is used to identify the value of timber concessions to concessionaires.

The derived demand model and these factors affecting stumpage values are applied in Part III, in Chapter 9 in evaluation of alternative forest charges, as well as in Chapter 10 in evaluation of the methods of determining the level, and in Chapter 11 on timber appraisal.

The concept of the seller's value of timber provides the basis for the development of minimum forest charges in Chapter 5 and the minimum level of concession charges in Chapter 6. These concepts are applied in Part III in Chapters 9, 10 and 11.

The distinctions between financial values based on market prices and economic values based on the values of non-market outputs and the adjustment of market prices for market distortions and imperfections will be utilized in evaluation of forest charges in terms of the other non-revenue objectives of forest policy introduced in Chapter 7.

# Chapter 4

## TIMBER VALUED AND STUMPAGE VALUES TO BUYERS

### 4.1 INTRODUCTION

This chapter extends the framework of the exchange model developed in the previous chapter, focusing on the buyer's range of values and maximum willingness to pay. A derived demand model is developed for estimating the buyer's maximum willingness to pay for timber at various stages in the production processes (for forest products, for roundwood at roadside in the forest, for standing timber in the forest, i.e., stumpage).

Timber values, refer to the value of timber at various stages of production; roundwood at roadside in the forest, roundwood delivered to the processing plants, processed products, or export logs delivered to the port for example. Consequently timber values must be qualified by form and location. Stumpage value, on the other hand, refers to the value of standing timber located "on the stump" in the forest. Thus stumpage value is the timber value of standing timber.

In establishing stumpage prices, royalties, or other forest charges whether by auction, negotiation or administrative decision, the government needs to know the stumpage value (i.e., the buyer's maximum willingness to pay) of the standing timber. Moreover, a knowledge of the factors affecting timber values and stumpage values is important both in establishing forest charges and in revising and updating them.

The objectives of this chapter are first to develope the stumpage value model which identifies the buyer's maximum willingness to pay for standing timber as a derived demand. Second, the chapter utilizes the model to identify the factors affecting this residually determined derived demand and to illustrate the effect of changing conditions affecting these factors. Finally, the chapter utilizes the derived demand model to develop the concept of marginal stumpage values and marginal timber values.

### 4.2 THE DERIVED DEMAND STUMPAGE VALUE MODEL

The stumpage value of standing timber, both to buyers of short-term timber supplies and to concession holders, reflects the buyer's evaluation of the timber in alternative uses and is based on their circumstances and costs. Thus the demand for stumpage is a derived demand based on the forest products and the stumpage value of the standing timber is a derived value. For the buyer producing logs, stumpage values are derived from the market price of logs. For the buyer producing sawnwood and plywood, stumpage values are derived from the market price of the sawnwood on plywood.

### 4.2.1 Stumpage Values Derived from Log Prices

The stumpage value of standing timber, representing the buyer's maximum willingness to pay, is derived in Table 4.1 for the simpler case in which a market of logs exists with an identifiable market price, using export log prices for illustration. Illustrative costs and prices in terms of U.S. dollars are presented in column 1 of Table 4.1. The reader is invited to apply the analysis to his own estimated costs and prices, based on situations with which he is familiar. Column 2 of Table 4.1 is provided for the reader's own costs and prices and his own derivation of stumpage value.

In columns 3 and 4 of Table 4.1 the illustrative costs are divided into fixed and variable costs. This division will be utilized at the end of the chapter in discussion of the marginal stumpage values in harvesting additional timber from an area. Fixed costs represent those costs which are incurred irrespective of whether any logs are produced or hauled. Variable costs are those that are directly related to the level of production. Road construction, log transportation, overhead, and log production overhead can all be classified as fixed costs, approximately fixed regardless of the level of output. Port handling charges, trucking costs, felling and yarding costs can be classified as variable costs.

In deriving stumpage values, the starting point is the average export price of logs for the species and grades contained in the stand. In Table 4.1 an illustrative price of \$100 per $m^3$ is used. This average price is the price the purchaser of standing timber or concession holder expects to receive and represents the financial value to him of the export logs.

From this export price, port handling charges and log transport costs are deducted to arrive at a derived value of logs at roadside of \$58 per $m^3$. In this example it represents the maximum price the timber buyer would be willing to pay for logs at roadside.

Finally, log production costs are deducted to arrive at a derived demand value of the standing timber of \$30 per $m^3$, the stumpage value of the standing timber. This represent the maximum price that the buyer would be willing to pay for standing timber to be utilized for export logs.

Costs are those expected by the concessionaire. They will of course vary with port handling costs, hauling distance, road conditions, the terrain on which logging is carried out, volume per hectare and other stand conditions. We shall have more to say on these factors when we explore their effect on stumpage values.

The derived demand stumpage value also incorporates a normal profit, that is, a normal rate of return on the investment, based on the level of investment in fixed capital investment, log inventories and other working capital requirements. This normal profit represents the rate of return that the buyer or concession holder could earn on alternative investments elsewhere, and includes the risk allowance incorporated into the return on alternative investments. Although this normal profit is not an actual "out of pocket" cost, it represents an opportunity cost in determining the mximum price the timber buyer or concession holder would be willing to pay for stumpage.

Table 4.1

ILLUSTRATED DERIVATION OF STUMPAGE VALUES BASED ON LOG PRICES

| | Illustrative Prices and Average Costs ($/m$^3$) | Reader's Own Estimates ($/m$^3$) | Illustrative Prices and Costs | |
|---|---|---|---|---|
| | | | Variable Costs ($/m$^3$) | Fixed Costs ($/m$^3$) |
| | (1) | (2) | (3) | (4) |
| Export price of logs | $ 100/m$^3$ | | - | - |
| Less port handling charges | 10 | | 10 | - |
| Less log transportation costs: | | | | |
| Road construction | 7 | | - | 7 |
| Transportation overhead | 3 | | - | 3 |
| Truck hauling, loading, dumping | 18 | | 18 | - |
| Normal profit on capital | 4 | | - | 4 |
| LOG VALUE AT ROADSIDE (Maximum willingness to pay) | 58 | | - | - |
| Less log production costs: | | | | |
| Logging overhead | 6 | | - | 6 |
| Felling and yarding | 16 | | 16 | - |
| Normal profit on Capital | 6 | | - | 6 |
| DERIVED STUMPAGE VALUE (Maximum willingness to pay) | 30/m$^3$ | | | |

This, in outline, is the derived demand approach to estimating the stumpage value of standing timber, that is the maximum price the purchaser would be willing to pay. Such an estimate is a necessary step for the buyer or concession holder in purchasing timber from the government, whether by auction, negotiation or at fixed administered prices, so that he can decide whether the timber is worth purchasing. Such estimates of stumpage values are not easy for the purchaser. However, he does have information on potential prices, on logging cost, the level of investment required and the alternative opportunity cost rate of return on that investment. The government, on the other hand, is less advantaged, and consequently it is in a more difficult position in setting fees or in negotiation. Yet it is equally important for the government to obtain such information in order to realize an adequate price on timber that reflects stumpage values.

This derived demand model serves to identify the key factors affecting the stumpage value of standing timber. These factors include species, forest products prices, log diameter and quality, sawing costs, hauling distance and transportation costs, logging costs, terrain and volume per hectare. They are examined below.

This basic derived demand model also provides the theoretical foundation for the several methods of timber appraisal and stumpage appraisal. Stumpage appraisal, used in setting the level of fees is, of course, more complex and detailed than the simple derived demand model present here. Stumpage appraisal and the data requirement for accurate appraisal are discussed in Chapter 11 below.

### 4.2.2 Stumpage Values Derived from Forest Product Prices

In the stumpage model illustrated above, the stumpage value of standing timber was derived from export log prices. However, in many cases the purchaser or concession holder has a processing plant and utilizes the logs to produce forest products such as sawnwood, plywood, etc. In such cases there is no market for logs and so the stumpage value of the standing timber must be derived from the value of the forest products produced.

In this section the basic derived demand stumpage model is extended to stumpage values derived from forest products. The extension is undertaken to demonstrate how stumpage values can be derived from forest product values and to illustrate that stumpage values can vary between uses, for example as logs or in plywood manufacturer. The deviation of stumpage values from forest products is illustrated in Table 4.2, based in this case on plywood prices and the price of pulp chips, a by-product. Recovery of pulp chips, although unusual, is introduced to illustrate the recovery of more than one product. Stumpage values could also, and just as easily, be derived from sawnwood and sawnwood prices.

Illustrative costs and prices in terms of U.S. dollars are presented in column 1 of Table 4.2, just as they were in the earlier example based on export logs. Log transportation costs and log production costs are identical to those used in the earlier illustration to facilitate comparisons. The reader is again invited to introduce his own estimates of cost and prices and

Table 4.2
ILLUSTRATED DERIVATION OF STUMPAGE VALUES BASED ON FOREST PRODUCT PRICES

| | Illustrative Prices and Average Costs ($/m³) | Reader's Own Estimates ($/m³) | Illustrative Prices and Costs | |
|---|---|---|---|---|
| | | | Variable Costs ($/m³) | Fixed Costs ($/m³) |
| | (1) | (2) | (3) | (4) |
| Selling price of plywood x recovery factor ($440/m³ x 0.50 m³ plywood/m³ logs) | $ 220/m³ | | | |
| Selling price of pulp chips x recovery factor ($50/m³ x 0.30 m³ chips/m³ logs) | 15 | | | |
| VALUE OF PRODUCTS RECOVERED PER m³ OF LOGS USED | $ 235/m³ | | | |
| Less plywood manufacturing costs (converted to log input basis: costs/m³ of plywood x recovery factor) | | | | |
| Overhead ($34/m³ x 0.50) | 17 | | - | 17 |
| Depreciation ($24/m³ x 0.50) | 12 | | - | 12 |
| Op. costs (labour, glue, etc.) ($170/m³ x 0.50) | 85 | | 85 | - |
| Normal profit on capital ($22 x 0.50) | 11 | | - | 11 |
| VALUE OF LOGS ENTERING PLANT (Maximum Willingness to pay) | $ 110/m³ | | | |
| Less log transportation costs: | | | | |
| Road construction | 7 | | - | 7 |
| Transportation overhead | 3 | | - | 3 |
| Truck Hauling, loading, dumping | 18 | | 18 | - |
| Normal profit in capital | 4 | | - | 4 |
| VALUE OF LOGS AT ROADSIDE (Maximum Willingness to pay) | $ 78/m³ | | | |
| Less log production costs: | | | | |
| Logging overhead | 6 | | - | 6 |
| Felling and yarding | 16 | | 16 | - |
| Normal profit on capital | 6 | | - | 6 |
| DERIVED STUMPAGE VALUE (Maximum Willingness to pay) | $ 50/m³ | | | |

to make his own estimates based on them. Column 2 of Table 4.2 is provided for this purpose.

In columns 3 and 4, costs are divided into fixed and variable costs, just as in the earlier illustration. This division will be utilized in estimation of marginal stumpage values at the end of the chapter.

In the illustration chosen, the starting point is the appropriate market prices received by the company for plywood and pulp chips. Transfer prices paid by a parent company or a marketing subsidiary are "paper prices" and would not be an appropriate starting point for the analysis. They commonly underrepresent market prices, in order to transfer profits abroad, or occasionally exceed market prices to transfer profits into the country.

Having established, the market prices of the products, the next step is to convert the prices to a log input basis. This is done by means of recovery factors representing the recovery of plywood and chips from the roundwood. In the illustration, 50 per cent of the log is recovered as plywood and 30 per cent as pulp chips. Thus two cubic metres of roundwood are required to produce one cubic metre of plywood, so one cubic metre of roundwood will produced $220 worth of plywood.

Plywood manufacturing costs are deducted to arrive at the value to the company of logs delivered to the processing plant, a value of $110 per $m^3$. This represent the maximum price the plywood mill would be willing to pay for logs delivered. Costs are normally recorded on the basis of plywood output, but are converted to the equivalent in log input, multiplying cost per cubic metre by the recovery factor to yield costs per cubic metre of logs used.

Next, log transport costs and log production costs are deducted just as in Table 4.1, to arrive at the derived stumpage value. In this case it yields, a derived stumpage value of $50 per $m^3$, representing the maximum price that the plywood mill would be willing to pay for logs for plywood production.

This model extends the derived demand approach, extending it one step further, from the price of the forest products produced back to stumpage values. Thus the derivation of stumpage prices from forest products involves additional steps and additional information on the production costs of forest products.

## 4.3 FACTORS INFLUENCING STUMPAGE VALUES

The derived demand models just developed conveniently serve both to identify some of the key factors determining the value of standing timber and to examine how the value of standing timber is influenced by these factors. This section utilizes these stumpage value models to examine in turn the several factors influencing stumpage values. A knowledge of these factors, and particularly of how stumpage prices respond to changes or variations in the factors, will prove useful in designing forest charges that adequately reflect variations in stumpage value and are responsive to changing values.

### 4.3.1 The Effect of Log Prices and Processed Product Prices on Stumpage Values

Stumpage values to purchasers will vary depending on the products produced. This can be illustrated by comparing the stumpage value derived from export logs (Table 4.1) and that derived from production of plywood (Table 4.2), brought together for comparison in Table 4.3. Logging costs are the same in both cases, facilitating comparison of the value of the products.

In the comparison presented in Table 4.3, plywood prices are such that plywood is the highest value use. Plywood yields a derived stumpage value of \$50 per $m^3$, export logs \$30 per $m^3$. Thus companies with plywood plants would value the timber more highly. Where timber is allocated, for example, by competitive auction, then plywood plants would be able to outbid export log producers. If the auction is fully competitive and free of distortions, and if no additional economic values are involved, then timber would be allocated to that use which yields the highest stumpage value, efficiency will be attained in the utilization of the forest and government revenue maximized.

However, the situation could just as easily be the other way round if export log prices were higher, or plywood prices lower. Either way, the example illustrates that stumpage values depend on the use to which the timber is put.

### 4.3.2 The Sensitivity of Stumpage Values to the Prices of Logs or Processed Products and to Price Changes

Stumpage values, as they are residually determined, are very sensitive both to the level of the prices for logs or processed products and to variations in these prices. The sensitivity of stumpage values to log prices and the effect of changes in logs prices can be illustrated by Table 4.4. Using the initial price and the costs of Table 4.1, stumpage values are calculated for price variations of plus and minus 10, 20 and 40 per cent.

From Table 4.4 it is apparent that stumpage values are sensitive to the prices of the logs or forest products from which they are derived. A 10 per cent lower export log price (i.e., a 10 per cent decline from the initial \$100 per $m^3$ in Table 4.1 to \$90 per $m^3$) leads to a 33 per cent lower stumpage value. Export log prices 20 per cent, or 40 per cent lower result in stumpage prices 67 per cent and 133 per cent lower (a negative stumpage value for export log prices 40 per cent lower). Export log prices 10 per cent, 20 per cent and 40 per cent higher lead to stumpage prices which are 33 per cent, 67 per cent and 133 per cent higher, respectively.

As stumpage values are derived residually, changes in stumpage values are proportionately greater than changes in log or product prices. This conclusion has a number of implications for stumpage charges and forest revenue systems. First, stumpage values will be sensitive to any variation in log prices. As shown in Table 4.4, a 10 per cent variation in export log prices resulted in a 33 per cent change in the stumpage value derived. Likewise, a 10 per cent error in export log prices would result in a 33 per cent error in the

Table 4.3

COMPARISON OF STUMPAGE VALUES DERIVED FROM PLYWOOD AND EXPORT LOGS

| | |
|---|---|
| **Stumpage Value of Timber in Plywood Production** | |
| Value of plywood and pulp chips (per $m^3$ of logs used) | $ 235/$m^3$ |
| Less plywood manufacturing costs (per $m^3$ of logs used) | 125 |
| Value of logs entering plant | 110 |
| Less log transportation costs | 32 |
| Value of logs at roadside | 78 |
| Less log production costs | 28 |
| DERIVED STUMPAGE VALUE AS PLYWOOD | $ 50/$m^3$ |
| **Stumpage Value of Timber as Export Logs** | |
| Export price of logs | $ 100/$m^3$ |
| Less port handling charges | 10 |
| Less log transportation costs | 32 |
| Value of logs at roadside | 58 |
| Less log production costs | 28 |
| DERIVED STUMPAGE VALUE AS EXPORT LOGS | $ 30/$m^3$ |

Table 4.4

THE EFFECTS OF PRICE CHANGES ON STUMPAGE VALUES
(Based on Figures from Table 4.1)

| | Initial Price | Prices, Costs and Values ($ per $m^3$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Declining Prices | | | Increasing Prices | | |
| | | -10% | -20% | -40% | +10% | +20% | +40% |
| Export price of logs | 100 | 90 | 80 | 60 | 110 | 120 | 145 |
| Less port handling charges | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Less log transport costs | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| Less log production costs | 28 | 28 | 28 | 28 | 28 | 28 | 28 |
| DERIVED STUMPAGE VALUE | 30 | 20 | 10 | - 10 | 40 | 50 | 70 |
| % CHANGE IN STUMPAGE VALUE | | - 33% | - 67% | - 133% | + 33% | + 67% | + 133% |

stumpage value derived. Thus accurate stumpage prices, which fully reflect stumpage values, require accurate estimates of log and forest product prices.

The second implication is that it is important for stumpage fees or other charges to be responsive to changes in log values or forest product values. Table 4.4 also serves to demonstrate the sensitivity of stumpage values to changing log prices or product prices. Ideally, stumpage prices should follow and respond to changes in stumpage values, although this may be difficult to achieve in practice. Log prices and forest product prices, like those of most resource commodities and other primary products, vary both over the long term, and cyclically with fluctuating world demand. Further, as changes in stumpage values are proportionately greater than changes in log or product price it may be difficult to fully adjust stumpage charges to reflect stumpage values especially for cyclical changes in prices.

Adjustment to long-term changes, and to inflation may require fairly sizeable changes in stumpage charges. Formulae approaches to stumpage charges, discussed in Chapter 10, and based on log or produce prices have advantages of responsiveness by automatic adjustment to price changes, although they are usually not sufficiently sensitive to reflect fully the changes in stumpage.

### 4.3.3 The Effect on Stumpage Values of Variations in Log or Product Prices Among Species and Grades

Just as the stumpage values derived vary with changes in stumpage prices, so too do the stumpage values derived vary among species and with log grades. Again, because stumpage values are residually derived, the variation in stumpage values among species and grades will be proportionately greater than the variation in log prices.

These points can also be illustrated with the aid of Table 4.4, by interpreting the columns headed "declining prices" and "increasing prices" as differing species or grades of higher or lower value than the standard species or grade (the "initial price"). Viewed in this way, stumpage values in Table 4.4 vary significantly between species, from -$10 to +$70 per cubic metre. As this variation in stumpage value is proportionately greater than the variation in log prices among species and grades, the variation implies that stumpage fees and charges, if they are to reflect stumpage values, ought to be varied significantly between species or grades. Commonly, the variation in forest charges is less than the variation in stumpage values. Thus higher valued species or grades are under-valued, earn greater profit and are commonly overcut.

### 4.3.4 The Effect of Log Transportation and Log Production Costs on Stumpage Values

Log transportation and log production costs are significant factors influencing the derived stumpage value estimated by the concessionaire or timber buyer. In the illustrations of Tables 4.1 and 4.2 logging costs are a sizeable deduction in deriving stumpage values, and can therefore significantly influence the stumpage values derived. In Table 4.1 transportation costs and

log production costs including profit totaled $60 per $m^3$, resulting in a derived stumpage value of $30 per $m^3$. With transportation and log production costs proportionately larger than the stumpage value derived, a 10 per cent increase in transporatation and log production costs to $66 per $m^3$, perhaps as a result of more difficult logging conditions, or as a result of an underestimate of costs, would reduce the derived stumpage value by $6 per $m^3$, a 20 per cent reduction.

The complexity of factors affecting hauling costs, construction costs, the timber stand conditions, and terrain and soil conditions make the estimation of logging costs difficult even for companies and concession holders with experience in logging. It is also difficult for governments attempting to estimate stumpage values to set stumpage fees and forest charges which reflect these costs. To do so governments must rely on studies of logging operations and cost estimates that are synthetically developed from component cost items, time and motion studies, etc. Alternatively, logging, hauling and processing costs can also be derived from surveys of contract logging and hauling rates, custom sawing charges, etc. In spite of the difficulties, governments need such information in setting the level of forest charges, as argued in Chapters 10 and 11.

A number of studies by FAO have been undertaken to assist countries in strengthening their abilities to develop cost estimates for logging, hauling and processing activities (for example FAO 1974, Logging and Log Transport in Tropical High Forest; FAO 1976, Harvesting Man-Made Forests in Developing Countries; FAO 1977, Planning Forest Roads and Harvesting Systems; FAO 1978, Assessment of Logging Costs from Forest Inventories in the Tropics as well as studies for individual countries).

Both log transport costs and log production costs are influenced by a large number of variables. Some of the more significant variables affecting transportation costs and log production costs are discussed below and their impact on stumpage values identified.

Distance and transportation costs. Transportation costs are a significant component of the delivered cost of tropical timber because of the weight of tropical timber, the often difficult roads, the high cost of imported trucks and parts, rising fuel costs, and the costs of road construction. Thus distance, road construction costs, road conditions and other cost factors have an important effect on the stumpage values. These factors have been considered and their impacts on transportation cost evaluated in the several FAO publications cited above.

Stand conditions and ground conditions. Stand conditions including such variables as the diameters, stems per hectare, or volume per hectare are major determinants of log production cost and consequently of stumpage values. Terrain conditions affect cable logging costs, while terrain and soil conditions affect tractor logging costs. These factors and their impact on logging costs are evaluated in the FAO publications cited above.

Normal profits. Normal profits on capital, identified as a cost item in Table 4.1 and 4.2, represent an "opportunity cost: of the capital investment in log production, log transportation and the processing of forest products.

The "opportunity cost" of these capital investments is based on the rate of return on investments of equivalent risk and uncertainty (insecurity) elsewhere. They are "opportunity costs" in that if a profit, or rate of return, equivalent to that earned elsewhere cannot be maintained, companies will not continue to replace equipment and reinvest in logging. Companies may continue to operate in the interim, but without replacement or reinvestment.

Determination of normal profits involves the identification of an "opportunity cost", alternative rate of return of equal risk and insecurity, and the estimation of the capital investment in fixed and working capital to which the rate of return applies. The fixed capital investment is based on the depreciated value of equipment, buildings, roads and other fixed assets, the stock of parts and other inputs. Working capital includes inventories of logs or other forest products and account receivable on logs and products shipped.

## 4.4 MARGINAL STUMPAGE VALUES

The concept of marginal stumpage value, the value of an additional increment in timber supply, is an important concept in estimating the value of additional timber harvested from a stand, in establishing charges to encourage increased utilization of the forest, or in estimating the value of increased timber supplies to processing plants. The concept of marginal stumpage value is useful, for example, in setting forest charges to encourage the more complete utilization of the forest. Where a company is already logging in an area it will not include road construction costs or the fixed costs of logging in considering the stumpage value of additional timber. As a result the company may be willing to harvest lower valued timber if the road system is already in or if it is already operating on the area.

The concept of marginal stumpage value is also useful in estimating the value of increased timber supplied to processing plants. Where a sawmill is operating at less than full capacity, it may be willing to pay more for additional logs, or go farther afield for logs, incurring much higher transport costs. In doing so, the sawmill is looking only at the marginal costs of the additional log supply. As long as the additional logs at least cover the additional, or marginal, costs of sawing they will contribute to profit and are therefore worth purchasing. It is for this reason that many small sawmills operating at less than full capacity are willing to go far afield to obtain additional timber, incurring sizeable transport costs for the additional logs. Similarly, a plywood mill, or pulp and paper mill, operating at less than full capacity will be willing to pay more for additional logs or pulpwood or to go farther afield for an additional wood supply, even though it could not pay that much, or go so far for all its timber supply.

### 4.4.1 Marginal Stumpage Values for Logging Operations

In deciding to log an additional volume of lower valued species, or lower grade logs from an existing logging operation, or to haul additional timber over an existing road, it is marginal stumpage values that is of interest. The roads are already built, the transport and logging overheads

have already been covered and the profit on the capital already earned on the initial volume harvested. Thus only the variable costs incurred are considered in estimating the marginal stumpage value.

Thus, based on the variable costs presented in Table 4.1, the marginal stumpage value of the extra volume of wood from a logging operation is estimated as follows:

| | |
|---|---|
| Export price of logs | $ 100/$m^3$ |
| Less port handling charges | $ 10/$m^3$ |
| Less variable transport costs | $ 18/$m^3$ |
| Marginal value of additional logs at roadside | $ 72/$m^3$ |
| Less variable log production costs | $ 16/$m^3$ |
| Marginal stumpage value of additional timber | $ 56/$m^3$ |

Since only the extra costs incurred need to be considered in valuing the additional volume cut, the stumpage value of this additional volume is correspondingly greater; $56 per $m^3$, versus the $30 per $m^3$ derived in Table 4.1 and based on average costs (both fixed and variable costs).

When logging lower quality species or additional timber within a stand stumpage valuation should be based on the variable log production costs. In harvesting an area using existing roads, marginal stumpage valuation should be based on the variable transportation costs, not on the full average log production costs, as the roads are already built.

Although loggers may not think in terms of marginal costs or marginal stumpage values, loggers make these types of calculation daily in deciding what species, log grades, diameters or stands to log, based on their experience and feeling for these values and the extra costs involved.

### 4.4.2 Marginal Stumpage Values for Processing Plants

This section extends the analysis of marginal stumpage values to that of processed products, and shows why processing plants may value additional timber highly and thus might be willing to pay quite high stumpage prices to obtain additional timber.

Referring back to Table 4.2, it can be seen that the variable costs of plywood manufacture are $85 per $m^3$ of logs used, versus overall average costs (fixed and variable costs) of $125 per $m^3$ of logs used. The $85 per $m^3$ cost of processing an additional cubic metre of logs into plywood represents the variable cost of labour, glue, materials, power, etc. used in production. Depreciation, overhead and other fixed costs are already covered by and included in the $125 per $m^3$ average cost.

Based on these variable costs of plywood manufacturing the value of additional logs delivered to the plywood plant can be estimated as follows:

| | |
|---|---|
| Value of plywood and pulp chips recovered per $m^3$ of log used | $ 235/$m^3$ |
| Less variable plywood manufacturing costs | $ 85/$m^3$ |
| Marginal value of additional logs | $ 150/$m^3$ |

This value of $150 per $m^3$ of logs represents the maximum price the plywood plant would be willing to pay for additional logs when the plant is operating at less than full capacity. It is $40 per $m^3$ higher than the $110 per $m^3$ value of logs derived in Table 4.2 and based on full average costs. Thus where the plywood plant is operating at less than capacity it would be willing to pay up to $40 per $m^3$ more for these additional logs, and so the stumpage value of additional timber to the plywood plant operating at less than capacity is $40 per $m^3$ higher.

### 4.4.3 Combined Marginal Stumpage Values for Logging Operations and Processing Plants

The plywood plant operating at less than full capacity may be willing to pay even higher stumpage prices for additional logs hauled over existing roads for which the road construction costs are covered, or for additional logs harvested from stands being logged. If, as illustrated above, the plywood plant is operating at less than full capacity, then in valuing additional logs it is only concerned with the variable costs of $85 per $m^3$ of logs used (Section 4.4.2). If, in addition, these logs will be hauled over existing roads, then the plywood plant is concerned only with variable transportation costs of $18 per $m^3$ of logs. And if, in addition, the logs are extra timber harvested from a stand in which logging operations are already underway, then the plywood plant is concerned only with variable logging costs of $16/$m^3$ of logs. Under these conditions the value of the additional timber is estimated as from Table 4.2 follows:

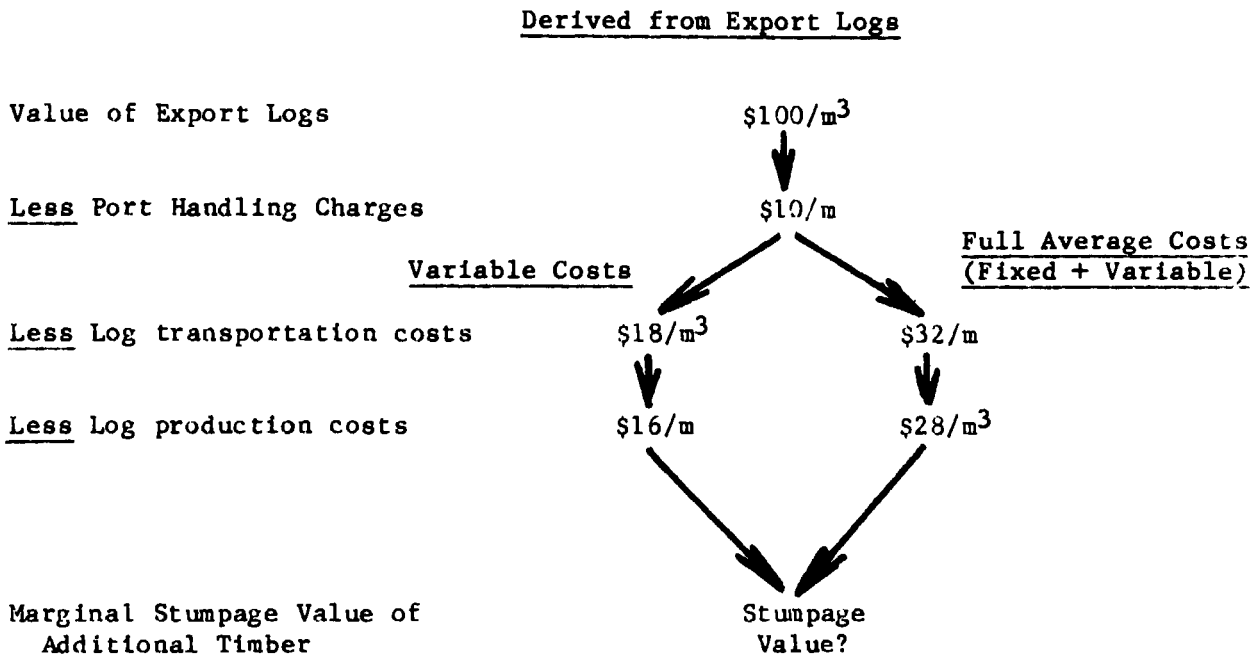
| | |
|---|---|
| Value of plywood and pulp chips recovered per $m^3$ of logs used | $ 235 / $m^3$ |
| Less variable plywood manufacturing costs | $ 85 / $m^3$ |
| Marginal value of additional logs | $ 150 / $m^3$ |
| Less variable transport costs | $ 18 / $m^3$ |
| Marginal value of additional logs at roadside | $ 132 / $m^3$ |
| Less variable log production costs | $ 16 / $m^3$ |
| Marginal stumpage value of additional timber | $ 116 / $m^3$ |

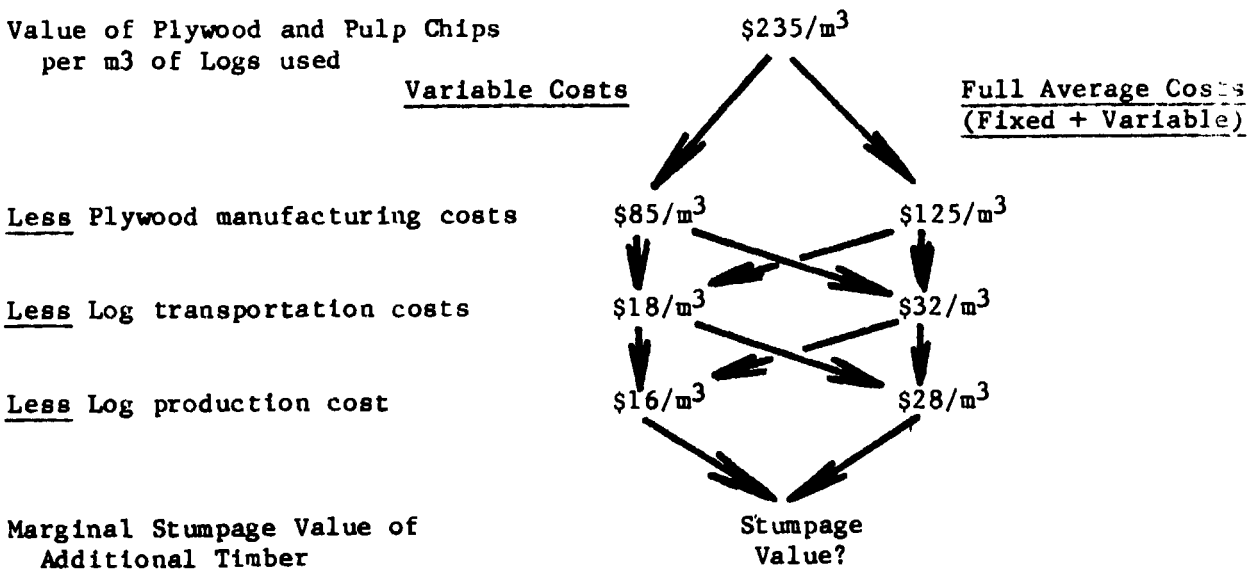
Under these specific conditions in manufacture, log transportation and log production the plywood plant's maximum willingness to pay for additional timber reaches $116 per $m^3$ over twice the $50 per $m^3$ derived in Table 4.2 above and based on the full average costs.

Marginal stumpage values depend on the specific processing, log transportation and log production situations experienced. The full range of alternative marginal stumpage values can be derived from the average and variable costs summarized in Figure 4.1, both for stumpage values based on export logs and those based on plywood. Marginal stumpage values are derived

Figure 4.1

ALTERNATIVE ROUTES FOR SELECTING MARGINAL AND AVERAGE STUMPAGE VALUE



by following the arrows from the value of the export logs or processed products, at the top, through the appropriate variable or average costs, to arrive at the marginal stumpage value applicable to each situation.

## 4.5 SUMMARY

This chapter has extended the framework of Chapter 3, by developing a derived demand model of stumpage values to identify the willingness to pay off timber buyers on concession holders.

The derived demand model was first developed in application to export log prices and subsequently extended to plywood manufacture. Stumpage values were shown to be residually determined in the derived demand model. The model served to examine the effect of cost and price variables on stumpage values and the sensitivity of stumpage values to change in them. It also served to explore the effect of forest stand factors and other important factors such as distance on stumpage values.

In addition the concept of marginal stumpage value based on incremental costs was introduced. These marginal stumpage values are useful in evaluating the effect of stumpage systems in utilization and in designing revenue systems to encourage improved utilization. Marginal stumpage values are also useful in explaining the value of timber to processing plants short of timber and operating with excess capacity, and in understanding their timber buying behaviour.

The concepts of stumpage value developed here are utilized in Part III to evaluate alternative revenue arrangements and to suggest alternatives. They will also provide a conceptual basis for an evaluation of methods of establishing the level of forest charges and later in a review of timber appraisal methods.

# Chapter 5

## STUMPAGE VALUES TO THE SELLER AND MINIMUM FOREST CHARGES

### 5.1 INTRODUCTION

The value of timber to the seller represents the other side of the exchange model presented in Chapter 3. Just as timber buyers have a range of values and a maximum value for each buyer determined by the circumstances of buyers and by economic conditions, so the government as seller has a range of values, and in this case a minimum. The government as owner of public forests and seller of public timber is equally concerned with the seller's value in establishing minimum forest charges and in deciding whether to sell a stand of timber.

The buyer's range of values and his maximum willingness to pay value were based on the uses of the timber and prices obtained. The seller's range of values and his minimum willingness to sell value are based on his costs; actual administrative costs, future values foregone, opportunity costs and regeneration costs, depending upon the circumstances.

### 5.2 ADMINISTRATIVE COSTS OF SELLING THE TIMBER

At the very minimum the government will wish to cover the administrative costs involved in selling the timber, otherwise the government will be out of pocket, and it would be better to let the stand remain uncut. The minimum forest charge should therefore, at the very least, cover the actual costs involved in making the sale, in supervising harvesting operations, in enforcing girth limits, in scaling the output, in billing and in collecting the revenue. Overall, the forest charges should also cover the proportion of the administrative overhead attributed to the sale of standing timber. However, on sales of additional timber the minimum charges need cover only the costs of selling that additional timber, and not the fixed costs of administration and overhead. Thus the minimum level of forest charges on additional timber need not be as high. Of course the government will wish to achieve forest charges close to the buyers' maximum price.

### 5.3 ADDITIONAL DETERMINANTS OF MINIMUM FOREST CHARGES

In addition to the administrative costs of selling the timber, the seller will normally also wish to obtain a minimum price which reflects the higher of (a) the future value of the timber if harvesting is postponed, (b) the economic value of other uses of the forest if uncut, (c) the economic value of benefits from harvesting the timber (incorporated by a downward adjustment of the minimum charge) and (d) the costs of regenerating the stand. Depending on the circumstances, the minimum charge should reflect one or other of these alternatives, or the higher of the alternatives where more than one is appli-

cable in addition to the administrative costs of selling the timber. The establishment of minimum forest charges, as well as the decision to sell a stand of timber, involves consideration of each of these components. Each component is discussed in turn.

### 5.3.1 Future Timber Values

Where standing timber is expected to rise substantially in value in the future, perhaps as a result of strong demands for timber products anticipated in the future or because of the possibility of future shortages, then the government might well be advised to hold over some timber for harvesting in the future. It should sell the timber today only if it can get more for it now than anticipated in the future. Forest charges should reflect this future value. The minimum charge should be the present equivalent of this future value, discounted from the future date in addition to the administrative cost of selling the timber.

For example, if the stumpage value of a high forest species such as West African Obeche is expected to rise to $\$60/m^3$ in 5 years (three times today's forest charge of $\$20/m^3$), as a result of increased demand and anticipated inflation, it may be worthwhile for the government to hold over some timber to serve that future demand or to raise forest charges to reflect this increased future value.

If interest rates are, for example, 15 per cent (comprising a 10 per cent per year expected inflation rate and a 5 per cent real interest rate) then the present equivalent of this expected value of $\$60/m^3$ would be:1/

$$\$60/m^3 \times \frac{1}{(1.15)^5} = \$60/m^3 \times \frac{1}{2.0114} = \$29.80/m^3$$

Consequently, today's minimum forest charges should be raised from the present $\$20/m^3$ to $\$29.80/m^3$, plus the administrative costs of selling the timber. Future timber values are an important factor to consider in setting minimum forest charges when the values of forest products are rising and are expected to increase rapidly in the future.

1/ Alternatively, if future values are estimated in terms of today's currency then an interest rate free of inflation is used to estimate the equivalent value today. For example, if Obeche in five years time is expected to be worth $\$38/m^3$ (in 1981 $), almost twice today's forest charges of $\$20/m^3$, then with real interest rates (free of inflation) at 5 per cent, the present equivalent of this expected future value will be:

$$\$38/m^3 \times \frac{1}{(1.05)^5} = \$38/m^3 \times \frac{1}{1.2763} = \$29.80/m^3$$

(Gregersen and Contreras 1979 Economic Analysis of Forestry Projects: 74, 105-106, 182-184).

### 5.3.2 Foregone Alternative Uses of the Timber

Where the alternative uses of timber for fuelwood or non-marketed uses are of significant value; where the forest is of value for food, game, wildlife, medicines or other non-marketed products; or where the forest is of economic value for erosion control, watershed protection, or other uses; then minimum charges on the industrial use of the forest for timber should at least reflect these alternative uses. If minimum charges reflect the value of these alternative uses, then the forest will be logged for timber only when the industrial use is of greater value than these alternative uses. In this way the minimum charge will help to encourage efficient allocation of the forest to its economically most valuable use. Without minimum charges, or with low minimum charges, stands will be cut for industrial timber when these other products or other uses are a more valuable use.

Determination of the value of timber or forest land in these alternative or non-marketed uses is not easy. However, it is important that the concept be recognized in establishing minimum charges. The minimum charge initially need only approximate the economic values of these alternative uses. Accurate valuation can come later.

### 5.3.3 Benefits from Harvesting the Timber

Rather than the economic costs of foregone alternatives, discussed in the previous section, there may be economic benefits from harvesting timber or logging a particular area. These economic benefits, which reflect non-marketed benefits to the government, would contribute to a lowering of the seller's minimum stumpage value.

Several potential economic benefits can be identified by their source. They include:

1. Benefits from salvage logging to areas prior to plantation establishement, or re-planting plantations.

2. Silvicultural benefits in the regeneration of high forest stands through removal of undesirable species or trees.

3. Benefits from improved utilization of lower valued species, poorer grades and smaller diameter material which would not otherwise be used.

#### Benefits from Salvage Logging

In salvage logging, prior to the establishment of plantations, the government's objective is to encourage the removal of all usable roundwood and all usable species. Consequently, minimum forest charges need only cover the costs involved in administration of the salvage sale, in supervising the salvage operation and in measuring the wood removed. In fact, if extra material left on the ground imposes additional costs of clearing and burning or impedes the planting operation, the government's minimum willingness to sell

and minimum forest charges might be reduced below the administrative costs, if it encourages greater utilization, or even become a negative charge (i.e., a subsidy).

Ideally salvage logging charges should be designed as low marginal charges on additional timber salvaged so as to avoid sacrificing revenue by a low charge on all timber removed. Area based charges or lump-sum timber sales, discussed in Part III, are examples. They involve a zero marginal charge on additional timber removed.

For salvage logging charges the additional determinants of the seller's minimum willingness to pay would not apply.

### Silvicultural Benefits in High Forest Regeneration

In regeneration of high forest stands by selective cutting and in other silvicultural treatments there may be benefits, for example, from encouraging the removal of lower valued species to shift the composition of the stand toward higher valued species, or from removal of diseased trees, trees of poor form, etc.. Again the government's willingness to sell value may justify marginal forest charges on certain species or trees below the administrative costs of selling the timber.

### Benefits of Improved Utilization

There may also be economic benefits to the country from improved utilization of timber which might not otherwise be harvested. However great caution is required in accepting these gains as benefits. Such benefits may already be included in prices. In addition they can easily be overstated.

Increased utilization of lower valued species, poorer grades, and smaller diameters can result in improved recovery of timber from logged areas. As a result, the country's wood requirements will be obtained from a smaller area, and so more of the forest area can be reserved for other uses, or for future timber supply. The benefits would be the alternative value of the areas reserved. However, if forest areas can be set aside, timber supplies must exceed demands and so the value of such reserves may not be very large.

If the country's timber supply is becoming scarce, improved utilization can stretch this timber supply, providing a benefit to the country. This benefit can be measured by the value of the extra timber. However, unless there are some constraints operating, the value of this additional timber supply will already be reflected in increasing market prices. Inclusion as an economic benefit would result in double counting.

For these reasons great caution is called for before the benefits of improved utilization are accepted as a reason for lower willingness to sell values and lower forest charges. In most cases the arguments can be rejected.

### 5.3.4 Regeneration Costs

The previously identified determinants of the seller's minimum willingness to sell value and minimum forest charges are a consequence of harvesting the timber. The costs of regenerating the forest after harvesting are not necessarily a consequence of harvesting the existing stand of timber and thus are not necessarily a legitimate determinant of the seller's minimum willingness to sell and of minimum forest charges. Only if the government is committed to regenerating the forest after harvesting can regeneration costs be considered as a basis for the seller's minimum willingness to sell, and for minimum forest charges. In such circumstances it would be foolish for the government to encourage harvesting of timber through low forest charges, yielding insufficient revenue to finance regeneration, if it is committed to spending substantial sums on regenerating the area.

Where the high forests are being regenerated, regeneration costs include the costs of silvicultural activities (enrichment planting, vine cutting, etc.), supervision and overhead, annual protection and maintenance costs, and a rate of return on this investment equivalent to the government's required or expected return on alternative government investments. The minimum charge required to earn this required rate of return can be estimated by carrying forward costs at the agreed rate of return to the end of the cutting cycle and comparing these capitalized costs with the yield, to derive the required charge per cubic metre. Alternatively, future costs can be brought back to the present and a charge determined which would yield the agreed rate of return on the present value of these costs. This later approach, although more difficult to describe, in practice, easier to calculate. (See Gregersen and Contreras 1979 Economic Analysis of Forestry Projects: 105-106). However, either calculation would lead to the same result, (i.e., the same charge).

Where plantations are being regenerated, regeneration costs include the cost of establishment, weeding, cleaning, annual protection and maintenance, supervision and overhead, etc., and a rate of return on investment as above. The charge per cubic metre is estimated from the expected yield at the end of the rotation in the same way as above.

Difficulties may arise in basing minimum forest charges on the cost of regeneration. Several alternative estimates of minimum forest charges may result depending on the circumstances and the costs included. For example, they may be based on the estimated costs of establishing a new stand, or they may be based on the actual establishment costs of the existing stand. These two estimates of regeneration costs may differ, even after adjusting for inflation.

Minimum forest charges for plantation timber based on regeneration costs will vary depending on the situation. For a plantation established after clearing the remnants of the high forest, regeneration costs will include clearing costs in addition to plantation establishment costs. Forest charges for the initial rotation would therefore need to be higher to cover these higher initial costs. For subsequent rotations, regeneration costs will be substantially lower so that a lower forest charge would be needed to cover regeneration costs.

Another difficulty may arise when the buyer's maximum willingness to pay is below the cost of regeneration. The government then faces a difficult decision in setting minimum charges. If it sets charges to reflect regeneration costs, buyers will be unwilling to pay such charges, harvesting will be reduced and timber left uncut. On the other hand, if the government reduces the charges below the cost of regenerating stands, it will have insufficient revenue to regenerate the areas cut.

## 5.4 SUMMARY

Several determinants of the seller's minimum willingness to pay have been identified. They provide a theoretical basis for the establishment of minimum forest charges. In all cases the administrative costs of selling the timber should be considered in setting minimum forest charges. Unless there are redeeming economic benefits there is little point in the government selling standing timber at stumpage charges that are less than its administrative costs involved in doing so.

Depending on the circumstances, the seller's minimum willingness to pay and minimum forest charges may also include (a) the potential future value of the timber (discounted to equivalent present values), (b) the economic value of foregone alternative uses, (c) any economic benefits resulting from harvesting the timber (reflected in a downward adjustment of the minimum charges) and (d) regeneration costs incurred as a result of harvesting the timber. The conditions under which each of these should be included in establishing minimum charges, were investigated, the cautions on including economic benefits as a downward adjustment noted and the special circumstances required for inclusion of regeneration costs identified.

These cautions and qualifications aside, it is important that governments give consideration to these determinants of the sellers minimum willingness to sell in establishing minimum forest charges. All to often forest charges do not cover even the administrative costs of selling the timber, let alone reflect the opportunity costs of values and uses foregone.

# Chapter 6

## THE VALUE OF CONCESSIONS AND TIMBER RIGHTS

### 6.1 INTRODUCTION

When the government grants a forest concession (i.e., a forest utilization contract) to a company or individual, it creates something of value to the timber user.1/ Forest concessions or other forms of timber rights have value to the forest industry in addition to the value of the timber contained thereon. They provide security of timber supply into the future at established forest charges. They also provide security for the expansion of processing plants and bargaining power in obtaining additional timber, in the purchase of logs, or in negotiations with logging contractors. Consequently, a case can be made for charges on concessions in addition to the charges on the timber cut.

Demands for concessions and pressures from individuals and companies that concessions be granted to them clearly indicate that timber rights have value. Charges that reflect these values, even if only approximately, can go a long way toward rationalizing these demands, as well as collecting more revenue.

This chapter introduces and develops the concept of the value of concessions to the concession holder. It identifies the factors that determine the value to concession holders and relates them to the forest charges and price setting arrangements discussed in Part III. The government's valuation of concessions, based on the opportunity costs involved, is identified, and used to establish a basis for minimum concession charges. Thus the chapter applies the framework of Chapter 3 involving "buyer's willingness to pay" and "seller's willingness to sell" values, and parallels its application in Chapters 4 and 5 to the valuation of the timber cut.

The chapter does not include discussion or evaluation of the terms and conditions of forest utilization contracts. These are thoroughly analysed in an earlier forestry paper (Schmithüsen 1977 Forest Utilization Contracts on Public Lands).

1/ Forest concession, the more widely used term, is taken as synonymous with the more precise term forest utilization contract. A forest concession or forest utilization contract is defined "... as formal permission of the government or a public agency which entitles an individual, a private company or a public or semi-public corporation, under clearly defined conditions, to the exclusive rights to explore the forest potential, to harvest wood and/or manage a specified area of public forest land". (Schmithüsen 1977 Forest Utilization Contracts on Public Lands: 10).

## 6.2 THE VALUE OF TIMBER RIGHTS TO CONCESSION HOLDERS

The value of timber rights to concession holders is determined by two major components: (a) the profits earned as a result of forest charges set below stumpage values and (b) the insurance value provided by the security of timber supply.

### 6.2.1 The Profit Potential of the Concession from Forest Charges Set Below Stumpage Values

Forest concessions provide a guaranteed timber supply until expiry of the concession. Where the stumpage value of the timber to the concession holder exceeds the forest charges levied on the concession, the concession provides a profit making opportunity of potential value to the concession holder over the lifetime of the concession. If the stumpage value of the timber is high but the fees and charges low, the potential profit is large and the value of the concession can be great.

Where stumpage values of the timber exceed the forest charges, the annual value of the concession, the annual profit potential provided by the guaranteed timber supply can be estimated from the volume harvested annually on the concession, multiplied by the difference between the stumpage value (as derived in Chapter 4) and the forest charges levied.

This first determinant of the value of concessions is related to underpricing of wood (ie., pricing wood at less than its maximum value to the concession holder). Concessions take on this value when the demand for concessions exceeds their availability and concessions then provide access to "underpriced" timber.

The value of the concession itself, representing the maximum price the concession holder is willing to pay for the concession, can then be calculated as the present value of these annual values stretched out over the lifetime of the concession. This is done using a present value formula and a discount rate to weigh future year's values in their present value equivalent.1/

This present value will be influenced by the following variables: (a) the length of tenure, (b) the annual cut of timber on the concession area, (c) the difference between the stumpage values and forest charges and (d) the discount rate. The longer the tenure of the concession, the larger the annual cut, the greater the difference between stumpage values and forest charges (i.e., the higher the stumpage values, or the lower the forest charges), and the lower the discount rate; then the greater the value of the concession. This suggests that charges on concession designed to reflect the value of the concession be based on these variables.

1/ For the present value formula methodology and choice of discount rate see Gregersen and Contreras 1979 Economic Analysis of Forestry Projects: 105-106, 182-184.

### 6.2.2 The Insurance Value of the Security of Timber Supply Provided by Concessions

A number of sources of this insurance value can be identified. Four are identified, although not all of the four are likely to apply on any one concession.

#### 6.2.2.1 Option Value of Timber Supply

The concession provides the concession holder with an option on future timber at the forest charges then in force. If the market for timber or forest products is buoyant and the concession holder wishes to cut the timber, the timber supply will be available. If the situation is not attractive he can leave the timber uncut, or even abandon the concession at little cost. Thus the concession provides him with an option to cut the timber if he so desires. It provides guaranteed access to a timber supply. Without the concession he has no guarantee of access. This guaranteed access has value to the concession holder over and above the value of the timber itself.

This option value exists as a result of uncertainty about the future and because concessionaires are risk-averse. For an option value to exist on a concession there must be (a) uncertainty of future demands for standing timber on the part of concessionaires, (b) uncertainty about future prices and (c) uncertainty of access to supply of standing timber. 1/ If concessionaires are predominantly risk-averse, the usual situation, the option value will be positive.

Option value is an important concept and could be a significant component of the value of concessions, but estimation of the option value of concession is not easy. However, option values can be captured by bonus bids on timber concessions, where concessions are put up to auction and competition is relatively free (as discussed in Part III).

#### 6.2.2.2 The Value of a Secure Timber Supply in Allowing Construction of More Efficient Processing Plants

One of the major arguments put forward by those seeking concessions is that the granting of concessions will allow them to build a larger, more permanent processing plant. Although this argument is perhaps overplayed, there is an element of truth in it. A concession does provide security of timber supply, which does make construction of a large, permanent processing plant viable. A large and permanent processing plant is likely to be able to take advantage of economies of scale and so achieve lower operating costs. A more permanent plant is also likely to achieve lower operating costs. These

1/ The concept of option value has been developed to explain the demands for and value of non-marketed public or collective goods (Weisbrod 1964. Collective Consumption of Individual-Consumption Goods; Cicchetti and Freeman 1971 Option Demand and Consumer Surplus).

cost savings, attributed to the security of timber supply from the concession, and the profits resulting therefrom represent a value of the concession, derived from the security of timber supply.

This component of the value of the concession can be estimated from the reduction in processing cost per cubic metre of wood used which results from a large scale permanent plant constructed as a result of the concession. This cost saving (or additional profit) per cubic metre represents the annual value (per cubic metre) of the concession. The value of the concession is the present value of this annual value over the life of the concession.

#### 6.2.2.3 The Value of a Secure Timber Supply in Providing for Future Expansion of Processing Plants

The expansion of wood processing plants usually involves a reduction in processing costs either as a result of the economies of scale from expansion or because it allows the introduction of new technology to the plant and the production process. The lower costs achieved would result in an increased willingness to pay for timber and consequently a higher value of the timber concession. For this value to be applicable the concession must contain a volume of timber surplus to the requirements of the processing plant, and there must be an existing processing plant to expand.

The annual value of this opportunity for expansion can be estimated from the cost reduction (the additional profit) per cubic metre of wood used as a consequence of the expansion. The contribution to the value of the concession is the present value of these annual values over the life of the concession, calculated as before.

#### 6.2.2.4 The Value of the Bargaining Power in Purchasing Wood and in Negotiating with Contractors

Concessions, which can supply a substantial part of his wood requirements, provide the concession holder with bargaining power in purchase of wood from other smaller operators. The same advantages of bargaining power provided by the concession can also extend to contract logging. Control of the forest in the hands of a few concession holders will mean that contract loggers have fewer concession holders to choose among, and therefore lesser bargaining power over contract logging terms or prices. If concession holders act together and maintain a capability to harvest a proportion of their own wood, the bargaining power of contract loggers is further weakened.

These four sources of the insurance value of timber supply provided by the concession will vary in significance depending on the country and the circumstances. The first will be significant where future wood requirements are quite uncertain and the industry strongly risk-averse. The second and third will only exist where a processing plant is involved. The fourth will be significant only where concessions are closely held and bargaining power strong.

Although each of these sources of the insurance value of concessions is real, they may not be easily measured. This should not deter their inclusion in concession charges. To leave them out is to set concession charges equal to zero.

## 6.3 THE SELLER'S VALUE OF CONCESSIONS AND MINIMUM CONCESSION CHARGES

The government needs to be concerned with the seller's value of concessions, and with setting minimum concession charges, just as it was in evaluating the seller's value of timber cut, and in setting minimum charges on timber cut.

In analysis of the seller's value of concessions and in setting minimum concession charges, the framework applied and the concepts involved parallel those applied to the seller's value of timber cut, as discussed in Chapter 5.

### 6.3.1 Determinants of the Seller's Value of Concessions and Minimum Concession Charges

The seller's value of concessions reflects the administrative costs involved and the opportunity cost value of foregone alternative uses of the concession area. They are similar to the factors identified for the timber cut in Chapter 5.

#### 6.3.1.1 Administrative Costs of the Concession

The government's administrative costs of allocating concessions among applicants, and in ongoing supervision, inspection and paperwork is not likely to be as large as those administrative costs involved in timber harvesting. However, it is still a cost which should be included in the seller's value and considered in setting minimum forest charges.

These administrative costs of concessions will apply in all cases, but the opportunity costs of alternative uses foregone which are applicable will depend on the particular situation.

#### 6.3.1.2 Future Value of the Concession

If the value of the concession to concession holders and applicants is expected to increase substantially in the future, and the government anticipates that it might obtain better terms and higher concession charges on future concessions, then there may be some advantage in delaying the granting of concessions. If so, the minimum concession fees should be set to reflect the present value of these anticipated better terms and higher fees, discounted as in Section 5.3.1 (and in Gregersen and Contreras 1979 Economic Analysis of Forestry Projects: 74, 105-106, 182-184).

### 6.3.1.3 Foregone Alternative Uses of the Concession Area

In committing an area to a forest concession the government may loose the opportunity to utilize the area for other uses: community use, small woodlots, game reserves, national parks, agricultural production, etc. Identification of these economic values, most of which are non-market values, involves shadow pricing and other approaches of economic analysis. Treatment of these is discussed in Gregersen and Contreras (1979: 77-89).

Although valuation of these foregone alternative uses of concession areas is not easy, minimum concession fees should include at least an approximation of the values foregone. Their inclusion will not only provide revenue, but will also help to achieve efficient allocation of forest areas among forest uses and alternative uses.1/

### 6.3.1.4 Benefits of Concessions

Instead of, or in addition to foregone opportunities, the establishment of concessions may yield economic benefits to the country. These benefits may take the form of employment generated, imports replaced by locally produced forest products, industrial development with linkages to other industries, etc.

These benefits should be evaluated in economic values rather than financial values, using approaches such as described in Gregersen and Contreras (1979, 57-72, 77-89).

## 6.4 SUMMARY

It is not commonly recognized that the concessions have value to the concession holders. This chapter has introduced the concept of the value of concessions and other forms of rights to timber. Its objective has been to identify the concepts involved and the factors which influence the buyer's value of concessions. Two major determinants of the value of concessions to concession holders were identified: (a) the profit potential of the concession from forest charges set below stumpage values, and (b) The insurance value of timber supply resulting from the security of supply provided by concessions.

One method of measuring, at least the combined value of these determinants of the value of concessions to concession holders, is to introduce some form of competition for concessions as for example by auctions of concessions.

1/ The evaluation of the economic costs of foregone opportunities also serves as the basis for zoning of areas for forestry, watershed protection, etc. Zoning is like a concession fee that is zero in areas with low foregone opportunity and infinite in areas of high foregone opportunities. Establishing concession fees based on the value of the foregone opportunities merely includes charges between zero and infinity. Thus zoning is a sharp and arbitrary, but simpler approach to allocating forest areas among alternative uses.

An auction would determine, if only approximately, the value of the concessions, and would also collect some portion of the value as revenue.

It is important to recognize the value of these timber rights created by concessions, and to reflect them in various types of concession charges. With increasing scarcity of tropical timber and of concession areas, the rights to a guaranteed timber supply can take on increasing value.

Finally, the chapter examined the value of the concession to the government in terms of foregone opportunities resulting from the granting of concessions. This concept, based on the idea of a seller's minimum price introduced in Chapter 3, serves as a basis for proposals on minimum charges in Part III (Chapter 10).

This chapter has provided a conceptual basis for concession charges. To reflect the determinants of the buyer's value of concessions, or the determinants of the seller's value, concession charges could be based on the area of the concession, the volume of timber, or the allowable cut. For example, an annual charge based on the total area of the concession represents a simple alternative related both to the size of the concession and to the length of tenure. These alternatives are examined in Part III (Chapters 8 and 9).

# PART III

# APPLIED FOREST VALUATION AND PRICING: THE CHOICE OF FOREST CHARGES AND THE DESIGN OF A FOREST REVENUE SYSTEM

## Chapter 7

## CRITERIA FOR EVALUATING FOREST CHARGES AND FOREST REVENUE SYSTEMS

### 7.1 INTRODUCTION

Forest charges, which represent the sales price of standing timber, are the vehicles for collecting revenues. They are also means of achieving development objectives and of influencing forest management. Forest charges, for example, can be set to encourage or discourage utilization of different species. High forest charges can help to slow the rate of exploitation and reduce over-cutting. Alternatively, low forest charges will encourage exploitation of the forest and perhaps the development of forest industries. Export taxes can be used to encourage domestic processing of roundwood although undesirable side effects of such a policy are common.

If forest charges serve objectives other than raising revenue the criteria used to evaluate forest revenue systems and alternative charges need to be evaluated within the context of broad forest policy and development policy objectives. This chapter will attempt to do just that. Starting from broad general economic policy objectives we establish criteria to be applied to evaluation of the range of forest revenue possibilities and then to forest revenue systems comprising sets of interrelated forest charges.

### 7.2 ECONOMIC POLICY OBJECTIVES FOR FOREST REVENUE SYSTEMS

Economic policy objectives provide the starting point in establishing criteria for evaluating forest revenue charges. While policy objectives vary among countries, certain broad objectives can be widely accepted. It is the weight applied to, or importance placed on particular objectives which is likely to vary more than the actual objectives themselves, especially when the objectives are broadly defined.

Four broad and widely accepted objectives are identified. The four broad objectives are: (1) financial revenue to the government, (2) administration cost and practicality, (3) economic efficiency in utilization and forest management and (4) equity in distribution of economic effects, revenue and income. In addition, two broad general constraints are identified: (1)

physical and biological feasibility and (2) social, ideological and cultural acceptability.1/

Although these four broad objectives along with the two general constraints provide a comprehensive framework for evaluation for forest revenues, there are difficulties and disadvantages in such a broad set of objectives; difficulties in defining specific operational criteria under each objective, difficulties in the integration of the various criteria and difficulties in adapting the framework to individual countries with diverse forest policy and forest revenue issues. Yet there are dangers to a narrower, more specific framework; dangers of omission of important considerations and dangers in predetermining or biasing the outcome by a narrower range of criteria.

The four objectives are reviewed in turn. Under each, specific operational critiera are developed and refined. Although the order in which they are discussed reflects a logical sequence of relevance to forest revenue decisions and of the interrelationships among them, it does not imply any ranking of importance. Some objectives may be of greater importance to certain countries, to certain decisions or in specific situations.

## 7.3 FINANCIAL REVENUE TO THE GOVERNMENT

Financial revenue to the government is an obvious objective for forest revenue systems and the first criterion considered in evaluating forest charges. For many countries short of government funds for development purposes it can be the most important criterion. The revenues collected from alternative forest charges can be evaluated operationally in terms of:

- revenue per cubic metre of timber harvested
- total annual revenues
- actual revenue compared to the potential revenue (based on the buyer's maximum willingness to pay).

Additional factors to consider are:

- the timing of revenues, (e.g., before harvesting, or after a long delay).

1/ These four broad objectives, the two general constraints and the specific criteria identified are synthesized from studies of forest policy, public finance and economic policy. See for example Adeyoju 1976 A Study of Forest Administration Problems in Six Selected African Countries; Allan 1971 The Theory of Taxation; Clawson 1975 Forests for Whom and for What?; McKillop and Mead 1976 Timber Policy Issues in British Columbia; Musgrave and Musgrave 1980 Public Finance in Theory and Practice; Paulin 1980 Management of Development Forestry; Prats-Llaurado and Speidel 1975 Comparative Study of the Public Forestry Administrations of Latin America; Velay 1976 Administrative Organization of Forestry in the Developing Countries.

- the annual variability of revenues.

### 7.3.1 Revenue per Cubic Metre of Timber Harvested

The level of revenue per cubic metre of wood cut is an obvious measure for evaluating financial revenues from forest charges. It is the volume of timber that is being sold by the government and it is the volume of timber upon which the buyer's valuation is based. In addition, many of the forest charges evaluated are based on timber volumes and the charge per cubic metre is directly available from the schedule of charges.

However revenue per cubic metre will probably require qualification by species and other aspects. Revenues per cubic metre may be high because high-value trees are being cut, areas are being selectively logged for high-grade material, or close-in accessible areas carrying higher stumpage charges are being logged.

### 7.3.2 Total Annual Revenue

The total annual revenue from a particular forest charge is useful for comparison with the administrative costs of the charge in judging the administrative efficiency of individual charges.

The total annual revenue from a particular forest charge and aggregate forest revenue from all forest charges will be of interest to government ministers concerned with revenue requirements to fund development programs and to the ministries of finance in evaluating forestry activities. However total forest revenues is not a particularily good criterion without qualification. Forest revenues may be large because the country is a forest-rich country, because the forests are being developed and exploited rapidly, or because the forest revenue system, for example, collects a large proportion of revenues by initial lump sum charges and a lesser proportion as the timber is cut.

### 7.3.3 Actual and Potential Revenues from Forest Charges

Ideally, forest charges can be evaluated by comparing the actual revenue generated per cubic meter, or in total, with the potential revenue. Potential revenue from the timber cut is measured by the buyer's maximum willingness to pay for timber, identified in the exchange model of Chapter 3 and the derived demand model of stumpage value developed in Chapter 4.

If stumpage values can be estimated, actual revenues per cubic metre can be compared with stumpage values (the potential revenues) and the proportion of the potential revenues collected used to evaluate and compare charges. Forest charges which reflect as closely as possible the value of timber to buyers will mean that the actual revenues from forest charges approach potential revenues and consequently maximize revenues from the charges.

Even where stumpage values cannot be estimated, the concepts of potential and actual revenues will be helpful in choosing among or modifying forest charges. For example, in reviewing forest charges among species, the concept of potential revenue based on stumpage values helps to understand why high-valued species that earn a sizeable return over and above the fees charged are overcut, while lower-valued species remain uncut. This concept of stumpage values is likewise helpful in adjusting charges between species even where one cannot accurately estimate these values.

### 7.3.4 Actual and Potential Revenues from Concessions

The value of the concessions themselves and the rights to the long-term timber supply provided, the security of timber supply identified in Chapter 6, is another and separate dimension of the potential level of revenues. As the analysis of Chapter 6 suggested, the rights to timber supply have value to concession holders over and above the stumpage value of the timber harvested.

Even where the potential value of concessions is not readily measured the criterion will be useful and appropriate in designing and assessing forest charges on concessions; lump sum charges, area based charges and others.

### 7.3.5 The Timing of Revenues

The timing of revenues is another dimension of the revenue objective. The timing of revenues is illustrated for example by area charges which collect revenue prior to cutting, versus volume based charges which collect revenue some considerable time after harvesting.

Revenues received early are of more value to the government since they can be utilized immediately. Differing patterns in timing of revenue flows can be compared by calculating the present value of the financial revenues received at future dates using an appropriate discount rate to bring estimated future revenues back to the present.1/

### 7.3.6 The Annual Variability of Revenues

The variability of revenues is yet another dimension of the revenue objective. The government would usually prefer relatively stable forest revenues to widely fluctuating revenues. Annual area based charges on concessions, for example, provide a very steady revenue source. Revenues from volume based charges will fluctuate with the annual timber harvest. Charges based on

1/ The discount rate serves to weight revenues received in future years at the equivalent in terms of revenue received today. For the procedures of discounting and of determining present values the reader is referred to Gregersen and Contreras 1979 Economic Analysis of Forestry Projects: 104-106, 182-184.

prices or values, such as ad valorem export taxes, or charges based on the value of sawnwood or other forest products will vary in response to fluctuations in both the volume cut and timber prices.

The variability of the revenue can be expressed either in a descriptive evaluation of variability or by a simple graphic plot of expected revenues over time.1/

## 7.4 ADMINISTRATION COST AND PRACTICALITY

Forest charges, or a forest revenue system comprising a set of charges, must be administratively and operationally practical if it is to function satisfactorily. Simplicity usually corresponds with administrative and operational practicality. Some forest charges are simple and easy to administer, requiring few forestry personnel and involving little in the way of administrative costs. Area based concession charges for example, require few personnel and are cheap to administer. Others, such as charges based on volumes harvested, require substantial manpower in scaling, billing and supervision, and thus are costly to administer. Many forest revenue charges which may meet the revenue, economic efficiency, and equity objectives may not pass the test of administrative practicality.

Forest charges will usually be evaluated in terms of the administration cost and practicality to the government, but consideration should also be given to the costs and practicality of compliance for the forest industry. Other aspects such as the likelihood of evasion and certainty of liability should also be considered.

### 7.4.1 Government Administration Costs and Practicality

Very commonly, government budgets and manpower are constrained resources, in short supply. Consequently, it is important that alternative forest charges be evaluated in terms of these constrained resources.

Government administration costs and operational practicality can be evaluated in terms of:

- implementation costs of charges or in introduction of new arrangements (i.e., the fixed capital or investment costs of charges)
- annual operating costs of administering the charges
- manpower requirements for implementation and operation.

1/ It could be expressed statistically by the variance, or the standard deviation, if sufficient data are available.

It is appropriate to separate the "once only" implementation costs from annual operating costs, first to recognize that changes in forest charges can involve significant initial costs, and second because some alternatives, although they might involve significant costs of implementation, may save on annual operating costs.

Evaluating the monetary costs in administration of forest charges also allows comparison of administrative costs of revenue collection with revenues collected. Administrative costs of alternative charges can then be compared as a percentage of revenue collected (Allan 1971 The Theory of Taxation: 41).

Frequently the government is short of the skilled or trained manpower to determine the charges, collect revenues and oversee forestry operations. Where manpower is a major factor in the choice among revenue alternatives, it is important to identify manpower requirements in any evaluation of forest revenue charges and to identify the training needs or other means to overcome the constraint.

Other government resources may also be in short supply, acting as a constraint or barrier to implementation. For example, sometimes scalers do not have transportation to the forests in order to measure the logs from which revenues are derived. If there are other constraints, these too should be identified in evaluating or comparing revenue arrangements.

### 7.4.2 Compliance Costs and Practicality

Although they are not borne by the government and do not appear in the government's budget, the costs and practicality of compliance on the part of the forest industry are also costs of implementation and operation of forest charges, costs borne by the country as a whole.

Compliance costs are also important because forest charges may be difficult to implement if compliance is costly for the forest industry or demanding of manpower. For example, revenue charges that require the industry to undertake complex scaling procedures may be impractical if the trained scalers are not available. Thus compliance problems for the forest industry can cause administrative problems for government.

Compliance costs may be of lesser concern to the government if the forest industry is foreign-owned since the compliance costs are then borne by foreigners. Yet if high compliance costs affect the stumpage value of timber to the foreign industry it may lead to lower forest charges and result in lower revenues.

### 7.4.3 Other Aspects of Administration

Two other aspects of forest revenue administration are of concern in evaluating forest revenue alternatives: the level of evasion and the certainty of liability of charges.

7.4.3.1 Evasion

Evasion of charges is of importance in forestry activities which are by nature carried out in rural or remote areas of the country, are difficult to oversee and are not always amenable to cross-checking through other transactions. For example, charges on sawlogs utilized by local sawmills may not be easily verified once the logs have been sawn and the lumber shipped.

The difficulties in verifying the volumes cut and potential problems of evasion are reasons why a number of countries put emphasis on collecting forest revenues from export charges on logs or charges on forest products. Exports, for example, are easily identified and measured at ports.

Evasion ratios (the percentage of revenue legally due but not reported through evasion) have been estimated for taxes and revenue sources in a few developed countries (Allan 1971 The Theory of Taxation: 39-40). However, in evaluating alternative forest revenue charges perhaps only a rough judgement of the likelihood of evasion will be possible.

7.4.3.2 Certainty of Liability

The certainty of liability of forest charges is an important consideration for the forest industry and other forest users. Certainty of liability is important if forest charges are to serve in influencing utilization and encouraging forest management. If forest charges are to act as tools to influence forest management the rates or level of charges which will apply should be known before harvesting begins. They should not be set arbitrarily or established after cutting has begun.

## 7.5 EFFICIENCY AND EQUITY IN THE UTILIZATION OF FOREST RESOURCES

The objectives of revenue maximization and the minimization of administrative costs must be balanced against the objective of maximizing the contribution of the forests to the economic welfare of the country and to its development. As well as monetary values, forests provide important non-monetary values for fuelwood and local building materials, erosion control, watershed protection, food and game, among a diversity of forest outputs that add to the economic welfare of the country.

The broad objective of economic welfare, the basis for the prescriptive field of welfare economics, is viewed in terms of the two dimensions of: (a) economic efficiency in resource allocation and use, and (b) equity in the distribution of economic effects, revenue and income. Economic policy involves both dimensions, but the classic separation of economic welfare into the twin objectives of efficiency and equity is followed here. This separation aids in a sharper definition of each and in the identification of the trade-offs between the two.

Forest policy choices which successfully maximize both the net benefits and simultaneously distribute the benefits in the desired directions

are rare. The choice among policies commonly requires a balancing of these twin objectives, a trade-off between them. Such is the nature of the political choices in decision-making. At the end of this chapter we turn to the trade-offs in balancing these twin objectives as well as the revenue and administrative cost objectives. Several approaches to the reconciliation of objectives are outlined.

## 7.6 ECONOMIC EFFICIENCY IN UTILIZATION AND FOREST MANAGEMENT

Having separated the welfare economic objective into the twin objectives of efficiency and equity, the present section focuses on the efficiency objective. The equity objective is discussed in the following section.

### 7.6.1 Measuring Economic Efficiency Effects

The economic efficiency effects of alternative forest charges are evaluated in terms of economic values unlike the other three objectives (which are evaluated in financial values). For example, the financial value of fuelwood, which is often not marketed, may be low or even non-existent; yet its economic value, valued in terms of the savings in kerosene obtained from imported oil, may be substantial. In another example, if industrial use of timber is encouraged by industrial development incentives, the financial value of industrial wood, based on the company's willingness to pay derived demand (as in Chapter 4) will include the subsidy. The economic value of wood on the other hand should be net of the subsidy and thus lower than the financial price. Other illustrations of the methodology of valuing project effects in terms of economic values and the methodology of shadow pricing of project inputs and outputs are discussed in Gregersen and Contreras (1979 Economic Analysis of Forestry Projects: 55-99 and especially 77-99).

### 7.6.2 Economic Efficiency and Forest Charges

Forest charges are not a substitute for forest management activities, but forest charges can complement forest management activities and together they can contribute to increased economic efficiency in the use of the country's forest resource. Forest revenue charges can be used to influence the rate of harvesting, the areas harvested, the species cut and the level of utilization. They can help to discourage creaming or high-grading of stands. For example, the level of forest charges will influence the profit level of firms and thus the desire of firms to expand or contract logging operations. Under low forest charges profits are correspondingly higher and logging firms will be keen to expand their activities. If forest charges are high and profits correspondingly lower, firms will be less inclined to expand. Forest charges high enough to reduce profits to below normal levels will result in logging firms not replacing equipment and in reduced logging activity.

Where the forest is being depleted rapidly or the stock of valuable timber is running out, then raising stumpage charges can lead to a slower rate of harvesting. Thus the level of forest charges can influence the level of

logging activity and so complement forest management regulations in achieving the desired rate of cutting.

Forest charges can also influence the areas harvested by means of differentials in forest charges among areas. A common problem is overcutting of near or readily accessible areas, the result of charges which do not reflect the differentials in stumpage value with respect to distance and accessibility (as identified in Chapter 4). This can be remedied by forest charges which discriminate by distance.

Forest revenue charges can influence the species or grades cut. Charges that do not fully reflect differences in stumpage value between species or grades will provide higher profits in cutting the more valuable species or grades and so encourage overcutting of this more valuable timber, and at the same time undercutting of the less valuable timber (as suggested by Chapter 4). Forest charges which do not reflect the differentials in value among species or grades will also encourage creaming or high-grading of the forest, counter to normal forest management objectives. Alternatively, differentials in forest charges can be adjusted to encourage the utilization of species or grades and forest charges used instead as a tool of forest management. Both economic efficiency and forest management objectives are achieved.

Where there are social benefits from harvesting certain stands, species, grades or sizes of timber there may then be reason for departing from charges which reflect stumpage values. For example, where an area is being salvage logged prior to establishing a plantation, a reduction in forest charges to encourage utilization, or even a subsidy, may be warranted to stimulate utilization of as much timber as possible and facilitate planting (see Section 5.3.3 above).

Where there are social costs involved in harvesting timber such as erosion damage, or losses of food or game, then forest charges should at least reflect these impacts in higher charges (see Section 5.3.2 above).

## 7.7 EQUITY IN THE DISTRIBUTION OF ECONOMIC EFFECTS, REVENUE AND INCOME

Equity in the distribution of the impacts is the other dimension of the overall economic welfare objective. The economic benefits of a particular programme of forest management or a particular set of forest charges fall on certain individuals or groups, while the costs often fall on certain other individuals or groups. Only rarely, if ever, will the two groups be the same, and the benefits and costs fall equally on each.

An equitable distribution of the economic effects of forest charges among individuals and groups, governments, industry and other parties involved is an important objective and the final one considered.

All too often overlooked, equity and distribution are important in analysis of forest policy and in political decision-making. They are an important part of the overall welfare objective, no less so than the economic efficiency objective. Thus for many countries development priorities have

shifted from emphasis on the net gains of development programmes to concern for their distribution.

The choice in management of plantations for industrial wood or for fuelwood provides a clear example of the distribution of benefits; to the rural poor in the case of fuelwood, or to higher income wage earners, contractors, owners, and urban consumers in the case of industrial wood. Forest charges can also have distributional effects. In many countries only token charges or perhaps no charge at all are levied on fuelwood or charcoal. Although there are administrative difficulties in levying charges, there are also important income distributional implications in providing fuelwood and charcoal at low charges or free.

### 7.7.1 Defining the Equity Objective and Measuring Distributional Effects

There are several dimensions by which the equity objective can be defined, and based on these the distributional impacts of forest charges measured. These several dimensions can be classified under economic effects, revenues and income distribution.

- Economic Effects
  - employment
  - regional effects
  - prices
  - foreign exchange earnings
- Revenues
  - to government and the different levels of government (federal, state, local community government)
- Income Distribution
  - on incomes of various groups
  - on profit, wages, prices, etc.
  - on overall income distribution.

The above list is not an exhaustive listing of the full range of distributional effects. These will depend very much on the revenue arrangements and the economic structure of the country. However, the list does identify the major distributional effects. The distribution of the effects of any forest policy is best measured by, first, (a) identifying the gainers and losers, and then, (b) the size of the gains and losses to each.

Among the economic effects, the impact of forest charges on employment is an important effect. The level or types of forest charges can encour-

age or redirect employment. Low forest charges can stimulate expansion of the forest industry but at some cost in revenue and perhaps, in the longterm, reduced timber supply. Forest charges are commonly used to encourage further processing and to generate additional jobs although not without also generating problems and unwanted effects.

Forest charges may result in benefits to regions or rural areas; may have effects on prices through increased production of certain forest products and lower prices; or can encourage foreign exchange earnings.

The distribution of revenues between governments (that is, between the federal, state and local governments, communities or traditional rulers) is another dimension of equity.

Finally, the effect of forest charges on the distribution of income to particular groups; as profits, wages and other payments; or on the overall income distribution of the country may be of significance.

## 7.8 CONSTRAINTS

Two basic constraints complete the set of criteria for the evaluation of forest charges and forest revenue systems. They are: (a) physical and biological feasibility and (b) social, cultural and ideological acceptability. They are both broad as well as obvious, and are important. They can significantly influence the choice of forest charges in the forest revenue system.

### 7.8.1 Physical and Biological Feasibility

Unless forest policies achieve physical and biological feasibility there is no point in considering the policies further. Certain species will not grow in certain areas, plantation species are not suitable for certain soils, high forest species can be regenerated only under specific silvicultural systems, forest species are only suitable for specific end uses. Thus physical and biological feasibility is taken as the starting point to, that is a constraint on, the choice of revenue arrangements rather than as an objective to be maximized or balanced against other objectives.

Factors in the physical and biological feasibility of forestry vary widely from country to country and even within a country, so that any discussion of physical or biological feasibility must to be specific to the country or area.

### 7.8.2 Social, Cultural and Ideological Acceptability

Social, ideological and cultural acceptability provides the context within which decisions are made. Like physical and biological feasibility, these are basic and fundamental to forest policy and are treated as constraints on the range of revenue alternatives.

The social, ideological and cultural views of forestry and of acceptable revenue arrangements will be specific to the country or region. Some types of forest charges or methods of setting the level of forest charges will work well in one country but are not acceptable in others.

## 7.9 BALANCING OBJECTIVES IN THE CHOICE OF FOREST CHARGES

The approach taken by this chapter in the choice of objectives has been intentionally broad, both to ensure that all aspects are included for consideration, and to ensure that the approach will be broadly applicable. If the coverage of the objectives is complete, then the study can be tailored to specific countries without leaving out important considerations.

As already suggested, the four objectives and the related criteria by which each objective is evaluated are not independent of each other. They are to a considerable degree interrelated. For example, with a volume based charge on the timber harvested, to maximize revenues the charges should fully reflect differences in value among species, with log diameter and log quality, with distance and with factors affecting logging costs, the factors identified in Chapter 4. The charge should also be adjusted to fully reflect changes over time in sawnwood prices, logging and transportation costs, as discussed above. This may be ideal, both maximizing government revenue and encouraging efficient utilization of the forest, two of the objectives. However, such charges are likely to require considerable manpower in setting and in adjusting the charges, in collection, and in enforcement. Administrative costs would be high, and manpower and data requirements might make volume based charges of this precision impractical. Thus, a trade-off will be required between the administration cost and practicality objective and both the government revenue and economic efficiency objectives.

Or in another example, a policy of reduced forest charges on locally processed timber, designed to encourage development of the forest products industry, may have effects on all four objectives: government revenues, administration costs and practicality, economic efficiency, and equity in distribution of effects. This policy will have an obvious impact on government revenues, reducing revenues perhaps quite substantially, especially if it is successful in encouraging local processing (to which the reduced rates apply). It may also have significant distributional effects, generating jobs and increasing wages of those employed as well as providing an increased supply of processed products and building materials at lower prices. However, the policy may also have some economic efficiency costs, depending on how it is applied, distorting the markets for logs or for forest products. Finally, the administrative cost and practicality may be affected by a policy of administering two sets of charges, (export charges and domestic charges) and the problems of ensuring that export logs pay the full charges. Thus in a policy decision adopting charges to encourage local processing all four objectives are involved. A balancing of the objectives and a trade-off among the objectives is required in the policy choice.

7.9.1 Reconciliation of Objectives

How might the different objectives and related criteria be reconciled in making policy choices among forest revenue alternatives? Several approaches are possible. They are briefly outlined.

For each of the forest charges considered, the first step under any of the approaches is to identify and list the effects and the level of attainment for each of the four objectives, measured by the criteria identified above. This is what is done in Chapter 9 for a range of alternative forest charges. The same approach is applied to alternative methods of setting the level of charges in Chapter 10.

The evaluation of alternative forest charges against each of the forest objectives is a useful step to decision making in and by itself, even if carried no further. For policy decisions on forest revenue systems, to do so would greatly clarify the trade-offs among objectives and aid in a balancing of of the objectives.

The next step in choosing among forest charges is to reconcile the trade-offs among the four objectives. There are several approaches to doing this, but we shall consider only three approaches.

A first approach to reconciling or balancing the four objectives is to set minimum standards, targets, or "thresholds" for each: a minimum revenue target, specified in terms of level, timing, variability, etc.; a minimum administration target specified in terms of costs and manpower, etc.; a minimum economic efficiency target, specified in terms of forest management targets, utilization standards, areas regenerated, etc.; and finally a minimum redistribution target specified in terms of minimum gains or losses to certain groups or income levels, employment generated, etc.1/

Forest charges are judged acceptable if they achieve the minimum targets or thresholds or are rejected if they fail to meet them. If there are several revenue alternatives a choice is made among only those alternatives which meet the minimum standards, picking those which exceed the minimum by the widest margin. For example, in the previously mentioned illustration of reduced forest charges designed to encourage local processing of forest products, targets might be set on forest revenues generated, on the output of processed products stimulated, on jobs created, on benefits to certain groups or income levels, and on administrative costs or manpower requirements in supervision and control.

Subjective judgement enters in the choice of the minimum standards. Where the minimum standard for a particular objective is set high, it implies that considerable emphasis has been placed on that objective.

1/ Minimum standards, targets, or thresholds imply a very great importance (i.e., an infinite weight) attached to the objective at levels below the standard; but no importance (i.e., a zero weight) attached to the objective and the standard is reached.

A second approach to reconciling or balancing the four objectives is by comparing the alternatives in terms of the trade-offs between objectives and the criteria under each. Then a choice is made based on the trade-offs. For example, one revenue arrangement might offer higher government revenues than an alternative, but lesser encouragement of forest management. Again, using the illustration of reduced forest charges to encourage local processing, the trade-off between revenues and economic efficiency might be measured by the additional jobs created per dollar of revenue foregone, or in terms of the additional output of forest products per dollar of revenue foregone. The final choice among forest charges involves a comparison among the trade-offs identified and a policy choice by the decision makers.

The third approach is to apply weights to each objective and the criteria under each reflecting their relative importance. If one could attach weights to each of the objectives and to the criteria under each, it would then be a simple matter to add up the weighted objectives and criteria in a single index of overall social welfare. Although the approach sounds easy, it is not so easy to implement in practice. The approach to reconciling objectives would require decision makers to identify the importance, or weight, they place on each objective, specified in terms of the quantitative criteria. This is a difficult task. In addition, policy decision makers are likely to hestitate to specify their weights, preferring to retain flexibility in policy choices.

In practice, therefore, it will usually be necessary to fall back to the less precise, less technical, more judgemental and more practical "minimum standards" or "trade-offs" approaches, or even to the first step of identifying and listing the achievements under each objective. The final choice of a forest revenue system will remain a policy decision, it is not for the analyst to undertake. Rather, the role of the analyst is to identify the alternatives and the trade-offs.

# Chapter 8

## SURVEY OF ALTERNATIVE FOREST CHARGES CLASSIFIED BY BASE

### 8.1 INTRODUCTION

The variety of forest charges and forest revenue arrangements in tropical countries reflects the diversity among them in forests, forest management, economic development, social and cultural background, governmental structure and history.

The objective of the present chapter is to develop a classification of forest charges, to identify and explain types of charges based on this classification and to survey examples of these charges drawn from selected tropical countries.

A full range of types of forest charges (including alternative means of collecting forest revenues) are identified and surveyed: from licence fees and ground rentals on concessions, through per-tree stumpage charges, volume based charges, charges on processed products, and export charges to profit based royalties, joint ventures and government ownership of concessions, logging operations or processing plants. Examples of these charges are drawn from the experience of major South-East Asian and West African timber producing countries surveyed. These examples illustrate the actual application of the alternatives as well as some of the advantages and difficulties experienced.

In the next chapter each of these alternative forest charges is evaluated in terms of the four criteria established previously (in Chapter 7).

### 8.2 CLASSIFICATION OF FOREST CHARGES

Forest charges are frequently classified by and described in terms of their name, intended purpose, or the use to which the funds are put rather than the base upon which they are levied. For example, "reforestation fees" applied in a number of countries may be levied on the area cut over, on the volume of timber cut, on the number of trees cut, or on logs and forest products exported. Royalties, reflecting the government's interest in the forest resource, may be levied in various countries as per-tree charges, on the volume of timber cut, on processed products, on exports, or even in some countries on the area cutover. Export taxes may be levied on logs or on processed products and on volumes or values of exports.

However, the diversity among countries in the names of forest charges, intended purpose, or the use to which the revenues are put, make any classification based on these complex, comparisons among countries difficult, and their evaluation unconstructive. In addition, in any one country there may be several charges with different names and purposes, although all are levied on the same base; for example royalties, reforestation fees, or public works changes, all levied on the volume of timber harvested.

To facilitate the review and evaluation of forest revenue arrangements, two dimensions of forest charges are singled out for analysis:

(a) the type of charge classified by the base upon which it is levied (eg. area based charges on concessions, volume based charges on timber cut, log export charges, profit based charges) and the structure of charges.

(b) the level of the forest charges and the methods of establishing the level (e.g. administratively set fixed rate charges, value related ad valorem charges, formula set charges, negotiated charges, sealed tenders and open-bid auctions).

The review of forest charges in terms of these twin dimensions separates the questions of the type and structure of forest charges from the independent question of the level of these forest charges. It facilitates the evaluation of individual forest charges and the structure of forest revenue systems separately from more contentious issues related to the level of forest charges.

### 8.2.1 Types of Forest Charges

The forest charges reviewed in the present chapter, classified in terms of the base upon which they are levied, are listed in Table 8.1. The classification is broadly interpreted to include alternative revenue arrangements.

This classification of types of forest charges, classified by the base upon which they are levied provides a framework within which charges and revenue alternatives can be grouped, compared among countries and evaluated. This classification can incorporate almost all of the forest charges used in developing countries. For example, it can include such volume based charges as royalties, reforestation fees, public works charges withholding charges, special deposits, scaling and grading fees and dredging fees all levied on the volume of timber cut. Some countries levy six or more volume based charges. These are best grouped together for evaluation of their effects on forest and for evaluation of their combined level.

Each type of forest charge is evaluated in turn. Examples are drawn from the following West African and South East Asian countries:

| West Africa | South East Asia |
|---|---|
| Liberia | Indonesia |
| Ivory Coast | The State of Sabah, Malaysia |
| Ghana | The State of Sarawak, Malaysia |
| Nigeria | Philippines |
| | Thailand |

These include the major timber producing countries of these regions, and a diversity of forest charges representative of those found in most

Table 8.1

TYPES OF FOREST CHARGES AND
ALTERNATIVE FOREST REVENUE ARRANGEMENTS

| Section | |
|---|---|
| | On Concessions |
| 8.3 | - Licence Fees. |
| 8.4 | - Annual Ground Rentals. |
| 8.5 | - Fees Based on Standing Timber Volume Annual Allowable Cut, or Property Values. |
| | On Timber Harvested |
| 8.6 | - Per-Tree Charges. |
| 8.7 | - Volume Based Charges. |
| 8.8 | - Charges Based on the Area Logged. |
| | On Forest Products Production |
| 8.9 | - Charges on Processed Forest Products. |
| 8.10 | - Charges on Minor Forest Products. |
| | On Foreign Trade |
| 8.11 | - Export charges on Logs and Forest Products. |
| | For Services |
| 8.12 | - Fees for Services Provided. |
| | On Productive Factors |
| 8.13 | - Charges on Equipment or Workers. |
| | On Companies |
| 8.14 | - Corporation Income Tax. |
| 8.15 | - Profit Based Royalties. |
| | Government Participation in Concessions, Harvesting and Processing |
| 8.16 | - Joint Ventures or Full Government Ownership of Concessions, Logging Operations, or Processing Plants. |

tropical countries. The Ivory Coast, for example, is representative of charges found in other French speaking West and Central African countries.

## 8.3 LICENCE FEES ON CONCESSIONS

Licence fees for forest concessions, timber licences and other forest utilization contracts are common in tropical countries, but are generally low, essentially token charges. However, the issuing of a concession, or timber licence involves the granting of rights to timber, rights which can be of considerable value. The value to the concession holder of these rights, identified in Chapter 6, is based on two components: (a) profits earned from the concession where the forest charges on the timber cut are below the stumpage value of the timber and (b) the insurance value provided by the security of timber supply.

A licence fee on the concession can be used to reflect the value of these timber rights. The licence fee may be either an initial lump-sum fee, or an annual fee payable yearly for the life of these timber rights. Both are common.

In most countries the levels of license fees on concessions or other timber utilization contracts are administratively set. However, the level could be established by bonus bids in an open-bid or sealed-bid auction or by one or other of the methods discussed below, in Chapter 10. Bonus bidding on licences is commonly used to capture the value of mineral and petroleum leases.

### 8.3.1 Examples of Licence Fees

Examples of licence fees include both initial lump sum fees and initial fees based on the area of the concession. In most of the countries the levels of the fees are administratively set.

Ivory Coast: Two initial lump-sum charges are levied on concessions (chantier); a Concession Permit Fee (taxe d'atribution) and a Public Works Fee (taxe de Gravaux d'intérêt général).

The Concession Permit Fee (taxe d'atribution) of 125,000 Francs CFA (US $625) in 1980 is charged on each chantier and goes to the central government. As chantier are of fixed size (2,500 ha), the Concession Permit Fee is equivalent to an area based ground rental of 50 Francs CFA/ha (US $0.25/ha). It thus represents a rather small charge.

A Public Works Fee (taxe de Gravaux d'intérêt général) of 400,000 Francs CFA (US $2,000) is levied on "rich" chantier and 200,000 Francs CFA (US $1,000) on "poor" chantier. These Public Works Fees go to the local government to finance public works and general local functions. The rates on both of these concession charges are administratively set, and remained unchanged for the last five years.

An additional charge on concessions, the Annual Area Charge (taxe de superficie) is an annual ground rental and is discussed below (Section 8.4).

Nigeria: In Nigeria, the State of Bendel, the major timber producing state, is the only State to levy a licence fee on concessions. The "Special Development Levy" is an initial charge on concessions and timber licences. It is based on the area of the concession or licence and levied on the entire area. The rates in 1981, unchanged since 1969, ranged from 0.70 Naira/ha to 1.55 Naira/ha (US $1.00/ha to $2.30/ha). Rates vary by forest reserve and are intended to reflect differences in the stocking of the forest among areas of the State.

Indonesia: Indonesia levies an initial Licence Fee on concessions based on the total area of the concession, an administratively set charge levied at 1,000 Ruphiahs/ha in 1980 (US $1.60/ha).

Philippines: In the Philippines a Licence Application Fee of 1.00 Pesos/ha (U.S. $0.13/ha) is levied on the area applied for. It is an initial or "once-only" charge paid at the time of application.

Thailand: Although the area of concessions vary, Thailand levies a fixed Concession Fee for the concession period of 30 years. They are understood to be an initial charge. For teak concessions these Concession Fees were 30,000 Baht (US $1,500) and 15,000 Baht (US $750) for non-teak concessions in 1980. These levels, administratively set, were established in 1975 when the administratively set charges were revised and most charges doubled.

## 8.4 ANNUAL GROUND RENTALS

Annual ground rentals on concessions represent an alternative to initial licence fees. Like initial licence fees, annual area based ground rentals can serve to reflect and capture the value of concessions or other forms of timber rights. In fact, ground rents can offer advantages of greater flexibility and thus may better reflect the value of timber rights, as the evaluation in the next chapter suggests. An annual ground rental is adaptable to concessions of varying lengths of tenure and to concessions of varying size.

It is possible to levy both licence fees and ground rental charges. The Ivory Coast, for example, levies both initial lump-sum charges on concessions and an annual area based ground rental.

### 8.4.1 Examples of Annual Ground Rentals

Annual ground rentals are usually applied to the entire licence area and levied at a uniform rate per hectare. In most countries the levels are adminstratively set, although there is scope to establish the level, for example as bonus bids in open-bid or sealed-bid auctions, or by formula, or other methods examined in Chapter 10.

Liberia: In Liberia, a "Land Rental" charge of US $0.10/ac/year (US $0.25/ha/year) is levied annually on concessions, based on the total area of the concession. This per acre charge has remained unchanged, at pre-1977

rates through 1980. The Land Rental charge, however, ranks as one of the lesser charges, in terms of revenue. It ranks fourth in revenues, after the several volume based and export charges on timber cut, and accounts for just over 7% of forest revenues.

Ivory Coast: In the Ivory Coast an Annual Area Charge (taxe de superficie) is levied in addition to the initial Concession Permit Fee (taxe d'atribution) and the Public Works Fee (taxe de Gravaux d'intérêt général) levied on each concession (chantier), which were described above (Section 8.3). Like these other concession charges, the Annual Area charge is a relatively minor charge. It is levied at the rate of 10 Francs/CFA/ha/year (US $0.05/ha/year) in 1980. The charge is administratively set with the level unchanged for at least the previous five years.

Ghana: In Ghana an annual ground rental is levied on all timber leases and licences, both inside and outside forest reserves. The rate of 0.25 Cedis/ha/year (US $0.10/ha/year) in 1980 is administratively set and remained unchanged from 1975. The revenues are shared with the customary land owners, Chiefs and the local council.

Indonesia: In Indonesia an area based ground rental (Iuran Hak Pengusahan Hutan, IHPH) is levied annually on the total area of concessions. The charge of about 50 Rupiah/ha/year (US $0.08/ha/year) in 1980 is a relatively minor forest charge. Revenues are shared between the provincial government (76%) and the central government (24%).

## 8.5 FEES ON STANDING TIMBER VOLUME, THE ANNUAL ALLOWABLE CUT, OR PROPERTY VALUES

Charges based on the inventory volume of standing timber, on the annual allowable cut, or property taxes based on the value of the timber are three closely related alternatives which can serve to reflect the value of concessions.

Charges based on the inventory volume of standing timber in some circumstances might serve to reflect the value of the concession and the timber thereon better than a licence fee, or annual ground rental. However, for most countries, the forest inventory data are usually not sufficiently reliable to apply this charge. It is not a particularly promising alternative for most tropical countries, except perhaps for plantations.

The annual allowable cut is a base related to the timber yield rather than the stock of timber. For managed forests it might provide a better base. An obvious difficulty is in determining the allowable cut of tropical forests, except again for plantations. In most tropical countries allowable cut estimates are, at best, estimates.

Property taxes, and alternatives such as site productivity taxes and yield taxes, are most common in developed countries where they are applied to private lands. There is extensive literature on the application of property taxes to forestry in developed countries and their effects on forestry.

Property taxes on forest lands are uncommon in tropical countries, where most of the forest land is in government or communal ownership.

### 8.5.1 Examples of Fees Based on Standing Timber Volume Annual Allowable Cut, or Property Values

In spite of the difficulties and problems mentioned, a few examples of these charges can be found in tropical countries.

Indonesia: The Indonesian IPEDA Property Tax on concessions, a property tax in name only, is levied at 20% of the total of all timber royalties and licence fees paid on concessions. The charge was converted to that base in 1976. Prior to that it was levied as an annual area based ground rental at 25 Ruphiah/ha/year.

Philippines: In the Philippines an annual Licence Fee is levied on concessions based on the annual allowable cut of the concession area. This annual Licence Fee is 5% of the "value" of the annual allowable cut, determined by multiplying the allowable cut by the average forest charge per cubic metre.

For example, if the annual allowable cut on a particular concession was 10,000 $m^3$/year, and the average forest charge paid was 3.50 pesos/$m^3$, then the annual licence fee would be: 0.05 (10,000 $m^3$/year x 3.50 Pesos/$m^3$) = 1,750 Pesos/year.

At a rate of only 5%, the fee is a relatively minor charge. It is equivalent to an additional volume based charge on the timber cut at rates of roughly 5% of the average charge per cubic metre, a very small additional charge.

In addition to the Licence Fee, based on the annual allowable cut, a Real Property Tax on Timber Concessions, established in 1975 by Presidential Decrees (PD No. 853 and PD No. 888), is also levied on concessions. It is levied at 1% of the assessed value, with the assessed value set at 40% of the "market value" of "the timber allowed to be cut annually." A "market value" set at 200 Pesos/$m^3$ in 1975 was still in force in 1980.

For example, if the annual allowable cut on a particular concession was 10,000 $m^3$/year, the annual property tax would be 10,000 $m^3$/year x 200 Pesos/$m^3$ x 0.4 x 0.01 = 8,000 Pesos/year. This represents an annual property tax of 0.80 Pesos/$m^3$/year (US \$0.18/$m^3$/year) on the allowable cut, again a relatively modest charge, equivalent to an additional volume based charge of 0.80 Pesos/$m^3$) (US \$0.18/$m^3$) on timber cut. This property tax is collected by the central government and distributed to the provinces and municipalities.

A 1% Special Education Fund charge, also based on the allowable cut, is levied in addition. Thus it effectively doubles the property tax charges.

## 8.6 PER-TREE CHARGES ON TIMBER HARVESTED

One of the simplest charges on the timber harvested is a per-tree charge, or "stumpage charge" as it is termed in several countries. The charge is based on the number of trees cut, at a rate per tree usually specified by species or species group and with higher rates on the more valuable species. Rates per tree are usually constant irrespective of tree size. A few jurisdictions specify per-tree charges by diameter (girth) classes, but it makes the charge more complicated.

Charges per tree can be based on the number of trees of each species class, that are to be cut, and a permit issued prior to harvesting operations. In this case revenues are usually collected beforehand, when the permit is issued. Alternatively, the per-tree charges can be based on the trees actually cut.

### 8.6.1 Examples of Per-Tree Charges

Per-tree stumpage charges, although not a common forest charge, are a component of the forest revenue systems of Ghana, Nigeria and Thailand. In Ghana, they are levied on timber cut, both inside and outside forest reserves; in Nigeria only outside forest reserves; and in Thailand only on concessions. Only in two Nigerian states do per-tree stumpage charges vary with tree diameter.

Ghana: In Ghana Stumpage Fees per standing tree (also termed Royalties) are levied on all trees cut, both inside or outside forest reserves, with the same rates both inside and outside forest reserves. Revenues are shared with the customary land owners, Chiefs and the local councils.

Stumpage Fees are administratively set for 39 species. Rates in 1980 ranged from 6.00 Cedis/tree to 54.00 Cedis/tree (US $2.20/tree to $19.60/tree). Stumpage fees per tree are fixed irrespective of tree size. These rates were established in 1975, and were based on average log prices experienced from 1968 to 1972.

Nigeria: In Nigeria per-tree stumpage charges were the earliest form of forest charge. They are now levied primarily on timber cut in the more scattered logging operations outside of the forest reserves.

In the forest tariff of most Nigerian states stumpage charges per tree are specified for about 40 major species, irrespective of tree diameter. Stumpage charges are administratively set. Rates in most states have been revised at intervals of from three to eight years.

Stumpage charges vary considerably between states, partly in response to variations in timber prices, but more as a result of variations in the timing of revisions among the states.

Charges for higher valued species are between two and seven times those of the lowest valued species, but differences are not usually great enough to fully reflect differences in the value of the standing trees and thus

the higher valued species are greatly sought after (Gray 1981 Nigerian Forest Revenue Systems).

In 1981, in those states with the higher stumpage charges, the charges ranged from 30.0 Naira/tree (US $45.00/tree) for the lowest value and "other" species up to 70.00 Naira/tree (US $105.00/tree) for the more valuable species. For those states with lower stumpage charge the range was from 3.30 Naira/tree (US $5.00/tree) for the lowest value and "other" species up to 26 Naira/tree (US $39.00/tree) for the more valuable species.

Stumpage charges in most Nigerian states are a set amount per tree. Consequently stumpage charges will not reflect the value of the larger diameter trees. For small trees, unless the charges are set at a low level they may exceed the value of the trees and so discourage cutting. Only two states, Anambra and Imo States vary stumpage charges by tree diameter i.e., by girth classes.

Thailand: Thailand levies per-tree Stumpage Fees on timber harvested from within concessions only. Stumpage Fees are collected from concession holders at the start of the felling season, prior to felling, based on the number of trees they plan to fell.

The level of Stumpage Fees is administratively set. Stumpage Fees range from 100 Baht/tree (US $5.00/tree) for larger Teak (Tectona grandis) and for Yang (Dipterocarpos spp.) down to 40 Baht (US $2.00/tree) for Shorea species and to 20 Baht (US $1.00/tree) for other species. For Teak only, Stumpage Fees vary by diameter, trees over 180 cm in girth pay 100 Baht/tree (US $5.00/tree), those under 180 cm in girth pay 30 Baht/tree (US $1.50/tree).

## 8.7 VOLUME BASED CHARGES ON TIMBER HARVESTED

Charges based on the volume of timber cut are one of the most important forest charges for tropical countries; most important in terms of revenues collected and in terms of their economic efficiency effects on forest management.

Volume based forest charges applied to the timber cut include severance charges, out-turn volume charges, royalties and a range of other forest fees or dues based on volume. In French-speaking countries they are referred to as "taxe d'abattage", "taxe de production", or "prix forfaitaire de vente". In Latin American countries, they are referred to as "impuesto forestal", "precio forestal" and "derecho de mont". As reforestation fees, silvicultural cesses and other forest management charges are also commonly volume based charges, their revenue implications and economic effects are considered along with those of stumpage and royalty fees. They are still sources of revenue to the government even if revenues are earmarked for certain purposes and they have the same impact on forest management, no matter how they are labelled.

Charges levied on the volume cut are most commonly set at a fixed rate per cubic metre which varies by species, or at an ad valorem rate based on the value of timber. However, the level of the charges can be administratively

established and levied at fixed rates, levied at value related (ad valorem) rates, established by formula, established by negotiation, or established by auctions. These methods are discussed in Chapter 10, below.

### 8.7.1 Examples of Volume Based Charges

There are a wide range of examples of charges based on the volume of timber cut and some interesting variations in volume based charges among the countries surveyed.

Liberia: Liberia levies two volume based charges on all timber cut, a Severance Fee and a Reforestation Fee. In addition, an export charge called the Industrialization Incentive Fee, based on log volumes, is levied on log volumes of export logs only, and is therefore described below, in the section on export charges (Section 8.11).1/

The Severance Fee, introduced in 1977, is an administratively set, fixed rate charge of US $1.50/m$^3$ in 1980, levied on all logs harvested, both those locally processed and exported. It replaced the Local Use Stumpage charge of US $1.00/m$^3$ levied only on logs processed locally. The Severance Fee, remained unchanged at US $1.50/m$^3$ in the 1980 revision of forest charges, and is Liberia's third most important charge in terms of revenue.

The rationale for the Severance Fee is that it is a charge for the "ecological value" of the trees removed. Under such circumstances it serves as a minimum forest charge or "reservation price" reflecting the Government opportunity cost of the timber, a role mentioned in Chapter 5.

The Reforestation Fee, a fixed rate charge of US $3.00/m$^3$ in 1980, is also levied on all logs harvested, both locally processed and exported. It is Liberia's second most important charge in terms of revenue. The charge was introduced in 1977 at US $1.44/m$^3$ and raised to US $3.00/m$^3$ in 1980. When introduced, The Reforestation Fee was intended to cover reforestation costs. Concession holders who undertook to do their own reforestation were exempt from the Reforestation Fee. However, following unsatisfactory reforestation by concession holders, the exemption is no longer allowed and Reforestation Fees are charged on all timber cut.

These volume based charges, and the Industrialization Incentive Fee levied on export logs, are based on the volumes of timber scaled in the woods as measured by Forestry Development Authority scalers.

Ivory Coast: In the Ivory Coast the Felling Tax (taxe d'abattage) based on log volumes is levied on the timber cut. The rates vary between species, for three species classes, and between logs locally used and those exported.

1/ An additional, relatively minor volume based charge on timber cut of U.S. $0.25/m$^3$ is levied to finance the Mano River Union Forestry Training Centre.

Rates under the Felling Tax are administratively set. Rates in effect in 1980 by species class, for locally used and export logs are as follows:

| Species Class | Locally Used Logs | Export Logs |
|---|---|---|
| 1 | 150 Franc CFA/$m^3$ (US \$0.75/$m^3$) | 300 Franc CFA/$m^3$ (US \$1.50/m |
| 2 | 100 Franc CFA/$m^3$ (US \$0.50/$m^3$) | 200 Franc CFA/$m^3$ (US \$1.00/m |
| 3 | 50 Franc CFA/$m^3$ (US \$0.25/$m^3$) | 100 Franc CFA/$m^3$ (US \$0.50/m |

These rates were established in 1966 and have remained unchanged since. As a result, the Felling Tax is no longer as important as other charges such as the Export Tax (Droits Uniques des Sortie, or DUS) on logs, described in Section 8.11, below. For example, the 200 Franc CFA/$m^3$ Felling Tax on export logs of Obeche, or Samba (Triplochiton scleroxylon) represents less than 1% of the 27,000 Franc CFA/$m^3$ 1980 posted export price (valeurs mercuriales). On the other hand, the Export Tax rate on Samba is 36% of the posted export price, and results in an Export Tax of 9,720 Franc CFA/$m^3$ (US \$48.60/$m^3$), making the Export Tax by far and away the most significant forest charge in the Ivory Coast.

Although Felling Tax rates are low, the Tax does have an appropriate structure, both to distinguish among species and to encourage domestic processing of logs. The Felling Tax distinguishes among three species classes, with species classed roughly by their relative value and higher rates for the more valuable species classes. The Tax also distinguishes between logs locally used and those exported, with higher rates on export logs to encourage domestic processing. However, with relatively low Felling Tax rates these differential rates are not sufficient, by themselves, to encourage domestic processing, or to fully reflect the differentials in value among species. Instead domestic processing is encouraged much more strongly by the Export Tax (Droits Uniques des Sortie) described in Section 8.11 below.1/

1/ On small concessions and in the Savannah zone of the interior a volume based charge called the Special Tax (permis de coupe) replaces the Felling Tax (taxe d'abattage). It also replaces the Concession Permit Fee (taxe d'atribution) and the Annual Area charge (taxe de superficie), described in Sections 8.3 and 8.4.

The rates for the Special Tax (permis de coupe), applying in 1980, are as follows:

| | |
|---|---|
| Class 1 species 600 Franc CFA/$m^3$ | (US \$3.00/$m^3$) |
| Class 2 species 400 Franc CFA/$m^3$ | (US \$2.00/$m^3$) |
| Class 3 species 200 Franc CFA/$m^3$ | (US \$1.00/$m^3$) |

As for the Felling Tax (taxe d'abbattage) the rates are administratively set and have remained unchanged from the mid-1970's or earlier.

Nigeria: In the Nigerian states "Out-Turn Volume" charges are levied on the measured volume of logs removed from the forest. Out-Turn Volume charges are generally applied inside forest reserves, to smaller concessions, to small scale operations or to salvage logging operations. On larger concessions, in most states they are replaced by lump-sum charges levied on the area cut-over.

The Out-Turn Volume based charges are set for 20 to 40 species, grouped under three to five separate rates. For most states, the rates are fixed irrespective of the size of the log. However, at least one state adjusts the charge for log diameter, charging half the rate on smaller diameter logs (Gray 1980, Nigerian Forest Revenue Systems).

Levels of the Out-Turn Volume charges are administratively set. Recent revisions to Out-Turn Volume rates in several states have raised rates to 14.00-15.00 Naira/$m^3$ (US \$21.00-\$22.50/$m^3$) for the more valuable species and to 6.00-10.00 Naira/$m^3$ (US \$9.00-\$15.00/$m^3$) for the less valuable species.

Just as with per-tree stumpage charges, variation in rates between species are not generally sufficient to reflect the differences in timber values between species resulting in strong pressures to cut these more valuable species (Gray 1981).

Indonesia: In Indonesia, log volumes of the timber cut is used as a base for eight or more forest charges. These include royalties on the timber cut, export taxes, withholding charges for industrialization contributions and for corporation taxes, reforestation deposits, as well as other charges designed to finance government activities such as river and harbour dredging providing benefits to the forest industry, and fees for such direct services as grading and scaling.

The more significant volume based charges, along with the method of determination, and the rates applicable in 1980, are given in Table 8.2.

The levels of several of these volume based charges are administratively set. The levels of others are determined as an ad valorem percentage of posted export prices, commonly termed "check prices" and described in Chapter 10. These charges are levied by a variety of departments and ministries of the Central Government. For example, the Timber Royalty, Additional Timber Royalty and Industrial Contribution are levied by the Department of Forestry (Ministry of Agriculture). The Timber Export Tax and MPO Tax are levied by the Ministry of Finance.

Some of these charges, such as the Industrial Contribution and Reforestation Deposits, go into funds to be repaid upon performance of activities. Others go to finance specific purposes. Revenues from some charges such as the Timber Royalty are shared between the Central Government and the Provincial Governments.

Indonesia's experience with these eight volume based charges illustrates the advantages of the use of a uniform base, such as log volume, for several charges. There are economies if scaled log volumes can be used for several charges, and the base is standardized and uniform among charges. There are also economies in setting the level, for example, with several ad valorem

Table 8.2

VOLUME BASED CHARGES ON LOG PRODUCTION AND EXPORT CHARGES ON LOGS: INDONESIA

| Volume Based Charges on Logs Indonesia (1980) | Representative Average Level (Based on an average check price on logs of U.S. $135/m$^3$) | |
|---|---|---|
| | (Ruphiah/m3) | (US $/m3) |
| **On Log Production** | | |
| 1. Timber Royalty (Iuran Halishutan, IHH)<br>- 6% of posted export prices, "check prices"/m$^3$ | Rp 5,000 | $ 8.00 |
| **On Log Exports** | | |
| 2. Additional Timber Royalty (IHH Tambahan)<br>- roughly Rp 500-1000/m$^3$, varies by region<br>- on export logs only<br>- intended to finance river and harbour dredging | Rp 700 | $ 1.20 |
| 3. Timber Export Tax (Alokasi Devisa Otomatis, ADO)<br>- 20% of posted export prices "check prices"/m$^3$<br>- on export logs only | Rp 16,900 | $27.00 |
| 4. Industrial Contribution (Simpanan Wajib Industri)<br>- on export logs only<br>- refunded upon investment in processing plant | Rp 2,000 | $ 3.20 |
| 5. MPO Tax (MPO Exim)<br>- Rp 40/m$^3$/U.S. $ of check price<br>- on export logs only<br>- withholding tax on corporations | Rp 5,400 | $ 8.60 |
| 6. Reforestation Deposit<br>- U.S. $4.00/m$^3$<br>- on export logs only<br>- refunded when reforestation achieved | Rp 2,500 | $ 4.00 |
| **Total Volume Based Charges** | | |
| On Domestically Processed Logs | Rp 5,000 | $ 8.00 |
| On Export Logs | Rp 32,500 | $52.00 |

charges based on the same posted export prices, "check prices". However, with a variety of charges levied by several different departments and ministries there are obvious problems of coordination. Without coordination of the various charges it is difficult to ensure that the charges will reflect the stumpage value of the timber cut, will not discourage or distort utilization, and will not conflict with other forest policy objectives.

Sabah, Malaysia: Volume based charges on timber cut are the major forest revenue source in Sabah, Malaysia. They include Royalties on logs exported or processed domestically (or alternatively on the processed output). These Royalties account for 85% to 90% of forest revenues. The volume based Timber Development Charge is levied on export logs only, and accounts for a further 5% to 10% of forest revenues (see Section 8.11).

Royalty rates are set monthly for six species groups for export logs and for domestically processed logs by means of royalty formulae and based on the monthly FOB log prices obtained by the State sponsored, Sabah Foundation. Sabah's formula approach to setting the level of Royalties is reviewed and evaluated in Chapter 10 (Section 10.5), where attention is focussed on the other dimension of forest charges, setting the levels of forest charges. Separate formulae for export logs and for logs which are processed domestically yield substantially higher charges on export logs. For logs processed domestically, Royalties can be based either on log volumes or on the volume of the processed products (see also Section 8.9).

This formula approach is a most effective royalty system, and yields some of the highest forest charges among tropical countries. For example, for red and white Serya, the major species cut and the most valuable species, Royalties in April 1980 on export logs were equivalent to US $\$76/m^3$. For Kapur and Yellow Serya, the other major species, Royalties on export logs were over US $\$63/m^3$.

Royalties set for the month of April 1980 for each of the six species classes and for export logs or logs processed domestically were as follows:

| Species Class and Major Species | | Export Logs | Domestic Logs | Export Logs | Domestic Logs |
|---|---|---|---|---|---|
| | | (Malaysian $/Hoppus ft). | | (US $/m$^3$) | |
| A | Selangan batu | 2.05 | 0.57 | 26.40 | 7.40 |
| B | Red Serya, White Serya | 5.89 | 0.75 | 76.00 | 9.70 |
| C | Kapur, Yellow Serya | 4.93 | 0.65 | 63.60 | 8.40 |
| D | Jongkong | 5.00 | 0.66 | 64.50 | 8.50 |
| E | Ramin | 3.27 | 0.49 | 42.20 | 6.30 |
| OT | Other Timbers | 4.23 | 0.58 | 54.50 | 7.50 |

Under the formulae, the high Royalties on export logs coupled with the substantially lower Royalties on logs processed domestically provides sizeable incentives for domestic processing, which is discussed in the section on export charges below (Section 8.11).

Sarawak, Malaysia: The Malaysian state of Sarawak levies three volume based charges on the standing harvested from concessions: Royalties, the major volume based charge; and two minor charges, the Timber Cess (or Native Premium), and the Timber Development Premium.

Royalty rates are specified for over 30 species, grouped into five separate species classes. Their levels, which are administratively set, were revised in 1980 and most rates increased by 50%. Royalty rates for logs of the more valuable species group which includes Meranti (Shorea spp.) and Bindang (Agathis spp.) and account for over 50% of Sarawak log exports were increased to $30 Malaysian/Hoppus ton (of 50/H ft.) (US $7.50/$m^3$) of logs. Royalty rates on logs of other species groups were revised to levels of between $9.00 Malaysian/Hoppus ton and $22.50/Malaysian/Hoppus ton (US $2.20 to $5.60/$m^3$ of logs).

Royalty rates for Ramin (Gonystylus spp.), unlike those of other species groups, vary by regions of the State. Following the 1980 revision they ranged from $24 Malaysian/ Hoppus ton to $36 Malaysian/Hoppus ton (US $6.00 to $9.00/$m^3$).

In Sarawak, Royalties on timber cut can be paid either on round log production from concessions, or on the sawnwood volume produced from the logs. Royalty rates, specified both for round logs and for converted sawnwood, are equivalent if sawnwood recovery is 50%.

In addition to the Royalties, two other volume based charges are levied on the timber cut. Both are levied at low rates, which are administratively set and have remained unchanged for a number of years.

The Timber Cess (or Native Premium) is levied on "hill timber" from inland areas at the rate of $1.00 Malaysian/Hoppus ton (US $0.25/$m^3$). Revenues are credited to the Sarawak Foundation Fund, earmarked for development projects benefiting the hill tribes.

The Timber Development Premium is levied on all swamp species at the rate of $2.00 Malaysian/Hoppus ton (US $0.50/$m^3$). Revenues are credited to the Sarawak Timber Development Corporation and used for the promotion of Sarawak forest products.

Philippines: Until consolidated into a single charge in 1980, volume based forest charges in the Philippines comprised a set of six volume based charges. Each was established under separate legislation or authority, for different purposes, or to fund different activities.

The Regular Forest Charges were established by Congressional Act a number of years ago with rates of 0.60 Pesos/$m^3$, 1.25 Pesos/$m^3$, 2.00 Pesos/$m^3$ and 3.50 Pesos/$m^3$ (US $0.08/$m^3$ to $0.47/$m^3$) for four species class. Rates have remained unchanged because the revision of rates required legislative revision of the Act, a complex and time consuming step. To raise the rates and increase revenues the Bureau of Forest Development reclassified species to higher species classes. Almost all species are now classified to the highest species class.

Over time, additional forest charges were added to provide forest revenues and help finance forestry activities. These include the Reforestation Fund charges, which also vary by species class; the Forest Information Fund charge; the FORPRIDECOM Fund charge; and Special Deposits for The Working Unit Trust Fund and Research and Development Trust Fund. Like the Regular Forest Charges, all of these have administratively set, fixed rates. Together these volume base charges in early 1980 totaled between 6.35 Pesos/$m^3$ and 9.35 Pesos/$m^3$ (US \$0.85/$m^3$ - \$1.25/$m^3$) on logs used domestically, and between 10.85 Pesos/$m^3$ and 13.85 Pesos/$m^3$ (US \$1.45/$m^3$ - \$1.85/$m^3$) on export logs.

Later in 1980 these six charges are understood to have been replaced by a single uniform charge of 20 Pesos/$m^3$ (US \$2.70/$m^3$)m which was to be raised to 30 Pesos/$m^3$ (US \$4.00/$m^3$) in 1981.

Thailand: Thailand levies a volume based Timber Royalty on timber cut both inside and outside forest reserves. Inside forest reserves, Forest Improvement Fees are also levied. Forest Improvement Fees for Teak are an additional two-times the applicable Royalty, for non-Teak species they are an additional one-times the applicable Royalty. Thus on timber cut inside forest reserves the combined total volume based charges (Royalty plus Forest Improvement Fee) are three-times the Royalty for Teak, and two-times the Royalty for non-Teak species.

The levels of both Royalties and Forest Improvement Fees are administratively set, with the 1980 levels having been established by the revision of charges in 1975.

Timber Royalties for Teak illustrate volume based charges which vary with log size. Four size classes of logs are determined by log volume. Timber Royalties in 1980 on Teak logs, along with combined Timber Royalties and Forest Improvement Fees applicable to timber cut inside reserved forests are as follows:

| Teak Log Size (by volume) | Teak Timber Royalties (Baht/$m^3$) | Teak Timber Royalties (US \$/$m^3$) | Combined Timber Royalties and Forest Improvement Fees (Baht/$m^3$) | Combined Timber Royalties and Forest Improvement Fees (US \$ |
|---|---|---|---|---|
| more than 0.5$m^3$/long | 150 Baht | \$7.50 | 450 Baht | \$22.50 |
| 0.3 - 0.5$m^3$/log | 120 Baht | \$6.00 | 360 Baht | \$18.00 |
| 0.2 - 0.3$m^3$/log | 60 Baht | \$3.00 | 180 Baht | \$ 9.00 |
| less than 0.2$m^3$/long | 15 Baht | \$0.75 | 45 Baht | \$ 2.50 |

Varying royalty rates by log size, measured in terms of log volume, offer an interesting approach that could ease the administrative burden of adjusting rates, especially under an automated scaling and billing system. For example, if field measurements of length and girth or diameters are fed into a computer programme that calculates log volumes, in calculating the royalty payable the programme can easily be instructed to automatically adjust the royalty rate based on the volume of the individual logs.

Timber Royalties for non-teak species vary between species, but not with log size. Timber Royalties in 1980 ranged between 100 Baht/$m^3$

(US $5.00/m$^3$) and 20 Baht/m$^3$ (US $1.00/m$^3$). Timber Royalties and the combined Timber Royalties plus Forest Improvement Fees applicable to timber cut inside reserved forests are as follows:

| Non-Teak Species | Timber Royalties (Baht/m$^3$) | Timber Royalties (US $/m$^3$) | Combined Timber Royalties and Forest Improvement Fees (Baht/M$^3$) | Combined Timber Royalties and Forest Improvement Fees (US $ |
|---|---|---|---|---|
| Dipterocarpus spp. | 100 Baht | $5.00 | 200 Baht | $10.00 |
| Shorea spp. | 40 Baht | $2.00 | 80 Baht | $ 4.00 |
| Lowest low valued species | 20 Baht | $1.00 | 40 Baht | $ 2.00 |

## 8.8 CHARGES BASED ON THE AREA LOGGED

Charges based on the area logged are an alternative to volume based charges. Under this type of charge, a block of timber is sold at a rate per hectare or at a lump sum for the whole block. The logger then removes all the timber he wishes from the area. As removal of additional timber involves no additional forest charges, the marginal charge per cubic metre is zero. With a marginal charge of zero, stumpage charges cannot discourage utilization of those low value species or trees.

The advantage claimed for charges based on area logged is that fuller utilization of low-valued trees and species is encouraged. As area based charges on the area logged, are designed to encourge full utilization of the timber on the area, they are most appropriate where clear cutting is the silvicultural system applied.

Area based charges on the area logged require accurate information on the volumes, species and other characteristics of the timber on the sale area, both for buyers and for the government.

Lump sum timber sales represent an example of area based on the area logged rather than the volume removed. In lump sum timber sales a block of timber is sold as a unit, commonly by auction, although setting the level of charges and disposal can be by other means.

### 8.8.1 Examples of Charges Based on the Area Logged

Although not common, there are a few applications of charges based on the area logged among the tropical countries surveyed, including examples of lump sum timber sales.

Ghana: Ghana levies a Silvicultural Fee on the area cut-over each year. Although not intended as a charge on the timber cut, it is none-the-less a charge on the area cut-over. Inside forest reserves, a Silvicultural Fee of 7.50 Cedis/ha (US $2.70/ha) in 1980 is levied on the area the concession holder is permitted to cut each year. Outside forest reserves, the Silvicultural Fee is levied at 2.50 Cedis/ha (US $0.90/ha) on the area which is actually cut each year. These rates, which are administratively set, have remained unchanged from 1975.

The revenues are placed in a fund for forest improvements, such as thinning and other silvicultural activities (excluding reforestation). Yet, in practice the levels of the Fee and the revenues generated have been insufficient to cover the cost of these activities.

Nigeria: In Nigeria, charges based on the area cut-over, termed "Area Charges", are used in several States. They were first introduced in the late 1960's on larger concessions as a replacement for out-turn volume charges on the timber cut. Thus it is intended as a charge on the timber cut.

The "Area Charge" is a flat rate charge per hectare levied on the area of the concession to be logged each year. The lump-sum charge is collected prior to cutting. A charge per hectare is established for each forest reserve, based on a broad estimate of the average stocking of timber within each forest reserve and its relative accessibility. The same rate is applied throughout the forest reserve, irrespective of the actual stocking on the area cut.

The levels of these area based charges are administratively set. In several states the levels were raised substantially in 1979 or 1980; in Ogun and Oyo States to 400 Naira/ha (US $600/ha) in all forest reserves, in Ondo State to between 220 Naira/ha and 270 Naira/ha (US $330-$405/ha). The trend in revision of area charges has been toward a uniform area charge for all forest reserves. Area based charges have been favoured because they are relatively easy to administer, avoid the necessity of scaling timber cut, and collect revenue before harvesting rather than after cutting.

Area charges are said to encourage utilization. As they are a charge per hectare, irrespective of the timber cut, they should encourage the removal and utilization of all merchantible timber from the areas cutover. Yet because a uniform rate per hectare is charged throughout the forest reserve, it will encourage the logging of the better stocked and more valuable timber stands first, leaving the poorly stocked and less valuable stands for later. To overcome this problem, rates would have to be dependent on the stocking, species and quality of each area cut, perhaps based on a detailed pre-sale inventory, a difficult and expensive process.

Lump sum timber sales have been used in the Anambra State for the sale of plantation timber by sealed-tender auction.

Thailand: Lump sum timber sales have been successfully used in Thailand for the sale of blocks of plantation timber sold by sealed-tender auction. Although the volume of timber involved have been small, these lump sum sales by sealed tenders have yielded revenues three to five times the level of Royalties and Forest Improvement Fees, and in excess of the reserve prices established.

## 8.9 CHARGES ON PROCESSED FOREST PRODUCTS

Charges levied on sawnwood, or other processed products can be used in place of volume based charges on logs, or as a supplement to charges on

logs. Charges on processed forest products, in their simplest form, may be a uniform rate per cubic metre, rates may be varied by species and grade to reflect differences in value, or they may be levied at ad valorem rates based on values.

As a replacement for volume based charges, charges on sawnwood or other forest products offer advantages, primarily in administrative simplicity. Measurement of the output of sawnwood and other forest products at processing plants may be cheaper and easier than scaling of logs in the forest.

From the viewpoint of utilization, charges on forest products have one major disadvantage. Since they are based on the output of sawnwood or other processed products, rather than on the logs used, they will not encourage the full recovery of processed products. With charges on logs, the sawmill pays the same forest charges, even if recovery is poor. With charges on the sawnwood, they pay less if recovery is poor.

However charges on processed products can serve to supplement charges on the timber harvested. In this case they function as a component of a two-part charge system. With separate charges on the timber cut and on forest products produced, each charge can be lower than otherwise. The two charges can also serve as a cross-check on each other, thereby reducing under-reporting and evasion under each charge. For example, if there is under-reporting of the trees cut under stumpage charges, or underscaling of logs under volume based charges, then sawnwood production and recovery would be out of proportion to reported log input.

### 8.9.1 Examples of Charges on Processed Forest Products

Several tropical countries levy charges on processed products. These may be as substitutes for or in addition to charges on the timber cut. The two examples from the selected tropical countries both illustrate charges on processed products which are substitutes for charges on the timber cut.

Many tropical countries also levy export charges on processed wood products, commonly at ad valorem rates on declared FOB prices or on posted export prices, established by the Government. However, export charges are levied on a different base, that is, on processed products shipped out of the country. Export charges are discussed below (Section 8.11). The charges discussed here are levied on all production of processed products, both exports and domestically consumed production.

Sabah, Malaysia: In Sabah, Royalties on domestically processed timber are payable either on the logs or on the output of processed products. The levels of Royalties for logs and for processed products are set monthly, for six species classes by means of royalty formulae and based on the FOB prices obtained by the State sponsored Sabah Foundation on its export log sales (as described in Chapter 10, Section 10.5).

The Royalty formula for domestically processed logs is:

Royalty (Malaysian $/hft) = 0.07 x FOB price of export logs (Malaysian $/hft.)

The Royalty formula based on processed products is:

Royalty (Malaysian $/true cu. ft.) = 0.15 x FOB price of export logs (Malaysian $/hft.)

Royalties paid under these two alternative formulae will be equal when 37% of the log is recovered in sawnwood or other processed products. [(0.07/0.15) x (1/1.273 true cu. ft. per Hft.) = 0.37]. If sawnwood recovery is greater than 37%, Royalties based on the processed products will be greater than Royalties based on logs. Thus if sawnwood recovery is, for example 50%, the forest industry will prefer, and choose, Royalties based on logs.

These Royalty formulae have remained unchanged from 1977, when the Royalty rate on logs was reduced to 7% (ie. 0.07) from 10% (ie. 0.10). As the FOB prices used in the formula have increased, the Royalties have risen.

Sarawak, Malaysia: In Sarawak, Royalties levied on the timber cut on concessions can also be assessed and paid based either on round log production or on the production of the converted sawnwood. The rates on logs and sawnwood are specified so as to yield equivalent royalty revenue where 50% of the log is recovered as sawnwood. If sawnwood recovery is higher, then royalty payments based on sawnwood would exceed those on logs.

Royalty rates, which are administratively set, were revised in 1980, with most rates increased by 50%. Revised rates for the more valuable species group which includes Meranti (Shorea spp.) and Bindang (Agathis spp.) were raised to $60 Malaysian/Hoppus ton (US $18.80/$m^3$) of sawnwood. Royalty rates on sawnwood of other species groups were increased to levels of between $18 Malaysian and $45 Malaysian/Hoppus ton (US $5.60 to $14.00/$m^3$).

## 8.10 CHARGES ON MINOR FOREST PRODUCTS

Forest charges on minor forest products (poles, piling, railway ties or sleepers, etc.) are normally based on the products themselves, rather than the volume of the trees used in their production. For minor forest products this usually involves a complex schedule of charges for each product, and in many cases for each size or grade of minor product. Such charges are usually laid down in the Forest Regulations. Consequently they are changed infrequently and as a result lag behind inflation.

### 8.10.1 Examples of Charges on Minor Forest Products

Examples of charges on minor products have been selected for only a few of the countries surveyed.

Nigeria: In the Nigerian high forest states, plantations of teak (Tectona grandis), Gmelina (Gmelina arborea), Opepe (Nauclea diderrichii), Idigbo or Afara (Terminalia spp.), and Eucalyptus (Eucalyptus spp.) are utilized for a variety of highly valuable and special uses such as poles, pit props and mine timbers, for sawlogs, and in the future for pulpwood. Most high forest states have pole tariffs, with charges by species levied on a piece

basis, and charges per pole which vary by pole diameter. Several states producing plantation timber for pit props and mine timbers have separate tariffs for pit props with charges based both on diameter and length.

In addition to these plantation charges, forest tariffs include charges for fuelwood, charcoal, and a variety of minor products including yam sticks, fence posts, raphia, chewing sticks, fruits, palm nut collecting, palm oil tapping etc. These are levied on a per piece, or for some products as a licence on persons gathering the products.

Sabah, Malaysia: Sabah levies fees on poles, shingles, fuelwood and charcoal. Pole fees per foot of length depend on the girth. Fuelwood fees include both fees based on stacked volumes and licence fees for those cutting fuelwood. Charges on charcoal include fees on production and a charge for each oven.

Sarawak, Malaysia: Sarawak levies Royalties on a variety of minor products. It levies administratively-set, fixed-rate charges on poles (with rates which vary by diameter), shingles, firewood and charcoal. An ad valorem charge of 10% is applied to other products. Rates have remained unchanged for a decade or more, in spite of inflation.

Philippines: In the Philippines, charges are levied on a wide variety of minor forest products at an ad valorem rate of 10% of the "assessed market value". These "assessed market values" are specified in Department of Finance, Revenue Regulations. Assessed market values and charges are listed for almost 40 products from charcoal, bamboo and rattan to resins and a variety of barks, nuts and leaves.

## 8.11 EXPORT CHARGES ON LOGS AND FOREST PRODUCTS

Export charges on logs and processed products are a common forest charge, and for many tropical countries their major forest revenue source.

Export taxes on logs are the volume based charges levied on export logs rather than all timber harvested. In many cases export charges are a substitute for volume based charges on all timber. They are distinguished from such charges by being based on export logs rather than all logs, an important distinction since charges levied only on export logs can serve to encourage domestic processing.

Export charges on logs or other roundwood can be set as fixed charges per cubic metre which may vary with species or species class and perhaps with log grade as well. Alternatively, export charges on logs can be set as a value related (ad valorem) charge. The ad valorem rate may be varied with species class, but is usually a constant percentage rate. These ad valorem charges can be based on the declared FOB prices of individual export shipments, or on posted export prices, established by the government or a government agency. Posted export prices are obviously less prone to problems of under-reporting of prices than are declared FOB prices.

Export charges on logs are normally levied at higher rates than are volume based charges on logs. As a consequence, export logs may pay higher charges than those processed locally. Exported charges are also levied at export points, such as ports, rather than in the forest.

Export charges on processed products can be a set rate per cubic metre, or can be varied with species, grade and product. More usually they are levied as ad valorem charges based either on declared FOB prices, or posted export prices.

Export charges on sawnwood and other processed products are generally lower than charges on logs. They are often lower, or even zero, the greater the degree of processing. Thus export charges on processed products are usually a less important revenue source than charges on export logs.

An important role for export charges, in addition to forest revenue, is to encourage the domestic processing of logs, and the further processing of forest products. The incentives for domestic processing of logs depend on the difference in charges between export logs and logs used domestically. These differences are determined from the differences in rates on export logs and on logs processed domestically, but are also dependent on the relative value of logs by species and grades and on the level of export charges on processed products.

Domestic processing is also influenced by export quotas or restrictions on logs, or by domestic processing requirements which require that a certain proportion of the timber harvested be processed within the country.

In summary, export charges serve two important functions: (1) as a substitute for forest charges on the timber cut and (2) as a means of encouraging domestic manufacture of forest products and their use.

### 8.11.1 Examples of Export Charges on Logs and Forest Products

The examples of export charges on logs and on processed products drawn from the countries surveyed illustrate a wide range of experiences with alternative variants of export charges.

Liberia: Export charges in Liberia consist of the Industrialization Incentive Fee on log exports and the Forest Products Fee on sawnwood exports.1/

The Industrialization Incentive Fee, levied on export logs, is Liberia's most important forest charge, both in terms of its purpose and revenue generated. Its purpose, stated in the Revenue and Finance Law, is

1/ The only other export charge is an Export Duty of US $2.12/m$^3$ on logs and US $1.27/m$^3$ on sawnwood, but rates are low and very few export logs pay Export duty. Practically all concession holders are exempt from payment of this duty if they export the timber themselves.

"...to encourage the establishment of a timber industry in The Republic of Liberia" (Revenue and Finance Law, Section 20.3). The charge generates over 60% of Liberia's forest revenue. However, to the extent the Industrial Incentive Fee encourages further processing, revenues from it should decline over time.

The Industrialization Incentive Fee is specified for 27 different species of logs under Forestry Development Authority regulations. Administratively set rates, established in 1977, ranged from US $50.00/m$^3$ for the most valuable species down to US $2.00/m$^3$ for "other" species. In 1980 rates were raised to US $75.00 for Sipo (Entandrophrgma utile), and to US $35.00/m$^3$ for a number of other important species. A relatively high Industrial Incentive Fee on export logs should provide a strong incentive for further processing of logs.

The Forest Products Fee, levied on exports of sawnwood, was introduced in 1977 under the new Revenue and Finance Law (Section 20.4). Before 1977 there were no export taxes on forest products. Rates are administratively set by the Forestry Development Authority by means of FDA regulations. Separate rates are specified for 27 species and, in addition, for three degrees of processing (sawn through-and-through, rough lumber and lumber planned-four-sides). Lower rates apply on the more fully processed sawnwood.1/ The rates were revised by new regulations in 1980, and rates for the more valuable species were raised, while other rates remained unchanged and a few were reduced. Rates in 1980 for semi-processed sawnwood (sawn-through-andthrough logs) range from US $60.00/m$^3$ for the most valuable species down to the US $1.50/m$^3$ for "others" species. Rates for the more fully processed, planned lumber are a token US $1.00 to $2.00/m$^3$ in order to provide an incentive to fuller processing. The Forest Products Fee is a relatively minor forest revenue source, both because of the low rates on more fully processed products, and because Liberia still exports the bulk of its forest production in log form.

Ivory Coast: In the Ivory Coast the export tax on logs (taxe d'exportation, or Droits Uniques de Sortie) is by far the most significant forest charge on logs, accounting for 85% to 95% of the total charges on exported logs.

The Export Tax on logs is a value related (ad valorem) charge based on the posted export prices (valeurs mercuriales) set by the government. Posted exported prices (valeurs mercuriales) are established for 47 species of logs by the Ministry of Finance, and revised approximately annually (see Chapter 10, Section 10.4). Valeur mercuriale prices are based on FOB log prices, but not rigidly. They are generally set somewhat below FOB prices. Export charges are based on these posted export prices (valeurs mercuriales), rather than declared FOB prices of logs, thus avoiding any incentive for under-reporting of export prices which might result from export charges based on the

1/ The Revenue and Finance Law provides for rates on all forest products but the Forestry Development Authority Regulations established rates for sawnwood only.

declared FOB prices of individual shipments. Ad valorem export tax rates are established for four species grouping, with rates in 1980 of 24%, 30%, 36% and 44% for the four species groupings. These ad valorem rates are reviewed periodically, but have remained unchanged or raised only slightly. An additional 0.6% Shippers' Tax (taxe au benefice du Conseil ivorien des Armateurs) based on valeur mercuriale prices is also levied on log exports.

These combined ad valorem rates, when applied to the valeur mercuriale prices prevailing in 1980, yielded export charges on logs ranging from 31,110 Francs CFA/$m^3$ (US $155.50/$m^3$) at the very top, down to 1,107 Francs CFA/$m^3$ (US $5.50/$m^3$) for the lowest valued species. Representative 1980 export taxes levels of some of the major species of export logs are:

| Species (Ivorian, Trade & Scientific Name) | Valeur Mercuriale (Francs CFA/$m^3$) | Tax Rate % | Log Export Charges (Francs CFA/$m^3$) | Log Export Charges (US $/$m^3$) |
|---|---|---|---|---|
| Sipo or Utile (Entandrophragma utile) | 50,000 | 44.6 | 22,300 | $ 111.50 |
| Aboudikou or Sapele (Entandrophragma cylindricum) | 31,000 | 44.6 | 18,826 | 94.10 |
| Acajou or Mahogany (Khayas spp.) | 27,000 | 44.6 | 12,042 | 60.20 |
| Iroko (Chlorophora excelsa) | 36,000 | 36.6 | 13,176 | 65.90 |
| Niangon (Tarretia utilis) | 27,000 | 36.6 | 9,882 | 49.40 |
| Samba or Obeche (Triplochiton scleroxylon) | 27,000 | 36.6 | 9,882 | 49.40 |
| Ilomba (Pycnanthas angolensis) | 13,000 | 24.6 | 3,198 | 16.00 |
| Frake or Afara (Terminalia superba) | 9,000 | 24.6 | 1,107 | 5.50 |

Export taxes on forest products are based on declared FOB prices, and are levied at lower ad valorem rates. With lower ad valorem rates, the problems of under-declaration of FOB prices are less likely. Export tax rates in force in 1980 on processed products were relatively low, having been reduced in 1979, to encourage further processing. Rates on sawnwood range from 2% or 6% on the low valued species to 6% or 11% on the high valued species. Veneer and plywood is taxed at 1% or 2%. The ad valorem Shippers' Tax (taxe au benefice du Conseil ivorien des Armateurs) is also levied on processed products at 0.6% of the FOB price of processed products.

Together the relatively high export taxes on logs coupled with the relatively low export tax on processed products produces sizeable incentives for domestic processing of logs, especially for high value species.1/

Larger domestic processing incentives for the higher valued species result from the combined effect of three dimensions of the export tax on logs:

1/ The volume based Felling Tax (taxe d'abattage), described in Section 8.7, imposes higher charges on export logs and thus it also contributes to this domestic processing incentive. However, as a result of the very low rates its contribution is insignificant.

(a) the higher export tax rates on these high value species, that are then (b) applied to higher valeur mercuriale prices, which in turn are (c) closer to the FOB prices.

Using the tax rates, valeur mercuriale prices, and FOB prices applicable in 1980, a comparison of the forest charges on export logs with those on domestically processed logs and sawnwood yields the following estimates of the levels of domestic processing incentives for representative species:

| Species (Ivorian, trade & scientific names) | Domestic Processing Incentives: The Extra Forest Charges on Export Logs (Francs CFA/$m^3$) | (US $/$m^3$) |
|---|---|---|
| **High Valued Species** | | |
| Iroko (Chlorophora excelsa) | 10,400/$m^3$ | $52/$m^3$ |
| Acajou or Mahogany (Khaya spp.) | 8,600/$m^3$ | 43/$m^3$ |
| Samba or Obeche (Triplochiton scleroxylon) | 8,000/$m^3$ | 40/$m^3$ |
| **Lower Valued Species** | | |
| Ilomba (Pycnanthas angolensis) | 2,000/$m^3$ | $10/$m^3$ |
| Fromager or Ceiba (Ceiba pentandra) | 1,800/$m^3$ | 9/$m^3$ |
| Frake or Afara (Terminalia superba) | 1,600/$m^3$ | 8/$m^3$ |

The higher export charges on logs result in sizable incentives for domestic processing of higher valued species, in the order of 8,000-10,000 Francs CFA/$m^3$ (US $40-50/$m^3$), providing a considerable cost advantage for domestic processing. Domestic processing incentives for representative lower valued species are much less, roughly 1,600-2,000 Francs CFA/$m^3$ (US $8-10/$m^3$).

Export quotas, imposed by the Ivory Coast about 1978, are the other vehicle used to encourage domestic processing. Under the quota policy, in order to export logs of Class A, the highest value species, the exporter must deliver an equal volume of Class A logs to processing plants. The quota is not specified in terms of log quality, and so the right to export logs can be earned through delivery of lower grade logs to processing plants. Under the quota policy, the exporter can also earn the right to export high valued, Class A logs, by exporting an equal volume of lower valued, Class C logs.

Ghana: In recent times Ghana has utilized Export Taxes, an Export Bonus and an Export Ban on logs of designated species to discourage the export of logs, and to encourage the production and export of processed wood products. The Export Tax, however, is the only revenue raising policy instrument.

The Export Tax is a value related (ad valorem) charge levied on logs and processed products at the following rates:

on logs - 10% of FOB value declared
on lumber - 5% of FOB value declared
on veneer, plywood and manufactured wood products - none

The status of the Export Tax in 1980 is unclear. Some sources suggested that it has been dropped, others that it was still in place. With

the introduction of an Export Ban on 14 species of logs in 1979, the Export Tax became a non-operational charge on most species of logs and thus largely irrelevant. Wawa, or Obeche (Triplochiton scleroxylon) was the only major species excluded from the ban. It previously accounted for over one-third of log exports and apparently was excluded because it was not in short supply. The 1979 Export Ban was invoked, following an earlier ban, quotas and other restrictions on log exports. The ban has resulted in a substantial increase in custom sawing of logs formerly exported.

An Export Bonus based on a percentage of the foreign exchange earning from export of logs or forest products has been utilized to encourage exports. It acts rather like a reverse export tax. With a fixed exchange rate and a shortage of foreign exchange, the opportunity to retain a percentage of the foreign exchange earnings in foreign currencies is an attractive incentive to exporters. Like the Export Tax its status in 1980 is unclear. In the past the Bonus had been dropped but later reintroduced.

Indonesia: Indonesia levies Timber Export Taxes on both logs and sawnwood. These export taxes are ad valorem charges, applied to posted export prices, or "check prices" as they are termed. Check prices of logs and sawnwood are established quarterly by the Indonesian Government. (See Chapter 10, Section 10.4).

The Timber Export tax on logs is the country's major forest revenue source, accounting for about half of the forest revenue from export logs.

The export tax on logs is levied at an ad valorem rate of 20% of the check price. The export tax rate on logs was raised from 10% to 20% in 1978.

Although the ad valorem tax rate on logs is a constant 20%, the check prices, established quarterly, vary by species, by log grade and by region of the country, and thus log export taxes vary over time and by species, log grade and regions. Check prices are designated for about a dozen species groups, for three species groups and for three regions of the country.

In the second quarter of 1980 check prices for the Meranti species group (Shorea spp. and others Kelompok Harga Kayu Meranti), which is the most important export species group and the highest priced group, ranged from US $160/m$^3$ down to US $100/m$^3$, depending on the region of the country and log grade. These check prices yield log export taxes which ranged from US $32/m$^3$ down to US $20/m$^3$.

For the Kapur species group (Dryobalanops spp., Dipterocarpus spp. and others, Kelompok Harga Kayu Kapur), the second most important species group and also the second highest priced group, check prices in the second quarter of 1980 ranged from US $120/m$^3$ down to US $80/m$^3$ depending on the region of the country and log grades. These check prices yield log export taxes which ranged from US $24/m$^3$ down to US $16/m$^3$.

The Timber Export Tax is the major export tax on logs, but several of the volume based charges, discussed in Section 8.7 above, are levied on exports only. Thus they are, in effect, additional export taxes. The Additional Timber Royalty (Iuran Halishutan Tambahan) and Industrial Contribution (Simpanan Wajib

Industri), are apparently levied only on export logs. Together they represent an additional charge of approximately US $4.40/m$^3$, equivalent to an additional export tax of slightly over 3% (at an average check price of US $135/m$^3$).

The other volume based charge levied on exports is the MPO Tax, a withholding tax on corporations levied at the rate of 40 Ruphiah/US dollar of "check price". It is apparently levied on exports of both logs and sawnwood. It is equivalent to an additional export tax of about 6% of the check price of each.

On processed products, an ad valorem tax of 5% is levied on semi-processed sawnwood (horizontally sawn and 5 cm or thicker) with rates based on the check prices of products established quarterly. From 1971 to 1977 the rate was set at 10%. The rate was dropped to 0% in 1978, but then reintroduced at 5% in 1979. Fully processed sawnwood (sawn four sides) veneer and plywood are now free of ordinary export tax, although an extra export tax on fancy woods applies to designated species. This extra export tax on fancy woods is applied to sawnwood of designated species at rates of 5.60% to 18.04% of check prices, but most fancy species pay 6.75%. Semiprocessed sawnwood of these fancy species would therefore pay both export taxes.

As Indonesia levies relatively high export taxes on logs, low export taxes on semi-processed sawnwood and nothing on fully processed wood products, export tax differentials provide a significant incentive to, and protection for, domestic processing of logs. For example, on logs priced at US $150/m$^3$ the 20% export tax represents an obvious US $30/m$^3$ advantage in log cost for domestic sawmills or plywood mills. At a 50% recovery of processed products this translates into effective protection of US $60/m$^3$ in sawing or processing costs per cubic metre of sawnwood or plywood compared to that of foreign processing plants. The effective protection provided by the 20% export tax on lower priced logs is less, but still significant. On logs priced at US $85/m$^3$ it represents an effective protection of US $17/m$^3$ on logs or US $34/m$^3$ of sawnwood or plywood produced (based on 50% recovery of processed products).

The several volume based charges mentioned above (Additional Timber Royalty, Industrial Contribution and MPO Tax), levied only on export logs, add to the differential and to the effective protection provided to domestic processing. Together they are equivalent to an additional export type tax of about 9%.

Sabah, Malaysia: In Sabah, export charges on logs include both Royalties, and the Timber Development Charge. Royalties on export logs are determined by a separate Royalty formula and are substantially higher than those on domestically processed logs. They provide a strong domestic processing incentive.

The Royalty formulae for export logs, as revised in 1979, are as follows:

Where: R = Royalty in Malaysian $/Hft.
FOB = FOB log price in Malaysian $/Hft. (derived from prices received by the Sabah Foundation for export logs)

For all species classes other than Class A (Class B, C, D, E, Other)

- where FOB is $1.80 or less R = 0.1 (FOB)
- where FOB is $1.80 to M$8.00 R = 0.1 (FOB) + 0.5 (FOB-$1.80)
  This is simplified to R = 0.6 (FOB - $1.50)
- where FOB is $8.00 or more R = 0.1 (FOB) + 0.6 (FOB-$2.66)
  This is simplified to R = 0.7 (FOB - $2.28)

For Class A species R = 0.25 (FOB)

The Timber Development Charge is levied on export logs, in addition to Royalties. The Charge of Malaysian $0.50 Malaysian/Hft. (US $6.40/$m^3$), established in 1979, combines three previous charged. It is applied only to export logs, adds to the level of charges on export logs, and so slightly increases the domestic processing incentive.

The levels of Royalties on export logs are set monthly based on FOB prices of export logs obtained by the State sponsored Sabah Foundation on its export sales.1/

Apart from the formula for Class A species, these formulae yield substantial Royalties, and result in high export charges on logs, among the highest of any tropical country. For example, export charges on logs, including both Royalties and the Timber Development charges for the month of April, 1980, for each of the six species classes for export logs were as follows:

| Species Class & Major Species | Royalty & Timber Development Charge Export Logs (Malaysian $/Hoppus ft) | Royalty Domestic Logs (Malaysian $/Hoppus ft) | Royalty & Timber Development Charge Export Logs (US $/$m^3$) | Royalty Domestic Logs (US $/$m^3$) |
|---|---|---|---|---|
| A Selangan batu | 2.55 | 0.57 | 32.80 | 7.40 |
| B Red Serya, White Serya | 6.39 | 0.75 | 82.40 | 9.70 |
| C Kapur, Yellow Serya | 5.43 | 0.65 | 70.00 | 8.40 |
| D Jongkong | 5.50 | 0.66 | 70.90 | 8.50 |
| E Ramin | 3.77 | 0.49 | 48.60 | 6.30 |
| OT Other Timbers | 4.73 | 0.58 | 60.90 | 7.50 |

Royalty rates on logs processed domestically are included both for comparison and to indicate the magnitude of the domestic processing

1/ The structure of this formula approach to setting forest charges as well as the process is examined in greater detail in Chapter 10 which examines the question of establishing the levels of charges. (See Section 10.5).

incentive.1/

Royalties for export logs (plus the Timber Development Charge) in April 1980 for Red and White Serya (Class B), the major species cut and the most valuable species, were equal to US $82.40/m$^3$, the highest of any species class. Royalties plus the Timber Development Charge in April 1980 for Kapur and Yellow Serya (Class C), the other major species, were equal to US/ $70.00/m$^3$ on export logs.

The high Royalties (plus the Timber Development Charge) on export logs, when compared to the Royalties on domestically processed logs, yield very substantial incentives for domestic processing. For Red and White Serya logs (Class B) the Royalty and the Timber Development Charge in April 1980 totalled US $82.40/m$^3$ of logs, while the Royalty on logs processed in Sabah was only US $9.70/m$^3$ of logs. The difference yields a domestic processing incentive equivalent to US $72.70/m$^3$ of logs used. For Kapur and Yellow Serya logs (Class C), the domestic processing incentive is lower, but still substantial. The Royalty and Timber Development charge totalled US $70.00/m$^3$ of logs, while the Royalty on logs processed in Sabah was only US $8.40/m$^3$ of logs. The domestic processing incentive, based on the differences in the two rates, is US $61.40/m$^3$ of logs used, somewhat lower than that for Red or White Serya, but still substantial.

Local processing increased in 1979 and 1980 in response to these strong incentives for domestic processing, although the bulk of the logs continued to be exported as round logs.

Log export quotas provided another incentive for domestic processing, encouraging the export in processed form, logs that could not be exported as round logs.

Sarawak, Malaysia: Sarawak levies an ad valorem Export Tax on logs, based on the declared FOB value of the logs. The Export Tax rate was raised from 5% to 10% in 1980.

This Export Tax on logs provides a modest incentive for domestic processing. Sawnwood exports pay no export tax and roughly the same Royalty is payable on logs or sawnwood. Based on an average declared value for Meranti (Shorea spp.) logs of about $180 Malaysian/m$^3$, the 10% Export Tax is $18 Malaysian/m$^3$ of logs used (US $8.00/m$^3$).

Philippines: In the Philippines, export charges are levied on logs, lumber, veneer and plywood. In 1980 export charges on each were as follows:

1/ The Royalty formula for domestically processed logs yields substantially lower Royalties. The Royalty formula for logs processed in Sabah is as follows:

R = 0.07 (FOB) where R = Royalty Malaysian $/Hft.
FOB = FOB log price in Malaysian $/Hft.

Logs

| | |
|---|---|
| Research and Development Trust Fund | 4.50 Pesos/$m^3$ (US $10.60/m |
| ad valorem Export Tax | 20% of FOB value |

Lumber

| | |
|---|---|
| ad valorem Export Tax | 4% of FOB value |

Veneer and Plywood

| | |
|---|---|
| ad valorem Export Tax | 4% of FOB value |

To avoid problems of under-declaration of the FOB values, the Central Bank bases the Export Tax for logs on posted export prices termed "guide prices" (See Chapter 10, Section 10.4). The Export Tax on lumber, veneer and plywood is lower, and is usually based on the declared values.

The Export Tax on logs has undergone several changes in recent years. The Export Tax was originally 10%. It was reduced to 4% and then in 1974 eliminated. Finally it was reimposed at 20% in 1979. This 20% ad valorem Export Tax on logs, exceeds the 4% ad valorem Export Tax on processed products, and so provides an incentive for domestic processing.

In addition, export restrictions on logs were introduced in 1976 to encourage domestic processing. Presidential Decrees PD No. 705, amended by PD No. 865, restricted log exports to 25% of the allowable cut from licences. It also required licence holders to construct processing plants or to enter into contracts with existing processing plants for the processing of their log production. In addition, an overall annual quota on logs was introduced. This further restricted log exports and made a share of this export quota both valuable and sought after.

Export limits on the production of sawnwood and plywood have also been introduced. These restricted exports to 70% sawnwood production and 80% of plywood production. As these are quantity restrictions only, they can provide an incentive to export the higher grades and more valuable species of logs, sawnwood and plywood, leaving the lower grades and less valuable species to serve local markets.

## 8.12 FEES FOR SERVICES PROVIDED

A variety of fees are charged by tropical countries for a wide range of required and optional administrative services to forestry and the forest industry. The most significant and most common fees are:

- fees related to the allocation of concessions or other timber rights
- fees related to forest management
- scaling, grading and other fees related to forest production
- port charges and other transportation service fees.

Fees are commonly levied for many of the government activities required by the Forest Regulation on concessions and in meeting forest management requirements, for such required activities as applications, approvals, inspections, marking hammers and a wide variety of other required approvals, based on the services provided. The fees, which in most countries are normally very low, or even token, are usually set forth in the regulations, infrequently changed, yield little revenue and do not cover the administrative cost involved.

Scaling and grading fees for logs are commonly levied on a volume basis, and thus are more appropriately evaluated as an additional volume based charge (Section 8.7), or where levied only on export logs as an additional export charge (Section 8.11). Grading fees for sawnwood or other processed products are usually based on the output of the product, and so are appropriately reviewed as an additional charge on the processed product (Section 8.9), or if on exports only, as an additional export charge (Section 8.11).

Scaling and grading fees are generally relatively low, and thus a relatively minor additional charge. The levels of the fees are commonly adjusted to reflect scaling and grading costs.

Port charges, reflecting the operating costs of ports and handling costs, are commonly levied on exports of logs or processed products. They vary depending on the particular port, but are usually a relatively minor charge. In some cases they may be based on the volume or value of logs or processed products exported, in which case they can be viewed as additional export charges (Section 8.11).

Dredging or log pond fees are another example of fees for services. These also may be based on log volumes. If so, they too can be viewed as an additional volume based charge (Section 8.7).

## 8.13 CHARGES ON EQUIPMENT AND WORKERS

Charges on logging and processing equipment, or on workers can serve as alternatives to charges on the timber cut. Charges on equipment may take the form of either an initial or an annual charge, and may be levied on such things as on tractors, rubber-tired skidders, cable yarders, power saws or other logging equipment, logging trucks, sawmill equipment, complete sawmill installations, veneer and plywood plants, or secondary wood processing plants. Charges on workers may be a charge on all employees or on designated employees and can take the form of a charge per worker or a payroll tax on the company.

### 8.13.1 Examples of Charges on Equipment and Workers

Charges on equipment or workers are not common among the countries surveyed, but they illustrate several alternatives.

Nigeria: Charges on logging equipment and operations, logging trucks, processing plants and equipment are included in the forest tariffs of a number of the Nigerian high forest states.

Charges on sawmills are the most commonly applied charges, and the most significant in terms of revenue. Charges include an initial "Installation Fee" and an "Annual Renewal Fee". For those states which recently revised their fees, the initial Installation Fees in 1981 ranged between 250 Naira and 1000 Naira (US $375 to $1500), and for most states were invariant with sawmill size. The Annual Renewal Fees ranged between 100 Naira/year and 600 Naira/year (US $150 to $900) and in some states varied with sawmill category, saw size, or capacity.

In some Nigerian states there are also initial Installation Fees and Annual Renewal Fees for veneer and plywood mills, pulp and paper mills, fibre board mills, particle board mills, or even for secondary wood processing plants such as furniture factories and timber preservation and seasoning plants.

A few Nigerian states have charges on logging operations and equipment in addition to charges on processing plants. Bendel State, Nigeria's major forestry state, included a "Timber Contractors' Registration Fee" in the forest tariff. The charge varies by size of operation (number of trees cut per year) and by region within the State. Cross-River State has introduced both an initial registration fee and an annual fee for power saws. Several states have considered a charge on logging trucks.

Indonesia: Indonesia levies a tax on production equipment in the forest such as tractors (Bea Balik Nama).

Indonesia also levies a tax on expatriate workers of US $100/month payable by the company on each foreign worker.

Sabah, Malaysia: Sabah introduced "Logging Vehicle Fees" on logging equipment in 1977. These fees, unchanged in 1980, are:

- tractors $400 Malaysian/year (US $180/year)
- skidders $200 Malaysian/year (US $ 90/year)
- other vehicles $100 Malaysian/year (US $ 45/year)

Philippines: A Sawmill Permit Fee is levied by the Philippines as an annual charge of between 700 Pesos/year and 1000 Pesos/year (US $13 to $130 year) depending on the capacity of the sawmill.

## 8.14 CORPORATION INCOME TAX

The corporation income tax on corporate profits is a general tax levied on all corporations, not just corporations in the forest industry. It is included here only because it is often suggested, incorrectly, that the corporation income tax would serve as a simple and convenient replacement for forest charges on timber, because the additional profits resulting from elimination of forest charges will be taxed under the corporation income tax.

However, the corporation income tax is not a substitute for forest charges for several reasons. It can not reflect the factors determining

stumpage values of timber cut or the value of concessions. Corporation income tax rates of 35% to 50% would, at best, only collect part of the value of timber of concessions. Tax incentives and investment incentives result in even lower effective tax rates. In addition transfer pricing of inputs and outputs can reduce taxable profit. These issues are examined in the following chapter when the corporation income tax is evaluated as an alternative to forest charges (See Section 9.14).

Because the corporation income tax is a general tax rather than a forest charge, examples have not been included here, even though a corporation income tax is now levied in most tropical countries.

## 8.15 PROFIT BASED ROYALTIES

Although the corporation income tax is not a substitute for forest charges, profit based royalties can be. A profit based royalty is levied on a different base from the corporation income tax, a base which attempts to isolate the economic rents earned from resource exploitation. One example of a profit based royalty is the "Resource Rent Tax" designed to tax the economic rents from mining or other resource based operations (Garnaut and Ross 1975, Uncertainty, Risk Aversion and the Taxing of Natural Resource Projects: 272-287; Garnaut and Ross 1977, A New Tax for Natural Resource Projects: 78-91). Under the resource rent tax profits are defined differently than under the corporation income tax. The tax is based on the cash flow of receipts and payments, excluding depreciation but allowing deduction of a normal rate of return on the investment. Profits over and above this normal rate of return are then taxed at high rates to capture a proportionate share of the economic rent that reflects the value of the resource itself.

The Resource Rent Tax itself has attracted considerable interest and discussion in seminars and workshops on mineral leasing and negotiations, and in academic journals. The resource rent tax itself, a number of variants of the tax, and combinations with other charges have been suggested and evaluated (Sumner 1978 Progressive Taxation of Natural Resource Rents; Emerson 1980 Taxing Natural Resource Project; Palmer 1980 Mineral Resource Policies in Developing Countries).

The structure of the Resource Rent Tax, and its prospects of application to forestry are examined in greater detail in the next chapter, drawing on these references.

The mining tax legislation introduced in Papua, New Guinea (Income Tax, Mining and Petroleum Act, 1978) is a version of the resource rent tax, combined with a corporation income tax. Other variants of the resource rent tax and other profit based royalties include the British Petroleum Revenue Tax levied on North Sea oil, Norway's "special tax" on North Sea oil, the United States windfall profits tax on the petroleum industry, Indonesia's special corporate income tax on windfall profits and the Malaysian progressive royalty on tin. (Gillis 1980 Fiscal and Financial Issues in Tropical Hardwood Concessions: 51-55). In Canada examples of profit based royalties include the progressive incremental royalty on oil and gas from federal lands, the uranium

royalty in the Province of Saskatchewan and the mineral royalty system in the Province of Manitoba.

Profit based royalties in forestry are not common. Examples might include the Malaysian timber profits tax and the logging profits taxes levied in the Canadian provinces of British Columbia and Quebec. However these are levied at low rates and, in the case of the Canadian provinces, are fully deducted from corporate income taxes, and thus are not truely profit based royalties.

## 8.16 JOINT VENTURES OR FULL GOVERNMENT OWNERSHIP OF CONCESSIONS, LOGGING OPERATIONS, OR PROCESSING PLANTS

Full government ownership of concessions, logging operations, and processing plants, or joint ventures with private companies can serve to complement forest charges. They can capture the stumpage values of timber harvested and the values of concessions which are not captured by existing forest charges. In this way government ownership and joint ventures can become an important component of a forest revenue system.

There is a diversity of types of arrangements for government participation in resource development and thus for capturing a share of the value value of the resource either through participation in the costs and returns of projects, or by taking a share of the output. These arrangements are well developed in the petroleum industry and in mining, both between private companies and between the government and private companies.1/

Joint ventures of various types, including equity participation, partnerships, production sharing and profit sharing arrangements are all means through which the government can capture a proportion of the value of the forest resource. Finally, among the range of alternatives there is full government ownership of concessions, logging operations or of forest products operations. Full government ownership of course, need not preclude the hiring of private contractors to carry out logging operations, just as large private firms do. Under full government ownership, all revenues, costs and profits accrue to the government. The value of concessions and the stumpage value of timber not reflected in forest charges will be captured as profits, provided the government owned operation both obtains appropriate prices on logs and processed products, and operates under efficient cost conditions.

### 8.16.1 Examples of Joint Ventures and Government Ownership of Forestry Operations

The countries surveyed provide several examples of government participation or full ownership in forestry and forest industries. These examples

1/ See for example, United Nations Centre on Transnational Corporations, 1980 Alternative Arrangements for Petroleum Development: A Guide for Government Planners and Negotiations.

illustrate several variations in government participation, ownership and operation.

Liberia: Under Liberia's Forest Development Authority Act, the Government has the authority to either participate in joint ventures in logging and processing or to undertake these activities on its own.

The Forestry Development Authority Act was established to coordinate forestry activities and to oversee and regulate concessions. The Act, developed with the technical assistance and advice of an FAO/UNDP project, was approved by the Legislature in 1976. Under Section 4 of the Act the Forest Development Authority is given wide powers:

> "... to engage in commercial undertakings as a principal or in conjunction with others ... to fell trees or to have them processed locally ... to trade with such timber ... and to engage in all other operations directly or indirectly connected with the trade in forest products". (Subsections O and P)

Although the Forest Development Authority has not exercised these powers, they provide it with an alternative both for capturing the value of the forest resource and for influencing forestry development.

Ghana: Ghana has four major state owned and controlled enterprises in the forest industry. These firms, originally foreign-owned, were acquired through nationalization in 1972. These four enterprises, their holdings of timber licences and leases, and their shares of industry production are as follows:

| | Forest Holdings* (ha) | Share of Industry Production* | | |
|---|---|---|---|---|
| | | Logs | Lumber | Plywood |
| African Timber & Plywood (Ghana) Ltd. | 596,000 | 10% | 9% | 17% |
| Min Timber Co. Ltd. | 97,000 | 9% | 11% | - |
| Gliksten (West Africa) Ltd. | 243,000 | 6% | 5% | 14% |
| Takoradi Veneer & Lumber Co. Ltd. | 163,000 | 2% | - | 12% |
| Totals | 1,099,000 | 27% | 25% | 43% |

* based on figures for 1975-76

Combined the four have significant forest holdings and a sizeable share of production of logs, lumber and plywood; sufficient to provide an opportunity of influencing the industry's output prices and behaviour.

The Ghana Timber Marketing Board, established in 1970, is another instrument of forest policy. The Timber Marketing Board acts as the exclusive agent in the export marketing of Ghanian timber and wood products, sets and enforces minimum export prices for timber and wood products, promotes Ghanian forest products and develops export markets, and allocates import licences for equipment, material and supplies among the forest industry.

Beyond these functions, the Board is given a broad mandate under the Ghana Timber Marketing Board Instrument (1970) and subsequently the Ghana Forestry Commission Act (1980):

- "...to control and supervise the production for export and the exporting or sale in Ghana of all types of timber, and wood products ..."

- "...to control the number of timber mills and factories and their siting ..."

- "...to declare species of timber that should be turned into finished and semi-finished products for export or for use in Ghana ..."

- "...to establish prices of, and secure the most favourable returns for logs, lumber, plywood and other wood products ..."

These functions provide the Timber Marketing Board with potentially broad powers which it can use to influence the structure and activities of the forest industry, establish prices and implement forest policy.

The Timber Marketing Board levies charges on exports to finance the Board's activities, to promote Ghana woods and to provide foreign currency deposits for the purchase of spare parts for the forest industry.

In addition to its marketing activities, the Board itself also has three small subsidiary operating companies:

- Ghana Timbers Ltd., which prior to the export ban purchased and exported logs from smaller logging operations.

- Ehwia Wood Products Ltd., which operated a small sawmill and owns timber concessions.

- Kumasi Furniture & Joinery Ltd., which produced furniture moulding and doors.

Sabah, Malaysia: The Sabah Foundation, a state established and endowed quasi-government organization, is the major concession holder in Sabah. It holds concessions over 85,000 ha for a period of 100 years. The profits from ownership and operation of the concessions are used to fund the Foundation's economic and social development activities. As remaining privately held concessions expire, it is intended that the Sabah Foundation take over these concessions to become the sole concession holder in the State.

The Sabah Foundation utilizes contractors to undertake the logging. Contractors are assigned blocks within the concessions and are responsible both for developing a felling plan and for marking the trees under supervision of the Foundation. They are paid on the basis of logs delivered. The delivered prices paid contractors reflect logging costs rather than the FOB prices of logs, and include an allowance for distance of $0.01 Malaysian/hft/mile (US $0.07/$m^3$/km) in 1980. Rates paid contractors in 1980 were about $1.80 Malaysian/hft (US $23/$m^3$) for higher grade logs and $1.70 Malaysian/hft. (US

$22/m^3$) for lower grade logs, plus the distance allowance of $0.01 Malaysian/hft/mile (US $0.07/$m^3$/km). Logs are delivered by the contractors to log ponds or to processing plants. Logs exported are sold by the Sabah Foundation through contracts negotiated with large buyers, primarily Japanese.

The Sabah Foundation is also involved in the several joint ventures with foreign companies and concession holders in timber processing and one in aforestation. These are:

Sinora Sdn. Bhd.: A joint venture on a 50% equity basis with Yuasa Company, a Japanese company, to develop sawmill and plywood operations.

Pacific Handwoods Sdn. Bhd.: A joint venture owned 51% by the Sabah Foundation and 49% by the large American based Weyerhaeuser Timber Company to develop sawmill and plywood operations.

Sabah Melale Sdn. Bdh.: A joint venture with a Philippine Company to develop sawmill operations.

Sabah Softwoods Sdn. Bdh.: A joint venture owned 60% by the Sabah Foundation and 40% by North Borneo Timber Sdn. Bhd. to develop softwood plantations on 60,000 ha of logged lands provide by the Foundation on a 99 year lease.

The joint ventures in processing are intended to draw upon the technical and management skills of the other partners and to utilize their marketing organizations in the sale of the product. In most cases, the Sabah Foundation will have an opportunity to collect, as profits, a proportion of the stumpage value of the timber cut, which is not reflected in and captured by the forest charges levied on the timber cut. If the costs of the joint venture and the prices obtained reflect efficient costs and competitive market prices, the share captured by the Sabah Foundation will then depend on its percentage share in the joint venture.

Thailand: In Thailand, the Forest Industries Organization, a 100% state owned corporate organization, plays a dominant role in the forest industry. The Forest Industries Organization illustrates the opportunities for and wide range of alternatives in government ownership of concessions, harvesting and processing operations.

The Forest Industries Organization holds major timber concessions and is engaged in logging, processing and marketing of logs and wood products. It is the largest concession holder in Thailand, controlling about 75% of the mature teak stands.

In logging, the Forest Industries Organization (FIO) has almost sole responsibility for extraction and marketing of Teak (Tectona grandis) and Yang (Dipterocarpus spp.), both from FIO concessions and from private lands. Teak is harvested by the FIO itself, non-teak species commonly by sub-contractors.

Forest Industry Organization logging operations produce roughly 100,000 $m^3$ per year of teak logs, and about 300,000 $m^3$ per year of non-teak

logs. The FIO also operates several large centrally located sawmills, a number of small transportable sawmills in the forest, dry kilns, and a wood preservation plant to process a share of its log production. Most teak logs are either utilized in FIO sawmills or sold by FIO at public log auctions (described in Chapter 10, Section 10.8). Lower grade teak logs are sawn in the FIO's own transportable sawmills or sold locally, by auction, to private sawmills. The non-teak logs are utilized either by the FIO's sawmills, by the Thai Plywood Company, a state owned affiliate, or are sold at public log auctions to privately owned wood processing plants.

In addition, the Forest Industry Organization is engaged in a substantial reforestation programme. The bulk of the reforestation is undertaken by "forest villages" established and operated by the FIO.

Finally, the Forest Industry Organization is involved as a major partner in Provincial Forest Companies, in each of the northern provinces of Thailand. These are joint ventures between the FIO and local logging and sawmilling companies and individuals. The Provincial Forest Company established in each province is granted long-term timber extraction concessions province to harvest non-teak species.

The extent and diversity of the activities of the Forest Industries Organization described above indicate that the FIO is a major factor in the forest industries of Thailand and that it can play a significant role in forest policy. The logging, log market sales, sawmilling and lumber sales allow the FIO to earn profits which capture the stumpage value of the timber not reflected in the forest charges levied. The FIO remits 70% of these profits to the Government and is allowed to retain 30% for reinvestment. Through its own logging operations and through activities such as the transportable sawmills utilizing lower grade logs, by operating log markets, and by means of its own processing plants, the FIO also has the capability to pursue forest policy objectives leading to silviculturally improved harvesting, fuller utilization of timber stands, fuller utilization of logs and improved processing. Forest policy for regeneration and in agro-forestry is achieved through the forest village system.

## 8.17 SUMMARY

In the chapter a variety of forest charges and forest revenue arrangements were identified and illustrated by examples drawn from the experience of selected tropical countries. These provide any country wishing to review its forest revenue system with a full set of alternative charges, combined with the actual experience of other countries in applying the alternatives or variants.

The alternatives were classified by the base on which they are levied rather than by the names attached to them since royalties, license fees, export taxes, reforestation charges, etc. can each be levied on a variety of bases. The choice of revenue base allows for the grouping of several charges, all levied on the same base, and analysis of them in terms of their impacts and economic effects.

In the next chapter each of these charges is evaluated in terms of the four criteria established in Chapter 7. Then in Chapter 10, methods of establishing the level of forest charges are surveyed and evaluated, again utilizing examples from the experience of selected tropical countries and the criteria established in Chapter 7 for their evaluation.

# Chapter 9

## EVALUATION OF FOREST REVENUE CHARGES CLASSIFIED BY BASE

### 9.1 INTRODUCTION

The present chapter builds on the analysis of the previous chapter. It evaluates each of the fourteen types of forest charges identified in the previous chapter and illustrated by examples drawn from selected tropical countries.

The objective of this evaluation is to provide a structural evaluation which administrators and policy makers can use in the review of their country's existing forest revenue system and in the evaluation of alternative charges. In the present chapter reviews and evaluates these fourteen types of forest charges, classified by the base upon which they are levied (area, volume, value, profits, etc.), in terms of their effects and effectiveness, evaluated in terms of the four criteria established in chapter 7. The level and the methods of setting the level of the charges (by negotiation, auction, formulae, administered prices, etc.) are evaluated in the next chapter. The levels of the charges, as well as the methods used in setting the levels, must necessarily be referred to in the present chapter, thereby setting the stage for their evaluation in the next chapter.

### 9.2 THE FOREST CHARGES EVALUATED AND AN OVERVIEW OF THE EVALUATION

The forest charges evaluated are those identified and illustrated in the previous chapter. To both guide the reader and facilitate comparison among charges, the charges and a summary evaluation of each are presented in Table 9.1. This provides a preview of the charges to be discussed and presents the highlights of the evaluation.

Forest charges are evaluated in terms of the four criteria established previously (Chapter 7): (a) financial revenues to the government, (b) adminstrative costs and practicality, (c) economic efficiency in utilization and forest management, and (d) equity in the distribution of economic effects, revenue and income. This evaluation utilizes the distinctions between value and price, the concept of the stumpage value of the timber cut, and that of the value of concessions or timber rights developed in Part II (Chapters 3,4,5,6). These provide the conceptual basis for the evaluation of the alternative forest charges.

From this evaluation, based on these four broad criteria, countries can choose a set of forest charges from among these fourteen alternative forest charges or variants and refine their own forest revenue system in terms of their national objectives. The evaluation of the present chapter in terms of these four criteria is by nature qualitative and judgemental rather than quantitative. Once the choice of forest charges is narrowed to a set of alternatives which look feasible for a particular country, or for particular circumstances, then attention can be focussed on a more quantitative evaluation.

Table 9.1

ALTERNATIVE FOREST CHARGES AND THEIR EVALUATION

| Forest Revenue Charges, Base and Description | Evaluation: Financial Revenue to the Government; Administration Cost and Practicality; Economic Efficiency in Utilization and Forest Management; Distribution of Economic Effects, Revenue and Income |
|---|---|
| CHARGES ON CONCESSIONS | |
| License Fees on Concessions<br>- base: lump sum.<br>- initial or annual payment.<br>- level: usually administratively set, could be set by auction of concessions and competitive bidding. | Revenue: Usually low. Potentially significant. Can reflect the value of concessions if set by competitive bidding.<br>Administration: Easy to administer, either as initial or annual fee. Compliance is easy, evasion low.<br>Efficiency: Charges which reflect the value of concessions will discourage accumulation of large areas. Charges should at least reflect alternative uses of areas as minimum charges.<br>Distribution: Involves primarily distribution of revenue between concession holders and government.<br>Suggestions: Scope for greater use of license fees or other concession charges to reflect the value of concessions. |
| Annual Ground Rentals<br>- base: the area of the concession.<br>- annual payment.<br>- level: usually administratively set, could be set by auction of concessions. | Revenue: Usually low rates, yielding little revenue. Potentially significant. Can reflect the value of concessions if appropriately set (eg. by bidding).<br>Administration: Easy to administer. Compliance is easy, evasion low. Competitive bidding can help to set the level.<br>Efficiency: Low ground rentals can encourage acquisition of large concession areas. Higher rates will discourage excess accumulation and encourage better use of existing areas. Minimum ground rentals should reflect economic values of alternative uses of the areas.<br>Distribution: Involves primarily the distribution of revenue between concession holders and government.<br>Suggestions: Annual ground rentals can reflect the value of concessions and can be used in conjunction with charges on the timber cut where feasible. Competitive bidding for concessions can serve to set rates. Minimum rates should reflect the values of the concession area in alternative uses. |
| Concession Charges Based on Standing Timber Volumes, the Annual Allowable Cut or Property Values<br>- base: inventory volume of timber on concession, annual allowable cut, or assessed value of the concession and timber.<br>- annual payment, but a charge on timber volume could be an initial charge.<br>- level: usually administratively set. | Revenue: If these bases match the value of concessions better than area based ground rentals, they could theoretically be better revenue source. In practice they are unlikely to be much better, if at all.<br>Administration: Difficulties and uncertainties of forest inventories, allowable cuts, or valuations make this charge impractical for most situations.<br>Efficiency: Charges based on volumes, or property values may encourage rapid liquidation of mature timber, but charges based on the allowable cut will not. Charges levied on all three bases can encourage concession holders to relinquish excess area if charges are high enough.<br>Distribution: Involves primarily the distribution of revenue between concession holders and government.<br>Suggestions: Not recommended for most countries. Ground rentals are simpler. |

Table 9.1 (continued)

| Forest Revenue Charges, Base and Description | Evaluation: Financial Revenue to the Government; Administration Cost and Practicality; Economic Efficiency in Utilization and Forest Management; Distribution of Economic Effects, Revenue and Income |
|---|---|
| CHARGES ON TIMBER HARVESTED | |
| Per-Tree Charges<br>- base: number of trees cut, charges usually vary by species but not by tree diameter (girth).<br>- often levied prior to harvesting.<br>- level: often administratively set, but could be established by other methods. | Revenue: Per tree charges can not easily reflect variations in stumpage values of timber cut. They can be collected prior to harvest, an advantage.<br><br>Administration: A simple, easy to administer charge. Avoids problems and costs of scaling the volumes cut.<br><br>Efficiency: Per tree charges will encourage full utilization of each tree cut, but can result in smaller trees being left, unless charges vary with diameter. Charges often are not varied sufficiently among species to fully reflect stumpage values, and so the more valuable species are overcut.<br><br>Distribution: Inequities may result, with more benefit to those cutting larger trees or the more valuable species.<br><br>Suggestions: Per tree charges should be used only where simple administration is important. |
| Volume Based Charges on Timber Harvested<br>- base: measured (scaled) volume of timber cut.<br>- includes stumpage fees, royalties, reforestation fees, silvicultural fees, etc.<br>- charge can vary with species, log grade or product values, distance, or location, for example.<br>- very widely used in one form or another, a major forest charge in most countries.<br>- level: can be administratively set, value related (ad valorem), formula based, negotiated, open-bid and sealed-bid auctions. | Revenue: A major revenue source for most countries. Can collect substantial revenues if set to reflect stumpage values and adjusted to changes in costs, prices and inflation. More sophisticated and complex charges may better reflect stumpage values and collect more revenue, but administration is more complex and costly. Often charges do not reflect the full variation in stumpage values between species and so higher valued species do not pay charges approaching their full value.<br><br>Administration: A single uniform charge is relatively simple. The variation of charges for several factors will complicate administration and encourage misclassification into lower rate classes. Wood measurement is demanding of manpower and costly. It may be subject to abuse and underscaling.<br><br>Efficiency: Volume based charges can discourage cutting of lower valued marginal timber. This incentive is counterbalanced by the low marginal costs of logging extra timber. Charges that are uniform, or do not fully reflect stumpage values, will encourage cutting of the more valuable species, grades, etc., or of nearer timber. Charges which reflect stumpage values accurately will provide an equal incentive for cutting all timber and assist forest management.<br><br>Distribution: If charges reflect stumpage values, the value is collected by the government; if not, then values are distributed to concession holder or timber buyers.<br><br>Suggestions: Volume based charges should be an important component of a forest revenue system. Charges should be set to reflect differences in stumpage values among species, etc. Charges should be adjusted over time for changes in prices, costs and inflation. |

Table 9.1 continued

| Forest Revenue Charges, Base and Description | Evaluation: Financial Revenue to the Government; Administration Cost and Practicality; Economic Efficiency in Utilization and Forest Management; Distribution of Economic Effects, Revenue and Income |
|---|---|
| Charges Based on the Area Logged<br>- base: the timber on a given area rather than a charge per unit volume.<br>- lump-sum timber sales are one version in which timber is sold by auction.<br>- usually an initial payment prior to cutting.<br>- level: administratively set or established by auction but other methods are applicable. | Revenue: Theoretically could yield slightly greater revenue than volume charges, but in practice, with uncertainty about timber volumes, or the value of the timber involved, revenues obtainable are likely to be somewhat less than for volume based charges.<br><br>Administration: No scaling required of timber cut, a substantial saving of manpower and administration costs. A detailed timber survey may be required to set charges to reflect timber values, or on lump-sum timber sales to reduce uncertainty of bidders.<br><br>Efficiency: As no additional forest charges are paid in cutting marginal species and trees, utilization will be encouraged. The charge is suitable for clear-cutting or salvage logging. Charges should vary with stocking of stands to discourage cutting of the best.<br><br>Distribution: A uniform charge per hectare can be inequitable to companies cutting poorer stands.<br><br>Suggestions: Area based charges have advantages of administrative simplicity and of fuller utilization. They could be more widely used where clear-cutting and utilization is to be encouraged, where timber surveys can be accurate; and where competitive bidding can be encouraged. |
| CHARGES ON FOREST PRODUCTS PRODUCTION | |
| Charges on Processed Products<br>- base: the volume or value of the processed products output.<br>- a per unit volume charge or an ad valorem (% of value) charge.<br>- can be used instead of charges on the timber cut.<br>- level: can be administratively set, value related (ad valorem) or established by formula. | Revenue: Charges on products instead of logs may be able to reflect prices, recovery, log grade and defect, but not those due to logging factors or distance. Charges on products can complement charges on logs, but the two must be co-ordinated. Charges on products that supplement charges on logs can discourage domestic processing if the charge is significant.<br><br>Administration: Measurement of products may be easier than scaling of logs and can also serve as a cross-check on log volumes.<br><br>Efficiency: With charges on products, standing timber will be treated as a "free good" and so recovery and utilization will be less. Near stands and better stands will be overcut. However, charges on products that supplement charges on the timber as a part of a "two-part charge" may together better reflect stumpage values.<br><br>Distribution: The structure of charges can be used to influence the production of products, employment, regional impacts, etc. However, charges on products can encourage log exports, unless matched by equivalent charges on export logs.<br><br>Suggestions: Charges on products should replace charges on logs only where there are administrative benefits, as they can have undesirable effects on utilization or forest management. However, they can usefully serve as part of a "two-part charge" on timber and products, if the two are carefully co-ordinated. |

Table 9.1 (continued)

| Forest Revenue Charges, Base and Description | Evaluation: Financial Revenue to the Government; Administration Cost and Practicality; Economic Efficiency in Utilization and Forest Management; Distribution of Economic Effects, Revenue and Income |
|---|---|
| Charges on Minor Forest Products<br>- base: the products themselves or the firms and individuals producing them.<br>- per unit (quantity), or value based charge.<br>- level: administratively set or ad valorem. | Revenue: Charges usually low, or even token, to avoid evasion problems, and for income distribution reasons.<br><br>Administration: With many, scattered, small producers administration is expensive. A simple system is needed. High charges encourage evasion.<br><br>Efficiency: Low charges may contribute to overcutting, but higher charges would not reduce overcutting, but only encourage evasion. Other non-economic policies are better solutions to overcutting.<br><br>Distribution: Low charges can encourage production, jobs, save foreign exchange (eg. fuelwood) and benefit the low income rural population.<br><br>Suggestions: Above all charges should be simple and easily enforced. |
| CHARGES ON FOREIGN TRADE | |
| Export Charges on Logs and Products<br>- base: The volume or value of logs processed products exported.<br>- often used in place of volume based charges on timber cut. May also be used in addition to them.<br>- frequently used to encourage domestic processing.<br>- can be a per unit (volume charge) or an ad valorem (% of value) charge.<br>- level: administratively set, value related (ad valorem), or formula set charge. | Revenue: Export charges on logs are the major forest revenue source for many countries. Charges can be based on world market prices. Raising rates on logs brings in more revenue, or encourages domestic processing, providing benefits either way. Export charges on processed products are usually low as high charges would discourage processing.<br><br>Administration: Export charges are often easier to administer than volume based charges on the timber cut, as they are collected at export ports, and are based on more readily measured volumes and values. If export charges are a significant part of export prices, they may encourage under-reporting of volumes or FOB values. Charges can be based on posted export prices to avoid under-reporting of FOB values of shipments. Export charges may also encourage misreporting of species and grades, especially if they attempt to reflect differences in stumpage values.<br><br>Efficiency: Export charges on logs can serve to influence forest management and utilization in many of the same ways as volume based charges. They can be varied by species and log grade, and perhaps also distance or region. Export charges on processed products have similar effects to other charges on products.<br><br>Domestic Processing Incentives: Export charges on logs, because they are a significant charge, can generate sizeable incentives for domestic processing. These incentives are larger on more valuable logs because of the higher export charges on them. Export charges on processed production reduce the incentive, but charges on products are usually low so the effect is minimal.<br><br>Distribution: Export charges which stimulate domestic processing can generate employment and income, influence product prices, and the availability of products, foreign exchange earnings, and government revenue.<br><br>Suggestions: Export charges on logs can serve as a substitute for volume based charges on timber cut. They can be effective revenue source. Export charges on logs can also serve to encourage domestic processing. However, export taxes alone can not achieve both objectives. They should be co-ordinated with other forest charges on logs, and with export charges and other charges on processed products. High export charges should be used instead of quotas or domestic processing regulations. |

Table 9.1 (continued)

| Forest Revenue Charges, Base and Description | Evaluation: Financial Revenue to the Government; Administration Cost and Practicality; Economic Efficiency in Utilization and Forest Management; Distribution of Economic Effects, Revenue and Income |
|---|---|
| CHARGES FOR SERVICES<br><br>Fees for Services Provided<br><br>- base: services for applications, inspections, scaling, grading, port charges, etc. | Revenue: Not a major revenue source, nor should it be. Fees should only cover costs.<br><br>Administration: Fees should reflect costs, and be adjusted for cost changes. Charges for services should be grouped into a minimum of classes.<br><br>Efficiency: If fees reflect the administration costs, efficient use of services will result.<br><br>Distribution: If fees cover costs they will be equitable.<br><br>Suggestions: Fees should be kept simple, set to reflect costs, and be adjusted in line with changes in costs. |
| CHARGES ON PRODUCTIVE FACTORS<br><br>Charges on Equipment and Workers<br><br>- base: logging or processing equipment, number of workers, foreign workers, or payroll.<br>- based on capital or labour inputs rather than outputs of logs or products.<br>- annual fee, plus in some cases an initial fee.<br>- level: usually administratively set, other methods are not practical, except ad valorem payroll charges. | Revenue: Usually low but scope for greater use and for higher rates.<br><br>Administration: Simple and easily administered charges. Based on readily identifiable items. Fees on logging equipment can assist in supervision of forestry activities.<br><br>Efficiency: As fixed lump-sum charges they will not deter forest management or utilization. They can serve with charges on the timber cut as a joint "two-part" charge. They can also encourage more efficient use of equipment.<br><br>Distribution: Will influence use of equipment and the substitution of labour and capital.<br><br>Suggestions: A useful charge as part of a forest revenue system. Administratively simple. Scope for greater use. |
| CHARGES ON COMPANIES<br><br>Corporation Income Tax<br><br>- base: the net profits of corporate forms of business. Net profits allow deducting of depreciation and interest payments, etc. Net profits are based on the corporation's audited accounts.<br>- levied on corporations only.<br>- level: tax rates usually 35%-50% of net profits. | Revenue: Not a good substitute for forest charges. Applies to corporations only. The tax collects only 35% to 50% of profits. Thus it can collect, at most, 35% to 50% of the stumpage value of the timber cut. Investment incentives and transfer prices of logs, or products sold, and of equipment purchased can reduce taxable profits.<br><br>Administration: Administratively easy if a corporation income tax is already in place, but requires reliable accounting systems and government auditing of accounts.<br><br>Efficiency: Substitution of a corporate income tax for forest charges would put forest companies in a more advantageous position than other corporations, as they would receive a free input, timber, and only part of the timber value would be collected by the income tax. This would encourage over use of the "free" timber input and over expansion of timber production. The incentive to cut more valuable timber will be stronger since only 35% to 50% of this higher value is captured by the corporate income tax.<br><br>Distribution: Timber producing companies would be better off than non-timber companies following a switch from forest charges to corporation income tax.<br><br>Suggestions: Countries should not rely on the corporation income tax as a substitute for forest charges. Corporation income taxes should apply equally to all corporations. Forest corporations would then pay forest charges and treat them as a cost in determining taxable profits for corporation income tax. |

Table 9.1 (continued)

| Forest Revenue Charges, Base and Description | Evaluation: Financial Revenue to the Government; Administration Cost and Practicality; Economic Efficiency in Utilization and Forest Management; Distribution of Economic Effects, Revenue and Income |
|---|---|
| Profit Based Royalties<br>- base: profits earned from exploitation of the natural resource. Profits defined to reflect the economic rent, the value of the resource itself.<br>- The resource rent tax is a widely discussed example. Profits are defined in terms of receipts and payments (cash flow) and a normal rate of return allowed. Profits above that are taxed at then high rates. | Revenue: Potentially able to capture a sizeable proportion of the stumpage value. Transfer pricing problems can reduce revenue. A major problem is the delay in revenue until the investment is recovered. This delay period can result in political dissatisfactions.<br><br>Administration: Can be relatively easy if accounting is reliable and accurate auditing is possible. Transfer pricing can create problems. The resource rent tax can supplement and compliment an existing corporation income tax.<br><br>Efficiency: It is claimed that it will not deter marginal investment. It should not distort utilization or forest management if applied to forestry.<br><br>Distribution: If effective, it is likely to collect greater revenues from the forest industry than alternative charges.<br><br>Suggestions: The resource rent tax can conveniently complement an existing corporation income tax, collecting a sizeable share of stumpage values without requiring additional administration. It is suitable only for self-contained "projects". |
| GOVERNMENT PARTICIPATION IN CONCESSIONS, HARVESTING AND PROCESSING | |
| Joint Ventures or Full Government Ownership of Concessions, Logging Operations or Processing Plants<br>- joint ventures may take the form of equity participation, profit sharing, production sharing, or options on production. A great diversity in detailed arrangements is possible.<br>- the government may own and operate concessions, or may hire logging contractors. It may then sell logs, or operate its own processing plants.<br>- an alternative revenue arrangement in addition to forest charges. | Revenue: Joint ventures should be able to capture a portion of the stumpage value not captured by other forest charges, the proportion depending on the ownership arrangements, the efficiency of the operation and the likelihood of transfer pricing problems. Full government ownership should be able to capture a greater proportion of the stumpage value of the timber, either by other forest charges, or as profits provided the government can obtain world prices, and can operate at costs equal to, or lower than, the private sector.<br><br>Administration: For joint ventures, administration can be relatively easy if the private partner undertakes planning and management. But government expertise and supervision is still required. Government ownership involves establishment of a government enterprise to operate the concession and substantial skilled manpower requirements. Contractors can be used, but must be supervised.<br><br>Efficiency: Advantages in pursuing utilization or forest management objectives. Normal forest charges still can be levied on the operation.<br><br>Distribution: Scope to pursue income or employment objectives.<br><br>Suggestions: Can serve as a supplement to forest charges, but is not recommended as a substitute for forest charges. A useful component of a forest revenue system, because government participation provides information on the forest industry, costs, prices, rates of return, and information that is helpful in setting other forest charges. |

## 9.3 LICENCE FEES ON CONCESSIONS

Licence fees on concessions can be either an initial lump-sum charge on the concession, or an annual lump-sum charge over the life of the concession.

Licence fees on concessions and other forest utilization contracts, can be an important component of forest revenue systems, reflecting the value of the timber rights granted by the licence. As suggested by the analysis of Chapter 6, the value of the timber rights granted, reflects both (a) the profits that can be earned in cutting the timber (the excess of stumpage value over the forest charges levied on the timber cut) and (b) the insurance value of the concession resulting from the security of timber supply provided. The value of these timber rights can be significant, if stumpage values are high but are not reflected in forest charges, and if security of timber supply is important. However, licence fees are often low, making the acquisition of concessions attractive and profitable.

### 9.3.1 Evaluations of Licence Fees

Financial revenue to the government: Licence fees are usually administratively set charges. They are often set at low rates. Consequently they are not an important source of forest revenue for most tropical countries. Where licence fees are applied, they tend to be used to reflect the costs to the government in granting the licence, rather than the value to the concession holder of the timber rights granted.

However, licence fees could play a more significant role in forest revenue systems, serving as charges designed to reflect the value of concessions. Where licence fees are intended to reflect the value of the timber rights granted, the level of fees can be established and the timber rights allocated by negotiation, open-bid auction, sealed-tender bidding, or at administered prices, methods discussed in the next two chapters. If, for example, concessions are allocated by competitive auction, using sealed-tenders or open- bidding on the licence fee, then the licence fees bid will at least partly reflect its value. However, with uncertainty on the part of bidders about the volume and quality of the timber, future timber values, logging costs, and the level of forest charges on the timber cut, the licence fees bid are unlikely to capture the full value of the concession. Bids may also not capture the full value of the concession if only a small number of bidders are involved. Bidders are likely to recognize their interdependence and not bid strongly against each other.

Licence fees can be either an initial lump-sum charge, or an annual fee over the life of the concession. Revenue from initial fees will be received early, as concessions are granted, but will peak and then drop off as soon as all forest areas have been licenced. Annual payments may yield less revenue in early years, but will continue as long as there are licenced areas. Annual

payments are likely to yield greater total revenue, but later.1/

Initial lump-sum licence fees are more suitable to auction bidding in the form of a bonus payment. Annual licence fees are more suitable to administratively set charges. Annual licence fees can be varied over time to adjust for inflation and to reflect changing circumstances.

Administration cost and practicality: Either initial or annual licence fees are easy to administer. If these fees are set to collect a reasonable share of the value of the concessions, administration costs will be a small percentage of the revenue collected. The major administrative problem is in establishing the value of the concessions and setting the level of fees. Appraisal of the value of concessions to set administered prices is not easy as the value of concessions is hard to measure. If competition for concessions can be encouraged, then open-bid, or sealed-tender auctions can be used to establish licence fees, as well as to allocate concessions. Auctions can both increase revenues and reduce pressures on administrative officials to favour one applicant over another.

Minimum licence fees should normally be set to at least cover the administrative cost of granting the concession, plus the economic value of the alternative uses of the area; the economic values for watershed protection, food, medicines, environmental values, or future uses.

Economic efficiency in utilization and forest management: As initial or annual licence fees are lump-sum payments, independent of the forestry activities of concession holders, they will not influence or distort the logging activities of concession holders or their utilization of the timber. Thus if part of the value of the timber can be captured effectively through licence fees, then lower forest charges can be charged on the timber cut. Lower forest charges on the timber cut will encourage utilization of marginal trees or marginal stands. In this way, licence fees become one component of a two-part forest revenue system, comprising charges on both concessions and on the timber cut.

Distribution of economic effects, revenue and income: If licence fees are set to reflect the value of the concession, they should not result in economic effects on the industry, employment, forest products prices, etc., because they are lump-sum charges not related to logging activity or other forestry activities. The only distributional effect will be that of revenues between concession holders and the government. This is dependent on the level of the licence fees.

Overall evaluation of licence fees: Licence fees can play a useful role in forest revenue systems to reflect the value of the concessions themselves. Where concessions are allocated by auction, initial lump-sum licence

1/ Annual and initial payments can be compared by calculating the present value of the annual payments using a discount rate reflecting the government's time preference (i.e., impatience). (See Gregersen and Contreras 1979 Economic Analysis of Forest Projects: 104-106).

fees are appropriate and can serve to capture the value of the concessions as bonus bids on the concession licence.

Licence fees on concessions can usefully function as part of a two-part system of forest charges, consisting of separate charges on concessions and on the timber cut.

Licence fees are most suitable to concessions of uniform size and length of tenure, or if concessions are allocated by auctions with licence fees set by means of bonus bids. Annual ground rentals, as discussed next represent an alternative to licence fees with advantages of flexibility in these respects.

## 9.4 ANNUAL GROUND RENTALS

An annual ground rental is an alternative to a licence fee on concessions. Because a ground rental is an annual charge and is based on the area of the concession, it can more easily accommodate concessions of varying lengths of tenure, and of varying size. As suggested in Chapter 6, the value of timber rights granted are related to the length of tenure and the volume of timber involved, so an annual, area based ground rental is an appropriate concession charge for many situations.

### 9.4.1 Evaluation of Annual Ground Rentals

Financial Revenue to the Government: Annual ground rentals are usually administratively set charges. They are commonly levied at relatively low rates, as suggested by the examples of the previous chapter. Yet, they can play a more important role in forest revenue systems, as a charge designed to reflect the value of concessions.

Administration cost and practicality: Ground rentals, which are usually based on the total area of the concession, are easy to calculate and to administer. Administration costs are low. As annual charges, they can be billed and collected regularly every year. Compliance by the forest industry is easy and the costs of compliance low. The charge, once established, is certain for the concession holder. Evasion is unlikely to be a problem.

Ground rentals could be based on the forested area or area of merchantable timber rather than on the total area of the concession. However, this would require accurate forest inventory data and mapping, as well as an ability to carefully delineate forested or merchantable area, and thus is not practical for most countries.

The major administrative problem of ground rentals is in establishing the levels of the charges to reflect the value of the concession. Again, this can be overcome if competitive bidding for concessions can be introduced and encouraged. Another administrative problem is in establishing minimum area charges designed to reflect both the administrative costs of concessions and/or the social opportunity cost of foregone uses and of damages.

Economic efficiency in utilization and forest management: Low area charges will encourage the acquisition of large concession areas, beyond the immediate needs of concession holders. At low area charges concession holders will have little to lose and potentially much to gain from retaining large areas, as the value of the concession to the concession holder in terms of a secure timber supply can easily exceed the low holding cost involved in paying the ground rent. Acquisition of large areas of concessions is encouraged and large forest areas will be tied-up and held without being utilized. Regulation will then be required to force concession holders to utilize the timber, or to relinquish areas exceeding their needs. For example, the government may place conditions on the concession, requiring a given volume of cutting each year similar to work requirements imposed as a condition of petroleum and mining exploration leases and permits. The net result is two inefficiencies. The government first dissipates potential economic rents and revenues by encouraging concessions over large areas at low ground rentals and then further dissipates potential rents and revenues by requiring production before it is economically efficient to do so. The problems of low ground rents, which do not collect the value of the concessions, are not corrected by requirements which dissipate the remaining potential rents in early utilization. It would be better to charge higher ground rentals initially.

Low ground rentals that encourage acquisition of large areas of concessions under lease also reduce competition for timber and, by doing so, lead to lower prices in negotiated sales and in auction sales. Offering less concession areas for lease would encourage competition and allow higher ground rentals. The forest industry would have a smaller cushion of timber reserves and would be more eager to compete.

Low ground rentals can also result in another inefficiency. The concession holder with an excess area, beyond his requirements, will tend to treat his timber supply as unlimited, viewing it as a "free-good", and Consquently to move on to new cutting areas, rather than logging the present cutting areas more intensively and to higher utilization standards. Thus low ground rentals where they result in large holdings of concessions, can also encourage "high grading" or "creaming" of the forest.

Ground rentals, just like licence fees, can be part of a "two-part" stumpage pricing arrangement: a fixed annual charge, the ground rental; and a variable charge based on the timber cut. The ground rental would reflect the value of the concession, while charges on the timber cut serve to reflect the stumpage value of the timber. As a result charges on the timber cut can be lower, thereby encouraging greater utilization (see Section 9.7).

Minimum ground rentals should be established to reflect the economic value of alternative uses for such uses as erosion control, food supplies from the forest, or environmental values of preservation, the social opportunity cost of concession areas.

Distribution of economic effects, revenue and income: Ground rental payments, like licence fees are not related to logging activity, or the volume of timber cut. Consequently the only distributional impact is on the distribution of revenues between the concession holders and the government, and is dependent on the level of the charge per hectare.

Overall evaluation of ground rentals: Ground rentals can play an important role in forest revenue systems, both as a charge reflecting the value of the concessions themselves and as part of a "two-part" charge on timber cut. More emphasis should be placed on ground rentals. In many situations the level of ground rentals could be raised substantially.

Where appropriate, competitive bidding for concessions can be utilized to establish levels of ground rentals that better reflect the value of the concessions to concession holders.

Where the levels of ground rentals have been administratively set, their importance has been eroded by inflation. They are usually established as a fixed amount per hectare and are revised infrequently. Thus, a means of easy or automatic adjustment of rates is suggested, perhaps by an adjustment formula based on the increase in the general price level (Sections 10.3, 12.7).

Minimum ground rental charges should be set to reflect, at least, the costs of granting and administering concessions plus the opportunity costs of harvesting. To reflect these opportunity costs minimum ground rental charges might vary by region of the country.

## 9.5 CONCESSION CHARGES BASED ON STANDING TIMBER VOLUMES, THE ANNUAL ALLOWABLE CUT, OR PROPERTY VALUES

Rather than ground rentals or licence fees, charges on concessions can be based on the inventory volume of standing timber, on the calculated annual allowable cut, or on assessed property values of the concession. Concession charges based on the inventory volumes, allowable cuts and property values are utilized in a few tropical countries surveyed, most notably the Phillippines (Chapter 8, Section 8.5).

Standing timber volumes, the annual allowable cut, or property values could be more closely related to the value of the concessions than are licence fees or area based ground rentals. On concessions logged for the mature timber, it is the inventory volume of standing timber that is of value to concession holders. In this case, a charge on the inventory volume rather than a ground rental may better match the value of the concession, especially if volumes per hectare and species vary widely. In principle the charge could be based on the volume of selected species, all commercial species, all mature timber, or both mature and immature timber. It is also, in principle, possible to apply different rates to the inventory volume of species or species groups. In practice, because of the diversity of species in tropical forests, reliable inventory data for individual concessions makes charges based on inventory data uncertain.

For concessions operated as managed forests and for plantation forests, it is the annual cut yielded by the area which is of value to the concession holder. In this case the annual allowable cut might be an appropriate base. However, accurate allowable cut estimates depend both on reliable forest inventory data and on accurate data of forest growth. In practice, accurate charges based on the annual allowable cut may be even more difficult than those based on the inventory volumes.

Property taxes or charges based on the assessed value of concessions go one step further, by applying valuation to the forest inventory, or annual allowable cut estimates. They may be yet more difficult to apply, in spite of any theoretical advantages.

### 9.5.1 Evaluation of Concession Charges Based on Timber Volumes, the Annual Allowable Cut, or Property Values

Financial revenue to the government: If standing timber volumes, allowable cuts, or property valuations of concessions correspond more closely to the value of the concessions than the area of the concessions, then these alternative bases, theoretically should be able to capture a greater share of the value of the concessions. However, in practice ground rentals may yield nearly as much revenue and be a good deal simpler.

Administration cost and practicality: Concession charges based on standing volumes, allowable cuts or property values involve administrative problems in establishing and measuring the base for the charges. The problems hinge on the reliability of inventory data. The difficulties in achieving an accurate forest inventory in tropical forests of diverse species and stand conditions are well known, and are significant. This affects both the implimentation costs for the government, and the certainty of liability of this type of charges for concession holders. Uncertainty of liability could cause significant administrative problems. The charge could be subject to abuse through manipulation of inventory figures, allowable cut estimates, or the valuations of the concessions.

Frequent adjustment of charges would also be required as stands of mature timber on concessions are cut-over, as plantations grow, as allowable cuts in response to changes in volume and growth, or as property values of concessions change. Consequently, periodic up-dating of charges would be required.

Economic efficiency in utilization and forest management: An annual charge based on inventory volumes is likely to have undesirable effects on forest management, encouraging rapid cutting of the timber. By cutting the timber rapidly the concession holder reduces the volume of growing stock, and thus the annual charge. The higher the charge, the greater the incentive to rapid cutting. A charge on the inventory volume may also encourage the concession holder to relinquish part of the concession, but only if the concession holder has an extremely large volume of timber which he cannot cut within a reasonable time, and only if the charge is high.

Charges based on the allowable cut will not encourage the liquidation of mature timber stands on concessions. A charge on the allowable cut may still encourage concession holders to relinquish part of the concession if he has a large concession with an allowable cut beyond his needs and if the charge is high enough.

Charges on assessed property values may encourage rapid liquidation of mature timber, and also the relinquishment of concession areas surplus to needs, if the charge is high enough.

Distribution of economic effects revenue and income: As with ground rentals or other concession charges, the major distributional effects are in terms of revenue, between concession holders and government.

Overall evaluation: Because of the administrative difficulties and the uncertainties resulting from the problems of forest inventory, annual allowable cut estimates and property valuations, concession charges based on these measures are not recommended for most countries. In most situations, simpler ground rental charges can reflect the value of the concessions almost as well, and with fewer administrative problems and uncertainties.

## 9.6 PER-TREE CHARGES ON TIMBER HARVESTED

Examples of charges on the timber cut, levied on a per-tree basis and termed "stumpage charges" were applied in several of the countries surveyed.1/ Among the countries surveyed per-tree stumpage charges vary by species but are usually uniform, irrespective of tree diameters. If so, charges per tree are a relatively simple and easy to administer charge. In a few cases, per-tree charges for high forest timber are varied by diameter, but this adds to the administrative complexity of the charges.

Per-tree charges are also applied to plantations, the most common examples are the pole charges mentioned in Chapter 8 (Section 8.10). Surprisingly, pole charges in many countries are varied by diameter, even though plantation trees are of more uniform diameters than high forest trees.

### 9.6.1 Evaluation of Per-Tree Charges

Financial revenue to the government: Charges per tree will not usually rank highly in terms of revenue effectiveness. If charges per tree are constant irrespective of tree diameter, they can not fully reflect the value of the larger diameter, more valuable trees, and thus revenues will be less than they might be. As well, smaller trees may be left uncut and so revenues from them will be lost. Where stumpage prices do not vary sufficiently between species to reflect the full value of higher valued species, then potential revenue will again be lost.

Stumpage charges can be collected prior to harvesting, as a permit fee based on the number of trees to be cut. If so revenues are received early.

Administration cost and practicality: Per-tree stumpage charges are simple, uncomplicated and easy to administer. This perhaps explains their popularity. It is easy to levy a charge on a per tree basis, to issue a permit for a given number of trees of each species, and to collect the revenue before

1/ They are termed stumpage charges, perhaps because they are based on, and verified by, the number of stumps.

cutting. This is an advantage especially for small scattered logging operations. Many of the problems of wood measurement (scaling) and of collecting forest revenues are avoided.

With per-tree charges, supervision of cutting involves policing to ensure that cutting takes place within the area designated, that the diameter or girth limits are respected, and that the trees cut (or the stumps) correspond to the number of trees and species authorized and paid for. However, this may still not be easy to carry out on the ground. Evasion of per-tree stumpage charges can be just as much a problem, as it is with other charges on the timber cut. More trees may be cut than authorized and paid for. Also high valued trees may be cut when stumpage was paid on low valued trees. Close supervision of logging, and a cross-check with the log volumes (by species), or against the forest products produced may help to reduce evasion.

Economic efficiency in utilization and forest management: Per-tree stumpage charges will encourage full utilization of those trees worth cutting. Having paid for the tree, the logger will take as much of the tree as is of financial value to him.

On the other hand, per-tree stumpage charges can discourage the full utilization of all trees within a stand. Where stumpage charges are the same for large or small diameter trees, they will encourage the cutting of larger trees and discourage the harvesting of smaller diameter trees, so that smaller trees are left unharvested. This may be advantageous or disadvantageous, depending on the silvicultural system used. If a selective cutting method of silvicultural based on diameter limits is practiced, per-tree charges would help to support minimum girth limits, making smaller trees financially less attractive to cut. Where clearcutting and utilization of all trees is desired, uniform per-tree stumpage charges will discourage full utilization.

When applied to plantations, per-tree stumpage charges, levied at a constant rate irrespective of diameter, may reflect the value of the timber reasonably well, because the trees are approximately the same size. Even so, some of the smaller trees may be left.

Per-tree stumpage prices usually do not vary sufficiently between species to reflect fully the difference in value between high valued and low valued species. Thus they often make the cutting of the high valued species more profitable, and so encourage overcutting of these high valued species.

Distribution of economic effects, revenue and income: From what has been said about the revenue effectiveness of stumpage charges, it can be seen that per-tree stumpage charges can distribute a sizeable share of the value of the timber cut to the forest industry. The more effective the stumpage charges are in reflecting the value of the timber, the larger the share of timber values collected by the government as revenues, but the more complex the charges.

Overall evaluation of per-tree stumpage charges: Since stumpage charges do not reflect timber values very closely, they do not rank highly as revenue sources. On the other hand, stumpage charges rank highly in administration simplicity. Stumpage charges can also help support diameter limits

designed under selective cutting silvicultural systems, and they encourage fuller utilization of those trees cut.

## 9.7 VOLUME BASED CHARGES ON THE TIMBER HARVESTED

Royalties, severance charges, out-turn volume charges, reforestation and silvicultural fees, and a wide variety of other charges are based on the volume of timber cut. As indicated by the survey of forest charges in the previous chapter, volume based charges are perhaps the most widely applied forest charges in tropical countries. For many countries, they are a major eevenue source.

Charges based on the measured volume of timber cut should be a key charge in a forest revenue system. The stumpage values of the timber cut are derived from the uses of the timber and are related to the measured volume of timber that is sold by the government. Other bases such as per-tree charges, charges based on the area logged, charges on processed products, or export charges are alternative, or proxy, measures. These proxy measures are used because they are more readily measured, or are utilized in order to pursue other objectives such as improved utilization or forest management, or to encourage domestic processing.

As volume based charges are levied on the measured volume of timber removed from the forest, the scaling of the timber cut is a major activity. Volumes are commonly determined from measurements of individual logs, but can also be derived from measurement of stacked volumes or truck loads, or from weight measurements.

A wide range of variation in types of volume-based charges is possible, from the simple to the complex. Some of the more important variants based on a number of the factors which influence stumpage values (identified in Chapter 4) are:

- a uniform charge per $m^3$ (or other volume measurement) invariant with species, log grades, log values, location or other factors.
- a charge per $m^3$ that varies by species or species group.
- a charge per $m^3$ that varies with log grade.
- a charge per $m^3$ that varies with log or product prices.
- a charge per $m^3$ that varies by region or zone, reflecting differences in costs.
- a charge per $m^3$ that varies with distance, reflecting transport costs.
- a charge per $m^3$ that varies with forest stand conditions, reflecting differences in logging costs.

Combinations of the above types are possible. For example, volume-based charges could be established by species and by distance for example, or to vary with log prices distance and stand conditions.

### 9.7.1 Evaluation of Volume Based Charges

Financial revenue to the government: To be an effective revenue source, maximizing revenues from the timber cut, volume based charges should reflect the stumpage value of the timber cut as closely as possible yet be simple and practical. To illustrate this, consider a uniform volume based charge on all timber, irrespective of species, the simplest possible volume based charge. If this uniform rate per cubic metre is set at a low level, more timber will be cut. Marginal stands, less valuable species, lower quality logs, and smaller diameter trees will be harvested. However, at a low rate, forest revenue will obviously be low, and only a small proportion of the stumpage value of the higher valued species, higher quality logs, and larger diameter trees will be captured. Revenue effectiveness, measured by the percentage of stumpage value captured as revenue, will be relatively low.

On the other hand, if this simple uniform rate per cubic metre is increased, in order to capture more of the stumpage value of the higher valued timber, this will discourage the cutting of some species, sizes and qualities of trees, and discourage the cutting in some stands altogether. More of the marginal timber will be left and less total volume of timber will be cut. Revenue per cubic metre will be higher, but total revenue may not be greater. Total revenue will be greater only if the percentage increase in the rate per cubic metre exceeds the percentage reduction in the volume of timber cut.

In any case, revenue will not be maximized unless the rates per cubic metre reflect the variables affecting stumpage values. To reflect stumpage values more fully, and thus maximize revenues, volume based charges should vary with the factors affecting stumpage values, identified in Chapter 4 and mentioned above, namely:

- species
- log grades
- log species and/or processed product prices
- transportation costs, or distance (which influence transportation costs)
- log production costs, or stand conditions and ground conditions (which influence log production costs).

The adjustment of volume based charges to reflect these factors will affect the other criteria, perhaps improving economic efficiency in utilization and forest management, but also increasing administration costs and complexity.

Among tropical countries, volume based charges are most commonly varied by species. Volume based charges that vary by log grade are less common. Charges which vary by distance, by region of the country, with stand conditions, or with ground conditions are found, but are uncommon.

Where volume based charges vary by species, the variation is usually not sufficient to fully reflect the variation in stumpage values. This can be illustrated below for three West African species based on Nigerian figures. Representative logging, hauling and sawing costs are deducted from sawnwood prices to yield an estimate of stumpage values; ie., the residual value of the standing timber. Stumpage values are estimated for three species: Cebia (cebia pentandra), a lower valued species; Obeche (triplochiton scleroxylon), a medium valued species; and Iroko (chlorophora excelsa), a high valued species (sawnwood prices and sawing costs are converted to the equivalent per cubic metre of logs, using on an average sawnwood recovery of 50%). The stumpage value estimates are as follows:

| | Species | | |
|---|---|---|---|
| | Cebia (Cebia pentandra) | Obeche (Triplochiton scleroxylon) | Iroko (Chlorophora excelsa) |
| Sawnwood prices | US$ 90/m$^3$ | US$ 140/m$^3$ | US$ 210/m$^3$ |
| Times recovery rate (50%) equals sawnwood value of logs | US$ 45/m$^3$ log | US$ 70/m$^3$ log | US$ 105/m$^3$ log |
| Less representative logging, hauling and sawing cost | US$ 40/m$^3$ log | US$ 40/m$^3$ log | US$ 40/m$^3$ log |
| Equals stumpage value (residual value of the standing timber) | US$ 5/m$^3$ log | US$ 30/m$^3$ log | US$ 65/m$^3$ log |
| Examples of Volume Based Charges (for three Nigerian States which recently raised their charges) | US$3.70-6.70/m3 | US$9.30-10.00/m3 | US$9.30-10.00/m3 |

For these species, the stumpage values derived range from US $5/m$^3$ for Cebia, the lower valued species, to US $65/m$^3$ for Iroko, the higher valued species.1/ This is a wide range in stumpage values. Yet the variation in volume based charges between species is much narrower than this range in stumpage values. Volume based charges in the three representative western Nigerian States in 1981 were US $3.70 to 6.70/m$^3$ for Cebia, about equal to the derived stumpage value of approximately US $5/m$^3$. However, volume based charges for Obeche, the medium valued species, and Iroko, the higher valued species, were substantially less than the stumpage values derived.

This comparison of stumpage values and forest charges illustrates a common phenomenon common to many countries. If the variation in forest charges

1/ As a result of the residual, derived demand nature of stumpage values, the stumpage value of Iroko is more than twelve times that of Cebia, although its sawnwood price is just over that of Cebia.

between species is substantially less than the variation in stumpage values potential forest revenue from the medium and higher valued species will be lost. In addition, overcutting of the medium and higher valued species will be encouraged by the extra profits from forest charges less than the stumpage value of these species.

Fluctuations in revenues from volume based charges will parallel variations in logging activity. Where the levels of volume based charges are quickly adjusted to fluctuations in log or product prices, the annual variations in revenues will follow the combined fluctuations of both logging activity and prices. In terms of the timing of revenues, revenues from volume based charges can only be collected after logging, following the scaling of the timber.

Administration cost and practicality: Volume based charges that make a minimum of distinctions in rates with respect to species, log grades or other factors will be the simplest to administer. However, this simplicity of administration will be achieved at some loss in revenue and in efficiency of both utilization and forest management. Consequently in designing a set of rates, a trade-off will be required, balancing administrative simplicity against revenue and economic efficiency.

Distinctions among species, by log grades, or other factors require the identification and classification of the logs scaled to each of the categories adopted. Volumes cut under each category must then be kept for calculation of charges and billing. Problems are created if it is difficult to distinguish different species, grades, or other categories. Misclassification or evasion may be encouraged by too many classifications.

Volume based charges can involve significant manpower requirement and administration costs. The measurement of logs and the estimation of volumes is time consuming and requires substantial skilled manpower. Usually all logs are measured individually for length and girth, and the volumes estimated individually from these measurements, defects estimated and deducted from the volumes.

The underestimation of volumes cut can be a problem and can result in loss of revenue. The forest guards or forest rangers can be put in a difficult position in measuring the timber. They work in close proximity to the loggers and sawmillers, and so are subject to strong pressures to be conservative in estimating the volumes of timber and to be generous in allowing for defect and they be subject to bribery. In addition, if forestry departments are understaffed, it is easy to miss logs or even entire truck loads. As a result, volumes measured and charged may understate the timber cut. These problems, the undermeasurement of volumes cut and the evasion of charges, are likely to rise as the level of charges is increased.

With volume based charges, administrative problems can also arise as a result of the lag between the cutting of the timber and the payment of the charges. After cutting, the logs must be measured, the volumes and charges calculated and the concession holder billed for the timber cut. All of these steps can take time and suffer delays. Also the receipt of payments is often delayed, as there is no incentive for quick payment. Delay in billing and

collection of volume based charges may result in default of payment, especially when the logs have already been processed exported.

Potential administrative difficulties can be reduced or overcome by careful planning and implementation of a system of wood measurement, billing and collection of revenue that is as simple and streamlined as possible, includes incentives for efficient operation and accurate and correct measurement, and incorporates cross-checks. For example, if fallers, skidder operators, truck drivers, or scalers are paid, in part, on the basis of their production, measured by the scaled volume, a cross-check and a degree of self-policing is built into the system, counter balancing the incentives for under-scaling. Scaled log volumes can be compared with the sawnwood output from sawmills, providing another cross-check on scaling.

In some situations, the measurement of volumes can be streamlined by weigh-scaling of the timber, utilizing weight as a proxy for measured volumes of individual pieces. This approach is particularly advantageous for pulpwood or plantation timber, where there would be many smaller pieces to measure. Measurement of stacked volumes either as piled wood or on trucks is another proxy measure of the volumes of individual pieces.

Economic efficiency in utilization and forest management: As volume based charges are levied on the volume of timber cut and removed from the forest, they may discourage the utilization of some of the merchantible trees in the stand and the full utilization of the trees cut. The logger will compare the charge per cubic metre with the value of the tree, or the value of the additional logs cut from the tree. Marginal trees or logs will be left.

Obviously, the impact of volume based charges will depend on the level of the charge. If volume based charges are low, and are a relatively small component of total logging costs and of the price of logs, then the impact on utilization will be minor. For example, a charge equivalent to US $\$10/m^3$ represents only 8% of the price of logs sold at US $\$120/m^3$. Factors such as logging and transportation costs will have greater influence on utilization. As volume based charges are raised they become a larger proportion of costs or log prices, and a greater deterrent to utilization. Greater attention to their impact on utilization will be required.

Under some situations utilization may not be discouraged, even if volume based charges are a significant component of log prices or costs. Where roads are already in place and logging operations are already being carried out within stands, then the marginal or incremental costs of removing additional timber will be low. Low marginal logging costs will lead to high marginal stumpage value, as illustrated in Chapter 4 (Section 4.4). In such situations high marginal stumpage values of marginal trees and marginal logs will help to offset the effects of volume based charges on utilization, encouraging utilization of marginal timber.

The structure of volume based charges can also have important effects on the utilization of various species, sizes or qualities of trees, on the utilization of certain stands, or the utilization of timber from different locations. Volume based charges often are not varied sufficiently between species to reflect the full stumpage value of the medium and higher valued

species as demonstrated above, as shown for the three West African species. This can result in greater profits earned in cutting the more valuable species, the overcutting of the more valuable species and the familiar "high grading" or "creaming" problems faced by forest management and forestry administration.

Likewise if volume based charges do not fully reflect differences in stumpage values with respect to sizes and qualities of trees, stands or timber in different locations, then the higher profits earned in cutting that timber will encourage the overcutting of high quality and larger size trees and the logging of the nearer, more accessible stands. Conversely, areas that are further distant or involve higher logging costs will be less attractive, as will be the lower valued species, qualities and sizes.

Where volume based charges do not fully reflect stumpage values, they will also encourage a temporal reallocation of cutting. They will encourage cutting of high-valued stands, species, qualities and sizes first, leaving lesser-valued timber for future cutting. Concession holders will prefer to earn profits sooner rather than later and so will cut timber yielding the largest profit per cubic metre first. The same phenomenon is experienced in mining, where the richer deposits and richer parts of the deposit are mined first.

These problems of utilization and forest management are all generated by volume based charges that do not fully reflect the differences in stumpage values. Volume based charges are in conflict with forest management objectives. These problems are usually tackled by regulations, by on-the-ground supervision and inspections, by fines and other penalties. Such administrative approaches are expensive and not always effective.

Yet, these conflicts between forest management and forest revenue systems need not be. For example, higher volume based charges on the more valuable species, nearer and more accessible stands can help to discourage overcutting. Lower charges on underutilized species or for distant areas can shift harvesting toward them. Thus volume based charges can be used as a tool of forest management, supporting rather than conflicting with forest management objectives.

Distribution of economic effects, revenue and income: Volume based charges can, by the level and structure of rates, influence employment as well as the utilization of the timber. Similarily, they can influence the prices or availability of forest products. Volume based charges can also influence regional development through regional differentials in charges.

A primary question of distribution is that of the stumpage values, either as profit to concession holders, or as revenue to the government. Where volume based charges do not fully reflect the stumpage value of the timber, there may be sizeable gains to concession holders, particularily of those concessions containing the best timber. Also there will be sizeable profits awaiting those able to obtain concessions, especially the concessions containing the better quality, or more accessible stands. This may result in strong pressures on the government and on officials to award concessions and particularily those containing the best timber. If the volume based charges reflect both a greater proportion of the stumpage value and reflect the differences in

the value of stands, these pressures will be less, as the potential gains are less.

Overall evaluation of volume based charges: The volume of timber removed is a good base to reflect timber values. Consequently volume based charges can rank highly in revenue effectiveness if some of the major administrative problems can be avoided or overcome. Administrative difficulties pose the biggest problems for volume based charges. Means of improving the administration of volume based charges can make this type of charge more useful.

In order to to reflect the value of the timber as closely as possible, volume based charges should take into account the important factors which affect stumpage values. Volume based charges which more accurately reflect the value of the timber will: (a) collect more revenue and a greater percentage of the potential value; (b) discourage overcutting of high-valued species and encourage a shift of cutting to low-valued species; (c) discourage "high grading" or "creaming" and reduce the pressures on administrative regulations, supervision and policing; (d) discourage a rapid and early cutting of the more valuable species etc., and (e) encourage a more uniform cutting pattern over time.

Volume based charges which more accurately reflect the value of timber will achieve a greater degree of both revenue effectiveness and economic efficiency. Unfortunately these may come at the expense of administrative simplicity. The art of establishing a forest revenue system lies in designing charges which are as simple as possible, yet collect a substantial share of the stumpage value of the timber, encourge utilization and support forest management objectives.

## 9.8 CHARGES BASED ON THE AREA LOGGED

Charges based on the timber harvested can be levied on the area cut over rather than on the volume or number of trees removed. The charge on the area logged may be on a per hectare basis, or as a fixed sum for the entire area. In one version, termed a lump-sum timber sale, the timber is allocated by auction, with the charge established by competitive bidding. Examples of area based charges on the timber cut in Chapter 8 illustrated several versions of charges based on the area cut-over.

Under a charge on the area cut-over, the logger pays for the timber on the area, and can then remove any trees he considers merchantible. Scaling of the timber cut is not required, there is no marginal charge per tree or per cubic metre of timber cut to deter the full utilization of all merchantible timber.

### 9.8.1 Evaluation of Charges Based on the Area Logged

Financial revenue to the government: In theory, under perfect knowledge of the timber available, area based charges on the timber cut should be able to collect somewhat more revenue than volume based charges. As area based charges involve no additional charge on additional timber removed, increased

utilization should result, and the purchaser would, in theory, be willing to pay a somewhat higher amount for the extra timber cut. In practice, with uncertainty about the volume of timber on an area and with risk-aversion, the purchaser might not be willing to pay as much in a lump-sum payment for an uncertain volume of timber.1/

As scaling is unnecessary, and billing for the timber cut is avoided, area based charges on the timber cut might generate greater net revenues, net of scaling and billing costs. If scaling and billing are costly, the saving could be substantial.

Area based charges on the timber cut offer advantages in timing of revenues. Revenues are usually collected prior to cutting, when a cutting permit is issued, or at the auction when the lump-sum timber sale is awarded. Thus, revenues are available early and default in payments avoided.

Administration cost and practicality: As no scaling or wood measurement is required, area based charges on the timber cut are simple and cheap to administer in comparison with volume based charges. This is a major saving in manpower and administration costs.

Area based charges requires careful inspection in order to make sure that cutting operations are confined to the cutting area. Evasion of payment by cutting too large an area may be greater than with volume based charges, although evasion through under-scaling will be non-existent.

For lump-sum timber sales a detailed timber survey of the area prior to the sale is desirable, in order to reduce uncertainty among buyers and encourage higher bids. Thus the savings in scaling manpower and costs may be offset by the manpower requirements and costs of the detailed timber survey required.

Economic efficiency in utilization and forest management: A key advantage of charges based on the area logged is their encouragement of the more complete utilization of timber on the area logged. This was one of the reasons for the introduction of area based charges in Nigeria (Nigeria, Federal Department of Forestry 1978 Regeneration of Nigeria High Forest: Call for Review of Tariff: 3).

With area based charges there will be no additional charge for additional timber removed. As a result, utilization should be higher than under volume based charges. If volume based charges are relatively high, a switch to area based charges would lead to a greater improvement in utilization than where volume based charges are low.

1/ The government may be able to reduce this uncertainty through more accurate surveys of the volume and thereby achieve higher revenues. However, the government would need to compare the increased cost of more accurate surveys against an estimate of the additional revenue likely.

Where clear-cutting is the preferred silvicultural system, area based charges can be efficient in encouraging full utilization. But where selective cutting by diameter limits or of marked trees is practiced, area based charges could encourage the cutting of too many trees. Close supervision of cutting would be required.

Area based charges are appropriate for salvage logging of areas being converted to plantations. Utilization of timber of positive marginal value will mean that less material is left behind to inhibit planting, or create fire, disease, or insect hazards. However, a major difficulty in applying area based charges to salvage logging results from the uncertainty about the volumes of timber available on salvage areas following primary logging.

Area based charges can be appropriate on plantations for the final clear-cut felling, prior to regeneration. They will encourage full utilization and the clearing of the site for regeneration. Two examples of area based charges applied to plantation timber were given in the Chapter 8.

If area based charges are not varied to reflect the stocking of the stands being cut they will reinforce the concession holders' desire to select and cut the high volume, valuable stands first, and will provide a powerful incentive to do so. Thus they can easily lead to scattered logging operations that leave poorer stands or patches of mature forest untouched. To avoid this, area based charges ought to reflect the stocking and value of the stands to be logged.

Distribution of economic effects revenue and income: If area based charges are a fixed charge per hectare, and the forest varies considerably in stocking either by species or in volume per hectare, area charges may not be very equitable between the government and the concession holder. On areas that are well stocked with valuable species, the government's revenue may be very much less than the value of the timber thereon. On very poorly stocked areas, the area charge may even exceed the value of the timber. Sale of timber by auction establishing the level of area based charges by bidding can help to overcome this. Alternatively, administratively set charges would have to be varied to reflect variations in stocking as suggested.

Overall evaluation of area based charges: Area based charges have advantages in encouraging full utilization of stands. They have advantages of simplicity and efficiency in administration, avoiding the need for scaling and collecting revenue early. The major disadvantages are in setting the level of the charge to reflect the value of the timber cut. These are heightened by uncertainties of the volumes and values of timber on the areas to be cut.

Charges should be varied with the stocking and value of stands for efficiency in utilization and forest management and for equity between the government and loggers. A uniform area charge per hectare levied throughout each concession or forest reserve can encourage the rapid cutting of the better stands and the leaving of poorly stocked stands, result in lower revenues being collected and in inequities. These disadvantages could be overcome if some level of competition were introduced, timber allocated by auction and the level of changes established by bidding that would better reflect the value of the

block of timber involved. Attention is focussed on these issues in Chapter 10 (Section 10.7).

## 9.9 CHARGES ON PROCESSED FOREST PRODUCTS

Charges levied on sawnwood or other processed forest products can serve in place of volume based charges on logs, or they can be used to supplement charges on logs. Examples in the previous chapter were the Royalties levied in the Malaysian states of Sabah and Sarawak and payable either on logs or on the sawnwood produced.

Charges on processed products can be applied both to exports of processed products and to products consumed domestically. Export charges on exports of processed products are often used to supplement charges on logs (see Section 9.11, below).

### 9.9.1 Evaluation of Charges on Processed Forest Products

Financial revenue to the government: Charges on sawnwood or other processed products are a second best alternative to volume based charges on the timber cut. Charges on processed products, as they are a step removed from charges on the timber cut, can not fully reflect the stumpage value of the timber. For example, charges on processed products can not reflect differences in stumpage values with respect to such factors as distance, stand conditions, ground conditions, or other factors affecting logging or transportation costs. On the other hand, charges levied on processed products, since they are based on the products recovered, may better reflect differences in stumpage values with respect to log grade, or defect, factors that affect recovery. Yet, on balance, charges levied on processed products, and in place of volume based charges on the timber cut, are not likely to be as effective a revenue source.

Where charges on processed products are used to supplement volume based charges on the timber cut, charges on processed products can serve to reflect that part of the stumpage value of the timber not captured by volume based charges. For example, charges based on the sawnwood output of logs could capture part of the effect of log grades and log defect on stumpage value. Similarily charges on sawnwood that vary by species could capture that part of the variation in stumpage values attributable to product prices. As a result, stumpage values not captured by volume based charges can instead be captured by charges on the processed products. If charges on logs and processed products together better match stumpage values, then greater revenues may be possible with a combined charge on logs and products. Yet, to be effective the two charges would need to be very carefully coordinated.

Where charges on processed products serve to supplement charges on logs, they are usually set at low levels, otherwise they would deter domestic processing of logs encouraging log exports instead.

Administration cost and practicality: As a replacement for volume based charges, charges on processed products may be administratively easier in some countries and certain situations. The measurement in the forest of trees

or volumes cut is avoided, with savings in scaling costs and manpower. The problems of under-reporting or under-scaling of log volumes measured in the forest will be avoided if charges are based on the output of sawnwood or other forest products. The measurement of the output of sawnwood or other forest products at processing plants can be cheaper and easier than scaling of logs in the forest, and is more readily checked and verified.

Charges on processed products that supplement volume based charges on the timber cut can aid in the administration of the volume based charges, and vice versa, the two charges serving as a cross-check on each other, reducing under-reporting or evasion for each charge. Where administrative procedures are designed to facilitate comparison of processed products production with timber inputs, then under-scaling or under-reporting of log volumes will be signalled by sawnwood production that is out of line with the reported volume of logs used. The key lies in the design and adoption of a simple and automatic administrative method of matching and comparing the volumes of logs and sawnwood under the two charges.

With separate charges on the timber cut and on forest products produced therefrom, each charge can be lower than it would need to be if only the one charge were used. With lower rates for each charge, there will be less incentive for under-scaling or under-measurement, for under-reporting, avoidance or evasion of charges.

Economic efficiency in utilization and forest management: From the viewpoint of utilization, charges on forest products have a major disadvantage. Since they are based on the output of sawnwood or other processed products, rather than on the logs used, they provide no incentive for full recovery of processed products. Without a volume based charge on the logs, the cost of to the sawmill will include only the logging and transportation costs and the sawmill will economize by increasing the throughput of logs, resulting in reduced lumber recovery and economically inefficient use of logs. With a charge on forest output instead of a charge on the timber used, standing timber is treated as a "free good", and logs as a "low-cost" input.1/

From the viewpoint of forest management, charges on processed forest products also have a major disadvantage. Because charges on processed products can not reflect differences in stumpage values between stands with respect to distance, logging costs, ground conditions, or stand conditions, nearby stands, stands for which logging costs are low, stands on easy terrain, and well stocked stands will be overcut. Distant stands involving high logging costs, stand on difficult terrain, and stand that are less well stocked will be left.

These problems of forest management could be overcome by the two-part charge suggested: a volume based charge on the timber cut, and a charge on the processed products. The volume based charges on the timber cut

1/ Only with a fixed input-output ratio between logs and lumber will the charge on lumber be equivalent to a charge on logs and not result in the inefficient use of logs.

could be set to reflect the differences in stumpage value with respect to distance, or other factors related to the forest. The charge on the processed products could then reflect the differences with respect to species, and factors related to product prices, quality, or grades, and to recovery.

Distribution of economic effects, revenue and income: In terms of their economic effects, charges on forest products can have important effects on the production of forest products, although not always those desired or intended. For example, charges levied on processed products may encourage the export of unprocessed logs, unless they are matched by charges of equivalent magnitude on export logs. Consequently charges on processed products need to be evaluated in conjunction with volume based charges and other charges on the timber cut, and in conjunction with export charges on logs and processed products (see Section 9.11 below).

The structure of charges on processed products can, for example, serve to encourage the processing of certain species, certain types or sizes of products, or production in certain regions, by means of lower rates for those species, types or sizes, and regions. Impacts on employment, prices of forest products and on income distribution will follow from these.

Overall evaluation of charges on forest products: Charges on forest products may serve in place of volume based charges on the timber cut in situations where scaling of timber for the volume based charges experiences administrative difficulties, and where the measurement of sawnwood output or other processed products can be readily measured. However, as charges based on processed products can have undesirable effects on utilization of logs, and on forest management, they should replace charges on the timber cut only where they yield substantial administrative benefits.

In some situations there may be gains to a charge on processed products in conjunction with a charge on the timber cut. The two charges can then be used to cross-check each other. Each charge can be lower, reducing incentives for under-measurement or under-reporting. If properly coordinated, the two charges can work together to reflect the factors affecting stumpage values related to both forest conditions and processing.

## 9.10 CHARGES ON MINOR FOREST PRODUCTS

Minor forest products include a wide range of forest products; from firewood and poles to very specialized products. The products and their importance varies greatly among tropical countries. Fuelwood and charcoal are very significant products in most countries, but many other products are special to particular countries or regions.

As illustrated by the examples in the previous chapter (Section 8.10) charges on minor products are usually based on the products themselves rather than the volume of timber used, since most minor products are produced directly in the forest. Usually the charges are levied per unit of output, with rates laid down in a fixed schedule of charges. For poles there is usually a schedule of charges by diameter. For some minor products and in some countries

charges are based on the value of the products. For some products, charges are levied on those gathering or producing them.

### 9.10.1 Evaluation of Charges on Minor Products

As a result of the diversity of minor forest products, charges on minor products are best reviewed and evaluated within the context of the specific situation of the individual countries. Consequently the evaluation here is purposely brief and general.

In terms of financial revenues to the government, charges on minor products are not usually important revenue sources. This is, in part, because the charges are most often administratively established, with fixed schedules of fees, that are revised infrequently. Another reason may be that higher charges on minor products would only encourage widespread evasion and thus might not yield any greater revenue. With production of minor products by small scale operations, scattered throughout the forest, and involving a large number of individuals, enforcement of charges above a relatively token level may be difficult.

In terms of administration costs and practicality, the large number of people involved in the production of minor products and the scattered operations together make administration difficult and expensive, and result in further problems of evasion.

With the administrative difficulties in enforcing minor product charges there is not much scope to use the charges to influence utilization or to achieve forest management objectives. If it is possible to enforce minor products charges, overcutting of minor products or cutting in areas under pressure might be reduced by raising charges, and production shifted to other areas with lower charges. However, for minor products whose use is not sensitive to prices, necessities such as fuelwood for example, higher charges are unlikely to reduce use, but instead only raise prices and encourage evasion. In such circumstances, other, non-economic, forest management policies are more appropriate. For example, policies to develop fuelwood plantations and increase fuelwood supplies might be a better alternative than higher forest charges.

Additional economic effects may result where there are non-monetary economic benefits from the production of minor products. If so, lower forest charges on those products may be called for.

In terms of their distributional effects, low charges on minor forest products can encourage employment, increase supplies, and for some products, save foreign exchange. For example, low charges on fuelwood can stimulate fuelwood cutting and use, helping to keep prices down, stimulate employment in fuelwood production and perhaps result in a saving in the foreign exchange spent on imported oil and kerosene. Thus a policy of low charges on minor products may be appropriate to certain countries provided timber supplies are sufficient and overcutting does not result.

Low charges on minor products can have income distributional effects, benefiting those producing these products, not only in employment, but also by transferring part of the stumpage value of the minor products to the producers, in the form of higher incomes.

Above all minor products charges should be simple and easily enforced. As suggested, there are also advantages to keeping them low.

## 9.11 EXPORT CHARGES ON LOGS AND FOREST PRODUCTS

For many developing countries export charges on logs, and on processed products, are important forest charges. They are important in terms of revenue, and also in terms of their effects on utilization, forest management, domestic processing, employment, foreign exchange, and on the availability of processed products within the country.

Export charges serve two basic functions: (a) as substitutes for forest charges on the timber cut, and (b) a means of encouraging the domestic processing of forest products and their domestic use.

Export charges on logs, export charges on processed products, volume based charges on logs, and charges on processed products are closely related, both as revenue sources, and in terms of their effects. Together they can serve as alternative revenue sources, or to encourage domestic processing. For example, export charges on logs, plus charges on processed products, together, can serve as substitutes for volume based charges on the timber cut. Export charges on logs can serve to encourage domestic processing of logs, yet the impact may be counterbalanced if there are high charges on processed products. Export charges on processed products can serve to encourage the provision of processed products for the domestic market, but can at the same time counterbalance the domestic processing incentive of export charges on logs.1/ It is for these reasons that this study has emphasized on the evaluation of individual forest charges as part of a forest revenue system.

As shown by the examples of the previous chapter, export charges on logs can be levied either as rates per cubic metre, or as ad valorem charges based on declared or posted export prices. Export charges can be specified at rates per unit of output, but for most countries are levied at ad valorem rates based on declared or posted export prices.

### 9.11.1 Evaluation of Export Charges on Logs and Forest Products

Export charges on logs and export charges on processed products are evaluated together. This facilitates comparisons between export charges on logs and products, volume based charges on the timber cut, and charges on

1/ A number of these effects just described were illustrated in the previous chapter by the examples of export charges drawn from the selected countries (Section 8.11).

processed products. It also facilitates analysis of the domestic processing incentives generated by the combined rates that apply to export logs and to logs processed domestically under these charges.

Financial revenue to the government: Among the tropical countries surveyed that are the major log exporters, the export charge on logs is the most important charge on the timber cut. This may be because export charges on logs are easily collected and can be related to, and based on, world market log prices. World market prices for logs, while not free of distorting influences, are much more easily identified than log prices in domestic markets.

With export charges, it is possible to use a so-called, "market test" of stumpage values, raising charges until log exports begin to decline. Countries keen on encouraging domestic processing may be willing to engage in such a "market test" of stumpage values. If they raise export charges and log exports decline very little, they get additional revenue. On the other hand, if they raise export charges on logs, and log exports decline they may encourage domestic processing. Thus, they may "win" either way by raising export charges.

Export charges on logs can also serve to reflect those components of stumpage values that are related to log prices. Species and perhaps also log grades are readily identified from the market prices of export logs. However, components of stumpage value related to distance and to logging cost (stand conditions and ground conditions) are not easily measured by export charges on logs.

Export charges on processed products are usually levied at relatively low rates, and at progressively lower rates on more highly processed products (see Section 8.11, above). The rates are low to encourage domestic processing and decline with further processing to encourage greater processing. As a result, export charges on processed products are a relatively minor revenue source.

Administrative cost and practicality: Export charges on logs, levied in place of volume based charges, offer advantages of low administration costs, simplicity and enforcement. Logs are more easily and more accurately measured at points of concentration, such as export ports. Measurements can be cross-checked against export documents and shipping reports, and charges enforced by withholding export clearance until payment is received. Thus avoidance by under-scaling and evasion of payment are reduced, although not eliminated.

Export charges on logs levied as an ad valorem percentage of the declared FOB prices of individual export shipments are administratively simple, involve low administration costs and are adequate at low rates. However, at higher rates they may encourage under-declaring of the FOB prices of shipments. The higher the ad valorem rates, the stronger the incentive for exporters to under-declare FOB prices.

To overcome this problem, countries have moved to base export charges based on posted export prices established by the Government, a government agency, or an independent authority. The systems of valeur mercuriale prices

in the Ivory Coast, "check prices" in Indonesia, the "guide prices" established by the Philippine Central Bank, and the use of the export prices received by The Sabah Foundation, in Sabah, Malaysia illustrate the approach. The use of posted export prices requires the government to undertake the market intelligence required to establish and revise the posted export prices, but avoids the problems of under-declaring of prices, and the expense of policing declared prices. The use of posted export prices may even result in greater revenue, sufficient to cover their administrative costs. Further, posted export prices can provide greater flexibility in setting export charges to achieve forest management objectives. Finally, the market intelligence of export log prices can be useful in setting other charges.

Export charges for processed products are most often levied as an ad valorem percentage of the declared FOB prices. A few countries utilize posted export prices. Since ad valorem rates on processed products are generally low for most countries, the problems of underdeclaring of export prices are not likely to be severe so that this administratively simple approach is adequate.1/

Economic efficiency in utilization and forest management: Export charges on logs can influence utilization and forest management in many of the same ways as the volume based charges discussed above (Section 9.7).

Export charges are usually varied with species, often varied by log grade, and in some cases varied by region of the country as well. These are also the factors most commonly taken into account by volume based charges on the timber cut, and are some of the key factors affecting stumpage values (see Section 8.7, 9.7 and Chapter 4). It may also be possible to vary export charges by hauling distance, as suggested in the FAO forest revenue study for the State of Sabah, Malaysia (FAO 1980 Sabah Timber Industry Royalty Appraisal and Market Study).

Export charges on logs can be structured, and the rates varied, in much the same way as volume based charges. Thus export charges can serve to reflect stumpage values, and influence utilization and forest management in much the same way as the volume based charges evaluated above (Section 9.7).

Export charges, like volume based charges, can be varied by species, to discourage the overcutting of the more valuable species, and to shift cutting toward the less valuable species, by means of lower charges. The Ivory Coast, for example, seems to have followed such a policy, basing the export charges for the higher valued species on posted export prices (valeur mercuriale prices) that are closer to world market prices of logs and applying higher ad valorem rates to these species. Posted export prices (valeur mercuriale prices) of lower valued species tend to be set below market prices of logs. These lower posted export prices, combined with lower ad valorem rates applied to these species yield considerably lower export charges and provide an incentive for utilization of these lower valued species (see Section 8.11).

1/ A few countries also base export charges for processed products on posted export prices.

Thus there is considerable scope for countries to vary export charges and so influence utilization. Posted export prices and/or ad valorem rates can be increased, thereby raising export charges for those species that are overcut, while posted export prices, ad valorem rates and export charges on under-utilized species are lowered. This can be done gradually until a better balance of utilization is achieved.

Yet in most countries export charges, like volume based charges, do not vary sufficiently to reflect differences in stumpage values fully, with the result that the higher valued species continue to be overcut and the lower valued species, especially the lowest valued species, remain under-utilized.

Export charges on processed products have effects on utilization and forest management similar to those of charges on processed products. Since they are levied on the output of processed products rather than on the log inputs there will be less incentive to economize on logs utilized, utilization of the logs will be less than it might be and recovery ratios lower. But, as export charges on processed products are usually set at relatively low rates, their impact on utilization is relatively minor.

Evaluation of domestic processing incentives: In addition to their functions as forest revenue sources, export charges on logs and processed products also serve as policy instruments to encourage the domestic manufacture of forest products, their further processing and their domestic use. To evaluate this important objective of export charges, we depart from the format applied to the other forest revenue charges, to focus separately on this objective.

The issue of domestic processing incentives is a broad one, involving export quotas, export bans, domestic processing requirements and other regulations, as well as export charges. Several of these were illustrated in the previous chapter, by examples from the countries surveyed. As a complete evaluation of these other aspects would take us beyond the scope of the present study only those aspects related to export charges are evaluated in any detail here.

Because they are levied on exports only, export charges on logs create an incentive for the domestic processing of logs. The incentive arises from the difference between the total charges on export logs and those on logs processed domestically. As export charges are frequently the major forest charge in developing countries (and are, levied only on exports) the domestic

processing incentives generated can be significant.1/

Among the countries surveyed in the previous chapter, export charges on logs of higher valued species are considerably greater than the export charges on logs of lower valued species. The result is domestic processing incentives that are substantial for the higher valued species, but are minimal for the lower valued species. These domestic processing incentives, derived in the previous chapter (Section 8.11) were approximately as follows:

Estimated Domestic Processing Incentives (1980)

(US $/m$^3$ of logs)

| Countries | High Valued Species | Low Valued Species |
|---|---|---|
| Liberia | US $ 35-75/m$^3$ | US $ 2/m$^3$ |
| Ivory Coast | US $ 40-50/m$^3$ | US $ 8-10/m$^3$ |
| Indonesia | US $ 40-50/m$^3$ | US $ 5-15/m$^3$ |
| Sabah, Malaysia | US $ 60-75/m$^3$ | US $25-50/m$^3$ |

For higher valued species, the export charges (and other volume based charges on export logs) result in a domestic processing incentive of from US $35/m$^3$ to US $ 75/m$^3$ on logs processed. Except for Sabah, Malaysia the domestic processing incentives for the low valued species are rather small, in the order of US $2/m$^3$ to US $ 15/m$^3$ of logs used.

For the higher valued species domestic processing incentives of US $ 35-75m$^3$ of logs used ought to provide a strong stimulus to their domestic processing. Yet to stimulate domestic processing, the incentives must be high enough to overcome trade and tariff policies of the importing countries, transportation advantages on logs and any productivity or processing cost advantages of processing logs in the importing countries. To achieve this can make domestic processing incentives expensive. On the high value species the government gives up substantial revenue in stimulating domestic processing, US $35-75/m$^3$ of logs processed, for many countries without achieving the desired degree of domestic processing. It is for this reason that countries have turned to export quotas on logs, or to an export ban on logs.

In designing export charges to generate domestic processing incentives, care must also be taken to be sure that they will stimulate increased domestic processing, without merely subsidizing domestic processors by low charges on timber cut.

1/ Differentials in volume based charges between export logs and those processed domestically, (as in the Ivory Coast or Indonesia), and the charges levied on the processed products produced also contribute to the domestic processing incentives. But, these charges are usually smaller and their contribution to the domestic processing incentives not as significant as export charges.

Export charges on processed products (as well as charges on all processed products, where they are levied as a supplement to volume based charges on logs) operate to reduce the domestic processing incentives generated by export charges on logs. If domestically processed logs must pay additional charges based on the products produced, or additional charges when exported as processed products, then it will be less attractive to process logs domestically. In most countries, both the charges on processed products and those on exports of processed products are relatively low. But if charges on processed products and export charges on products are high enough, they could overbalance the domestic processing incentives provided by the export charges on logs.

Export charges on processed products are generally structured to decline with increasing degrees of processing. But, because the rates are generally low in any case, the reduced in rates provide only a small incentive for further processing.

To encourage domestic processing, export charges are often supplemented by export quotas, an export ban an unprocessed logs, or by domestic processing requirements. Examples from the countries surveyed in the previous chapter illustrated several types of export quotas, export bans and domestic processing requirements.

Export quotas can take the form of an overall quota allocated among export requests, or a quota for each concession holder and/or processing plant. Export quotas are often applied where export charges are felt to be insufficient to deter exports.

Export quotas that greatly restrict exports of logs or processed products can become a valuable and sought after commodity to quota holders. Where export quotas are used, they could be allocated by auction with competitive bidding for quotas. The auction of export quotas would both allocate the quotas among bidders and yield revenues.

As export quotas are usually specified in terms of quantity, they will encourage quota holders to use their quotas to export the high valued species and grades of logs or processed products, leaving the lower valued species and grades to serve the domestic market. With only the lower valued species and grades of logs available, the profitability of domestic processing can be reduced. Replacement of quotas by higher export charges would likely result in a more balanced supply of logs and products to both the export and the domestic markets.

Export quotas are equivalent to an export charge which is zero up to the specified quota and very high (high enough to deter exports) beyond. Generally export charges are preferable to quotas. Export charges yield revenue, and the level can be adjusted to allow the desired amount of exports. An export charge is also an economically more efficient means to restrict exports. Exports will be limited to those logs or products which are most valuable abroad and are thus most able to pay the higher charge. As a result, both revenue from the export charge and foreign exchange earnings will be received.

Domestic processing requirements, which are another means to encourage domestic processing, can take several forms. Examples are a requirement that a certain percentage of the annual cut of each concession be processed domestically, or the right to export more valuable species earned by exporting a given quantity of lesser valued species. Because these requirements again tend to be specified in quantity terms, they will encourage export of the better grades, leaving the lower grades for domestic processing. With only poorer quality logs available, the productivity and profit ability in the domestic processing industry may be lowered. Again higher export charges might be a better policy.

This evaluation of domestic processing incentives has touched only on the major impacts. The policy issues in domestic processing incentives are broad and important. A more complete evaluation would require a separate study and is outside the scope of the present study, which is focussed on forest revenue arrangements.

Distribution of economic effects revenue and income: Export charges which stimulate domestic processing will generate employment. Export charges on logs will generate employment in sawmills, veneer and plywood plants, but this production may still be oriented toward exports. Greater linkages and further employment will be generated if production of sawnwood veneer and plywood serves the domestic market, rather than the export market.

This extra employment generated will likely come at some cost in terms of lost forest revenue. If the consuming countries have a sizeable cost advantage in processing, for whatever reason, then substantial domestic processing incentives may be required to encourage any domestic processing at all, and thus the revenue cost of the jobs created may be very high.

Export charges or quotas on processed product exports can serve to direct processed products to the domestic market. The increased supply to the domestic market may help to keep prices down. This impact on prices will depend on the magnitude of the increase in supply and on the sensitivity of demand to price. If demand is sensitive to price, a small increase in the availablity of forest products may lead to a sizeable decline in price. If demand is not sensitive to price, the impact on prices may be small.

Overall evaluation of export charges and domestic processing incentives: Export charges on logs can serve as a useful substitute for volume based charges on the timber cut, with administrative advantages and revenue advantages in setting the charges. Export charges on logs can be set to reflect stumpage values reasonably well, although not for all factors.

Export charges on logs can also serve to encourge the domestic processing of logs. Thus export charges can serve as an instrument to achieve two objectives, as well as domestic processing and financial revenue.

Yet to satisfactorily achieve both objectives, revenue and domestic processing, it may be necessary to combine export charges with other charges, utilizing two policy instruments. For example, volume based charges might serve to reflect stumpage values, collecting revenue, with export charges on

logs serving to encourage the desired pattern of domestic processing and collect additional revenue. Other combinations of charges are also possible.

## 9.12 FEES FOR SERVICES PROVIDED

Fees are levied for a wide range of forestry services related to (a) the allocation of concessions and other timber rights, (b) forest management, (c) the measurement of forest produce and (d) transportation activities. They include fees for such services as applications, approvals, inspections, marking hammers, scaling, grading, port charges, etc. The fees cover both services that are required and those that are optional.

### 9.12.1 Evaluation of Fees for Services Provided

In terms of financial revenues to the government, these administrative fees are usually not large revenue sources. Many of the fees are low, or even token. Many are administratively set by forest regulations, revised infrequently, and eroded by inflation. As a result they may no longer cover the administrative costs involved. Other charges, such as scaling and grading fees, or port charges, are often more closely related to the costs involved and revised to reflect changing costs.

Administrative fees for services should not be considered as money making revenue sources, but they should at least cover the costs of providing the services.

In terms of administrative costs and practicality there is commonly a great diversity of fees, one for each required service, application, inspection etc. As a result, the costs of administering and collecting these fees can easily exceed the revenues collected. If so, the fees should be either revised upward, simplified, or dropped. Where fees are appropriate, they should be grouped as much as possible, and uniform fees set for groups.

Where fees are set by legislation, revision of the legislation will be required to change or adjust them, a slow time consuming process when there is a legislative backlog of important legislation. If fees are set by government regulations, they still require a decision by a government body, or minister, that may also have a backlog of important matters to deal with. If fees are to reflect costs, there should be a simple means of relating operating costs to the fees levied. There should also be a mechanism, both for periodic review and adjustment of fees in response to inflation, perhaps by automatic revision based on the increase in the general price level.

Fees that are relatively low but reflect the administrative costs involved should have little impact on economic efficiency in utilization or forest management. In fact, if the fees fully reflect the administrative costs of the services provided, they will contribute to efficiency, and discourage any overuse of optimal, non-required services.

Equity will also be served and distributional effects balanced by fees that reflect the costs involved.

In summary, fees to cover administrative services are appropriate, provided the fees cover the costs, and provided the administrative costs of establishing and collecting the fees are not great. Where possible, the number of different fees should be reduced, fees amalgamated or grouped, and a simple means for the review and revision of fees introduced.

## 9.13 CHARGES ON EQUIPMENT AND WORKERS

Charges based on logging equipment, processing equipment or number of workers represent a quite different type of charge, on inputs of capital or labour inputs rather than on outputs, such as trees, logs, sawnwood, or exports.

In the previous chapter, charges on equipment were illustrated by several examples from the countries surveyed. Among the examples were annual charges on logging equipment (power saws, tractors, skidders, trucks etc.); on logging operations, by capacity; on sawmills, by capacity, or size of equipment; and on veneer, plywood and other processing plants. Both initial "installation fees" and an annual fee were levied. Charges on the forest industry based on labour input could take the form of a charge per worker, or a payroll tax. One example was Indonesia's monthly tax on companies for each expatriot worker.

In most of the countries surveyed, charges on equipment or workers have not been important revenue sources. Yet it is suggested below that they can serve as a useful component of a forest revenue system.

### 9.13.1 Evaluation of Charges on Equipment and Workers

In most of the countries that have used them, charges on logging or processing equipment and workers have been administratively set, and adjusted infrequently for inflation or changing conditions. Thus they have not been an important source of revenue. Evaluation in terms of the other criteria suggests that charges on equipment or workers could become a more significant revenue source.

Charges on equipment can be relatively easy to administer. Logging or processing equipment is readily identified. An annual charge can be coupled with the licensing of equipment. Licensing of logging equipment such as power saws, tractors or skidders, and logging trucks can serve both to regulate their use for forest management purposes, and to assist in administration of charges based on the timber cut, providing a means to control the timber cut and to reduce evasion. Thus charges on logging equipment can compliment per-tree stumpage charges, or volume based charges on the timber cut.

In terms of their effect on utilization and on forest management, charges based on equipment or workers offer advantages. As charges on equipment or workers are lump-sum charges (usually annual), no additional payment is required if additional timber is removed from the forest, or if additional processed products are recovered from the logs. As a result, they will not

deter harvesting and utilization of marginal species, or marginal logs. Charges on equipment or workers will also enable the same level of forest revenue to be achieved with lower charges on the timber cut (per-tree stumpage charges and volume based charges), or lower charges on processed products. These lower charges on the timber cut or processed that will help to encourage greater utilization or recovery.

In terms of their economic effects, charges on logging or processing equipment can serve to encourage the more efficient utilization of the equipment. An annual charge on tractors or skidders, if set at a significant level, may encourage a reduction in numbers, the more intensive use of the machines to produce the same volume of logs, operation of equipment for longer hours, and perhaps a substitution of manpower for capital equipment. Where there is excess capacity in the sawmill industry, for example, a charge of sawmills that is gradually raised may assist in reducing the number of mills, and lead to more efficient utilization of capacity, operation for a greater proportion of the year, or use of more manpower to increase production from existing mills.

Charges on workers, however, would encourage a reduction in the number of workers, and the substitution of capital equipment for labour. As most countries will wish to encourage employment rather than capital equipment, charges on equipment will be generally preferred. A charge on certain workers, for example, Indonesia's charge on foreign workers, may encourage a substitution of other workers.

Charges on equipment or workers can be combined with charges on the timber cut. For example, a volume based charge on log production from logging operations could be combined with an annual charge on tractors and skidders. Together the two would function like a two-part charge on the timber; consisting of a fixed annual charge related to log production capacity, based on logging equipment; aud a variable charge based on the timber actually cut.

In these ways, charges on the forest industry, on equipment or workers, can serve as a useful component of an overall forest revenue system, complementing charges on the timber cut.

## 9.14 CORPORATION INCOME TAX

The corporation income tax is sometimes proposed as a simple and convenient replacement for one or all of the forest charges discussed above. It is not a substitute for forest charges.

The corporation income tax is not a substitute for forest charges for several reasons: first, because it can not adequately reflect the diverse factors determining the stumpage values of timber cut and the value of concessions; second, because a corporate income tax rate of less than 100% can at best only collect a portion of the value of the timber; third, because of the difficulties of accurately measuring profits as a result of transfer pricing and accounting problems; and fourth because the corporation income tax is applied to corporations but not to other businesses.

Neither is the corporation income tax a substitute for carefully setting the level of forest charges to capture stumpage values of timber or the

value of concessions. It is sometimes suggested that countries need not worry about the level of forest charges because the extra profits resulting from low charges will be collected by the corporation income tax. This too is incorrect, and for similar reasons to those mentioned.

### 9.14.1 Evaluation of Corporation Income Taxes as Forest Charges

The review and evaluation of corporation income taxation in terms of revenue, administration, economic effects and income distributional effects is an important topic of public finance theory and applied economic analysis. It is not the intention of the present study to survey the extensive literature on the corporation income tax. Rather the intention is to review and evaluate the corporation income tax as an alternative to forest charges, and in terms of the criteria applied to forest charges.

Financial revenue to the government: For the reasons mentioned in the opening paragraphs of this section, revenues collected from forestry operations by the corporate income tax can not be expected to approach the potential revenues reflected in the stumpage value of the timber cut.

First and foremost, the corporate income tax can not reflect all of the factors that influence stumpage values, nor can they fully reflect the factors that determine the value of concessions. Consequently, stumpage and concession values can only be partly captured in corporate profits.

Second, unless corporate income tax rates approach 100%, the corporate income tax will not collect the full amount of those stumpage values and concession values which would be reflected in corporate profits. In most countries, corporate income tax rates are between 35% and 50%, so at most only 35% to 50% of those stumpage and concession values reflected in profits will be captured as government revenue. In addition, various investment incentives, such as accelerated depreciation, tax holidays, etc., result in effective corporate tax rates of less than the 35% to 50% statutory rates.

Third, the transfer pricing of logs or forest products sold to parent companies, marketing companies or subsidiaries at low prices can result in the transfer of profits to these companies, or out of the country. Likewise transfer pricing of machinery, equipment or materials purchased from parent or subsidiary companies at high prices can transfer profits of the operating company out of the forest industry, and perhaps out of the country.

Finally, as the corporation income tax is applied only to corporations, profits earned by proprietorships and other non-corporate forms of business would go untaxed. Thus the corporation income tax can not function as a substitute for forest charges on timber cut by non-corporate forest operations (proprietorships and partnerships).

The replacement of forest charges by a corporate income tax and the impact of this replacement on revenue can be illustrated by a simple example. Table 9.2 presents a simplified profit statement for a forest company and compares the situation in which stumpage charges are levied on timber cut (Situation A) with a situation in which no stumpage is charged and revenues are

Table 9.2

REPRESENTATIVE CORPORATE PROFIT STATEMENTS UNDER FOREST CHARGES AND UNDER A CORPORATION INCOME TAX ALONE: COMPARISON OF PROFITS AND GOVERNMENT REVENUE

| Representative Annual Profit Statement | Situation A: With Forest Charges on Timber Cut | Situation B: With Corporation Income Tax Only |
|---|---|---|
| (1) | (2) | (3) |
| | (US$ '000) | (US$ '000) |
| Sales of Logs (US $150/m$^3$ x 20,000 m$^3$) | 3,000 | 3,000 |
| Costs: | | |
| Forest Charges on Timber Cut (US $50/m$^3$ x 20,000 m$^3$) | 1,000 | - |
| Labour (wage/hour x hours) | 600 | 600 |
| Depreciation (capital x depreciation rate) | 300 | 300 |
| Office and other expenses | 100 | 100 |
| Net Profit Before Corporate Tax | 1,000 | 2,000 |
| Corporate Income Tax (tax rate 40%) | 400 | 800 |
| Net Profit After Corporate Tax | 600 | 1,200 |
| Government Revenues | | |
| Forest Charges on Timber Cut | 1,000 | - |
| Corporate Income Tax | 400 | 800 |
| Total Government Revenues | 1,400 | 800 |
| Corporation's View of Forest Charges As "Taxation" | | |
| Forest Charges on Timber Cut | 1,000 | - |
| Corporation Income Tax | 400 | 800 |
| Total "Taxes" | 1,400 | 800 |
| "Taxes" as a percentage of net profit before tax, the corporations view | = 1,400 / 1,000 | = 800 / 2,000 |
| | = 140% | = 40% |

collected only by a corporation income tax (Situation B). Table 9.2 presents the profit and income tax calculations for the two situations. In Situation A; forest charges of $1.0 million levied on timber cut and other costs deducted from annual log sales of $3.0 million leaves a net profit before tax of $1.0 million. Corporate income tax at 40% amounts to $0.4 million, leaving a net profit after tax of $0.6 million. Government revenues are $1.0 million in forest charges and $0.4 million in corporate income tax, a total of $1.4 million.

If instead, stumpage charges were dropped, with the idea that corporate income taxes would collect the revenue (Situation B), annual sales of $3.0 million, less operating costs and overhead leaves a net profit of $2.0 million. This is $1.0 million higher, exactly matching the reduction in forest charges. With a corporate profits tax of 40%, corporate income taxes would now be $0.8 million and after tax profits $1.2 million. Government revenues of $0.8 million would now come entirely from corporate income tax. Although corporation income tax collections would be twice as high in Situation B, total government revenues would be considerably less. Thus corporation income taxation will not be equivalent to a forest charges levied on the timber cut. The corporation income tax is not an effective way to collect the value of the timber utilized. With a corporate income tax rate of 40% the corporate income tax could collect at very best only 40% of the value of the timber if forest charges were eliminated.

Administrative costs and practicality: Where a corporate income tax is not already levied on corporations, the introduction of a corporate income to replace forest charges could involve the government in administration costs and manpower requirements for initial implementation costs and annual operating costs. Income tax statements and company accounts require checking and auditing. Elimination of forest charges would create increased profits in the forest industry and increased incentives to transfer profit to parent or subsidiary companies, or out of the country. Transfer prices pose problems for auditing and in verifying appropriate prices, as relatively small changes in transfer prices large changes in profits.

Economic efficiency in utilization and forest management: Eliminating forest charges in favour of collecting government revenues through corporation income tax, as illustrated in Table 9.2, above, is equivalent to allowing the corporation a free input, a free timber supply. Without forest charges on timber cut, the companies would treat the standing timber as a free good even though its stumpage value may be quite high. Utilization of the forest may decline. Reliance on the corporation income tax, in place of forest charges on the timber cut, would provide an incentive to companies to harvest the better species, better stands, nearer stands, and more valuable timber on which a higher profit (both before and after tax profit) could be earned, leading to overcutting of this timber. The poorer stands, poorer species, more distant stands, and marginal timber would be left. "High grading" or "creaming" will result.

Without forest charges on the timber cut, the companies would also view logs entering processing plants as low cost inputs, whose cost includes only logging and transportation costs. Again there would be an incentive to

use logs rather freely, to be more concerned about the throughput of logs than about recovery.

Equity in the distribution of economic effects, revenue and income: Replacement of forest charges by collection of government revenues through corporation income tax, would discriminate in favour of the forest industry, giving it free government-provided inputs, free timber and free concessions. It would be equivalent to providing other industries with a free government subsidized input, free labour or materials, with the expectation that the value of this free labour or materials would be recouped through corporation income taxation. At best, only 35% to 50% of the wage or materials subsidy could be recouped.

The representative calculations in Table 9.2 illustrate this subsidy. Replacement of forest charges by the corporation income tax reduced government revenues from $1.4 million to $0.8 million for the hypothetical corporation.

Elimination of forest charges in favour of collecting government revenues through corporation income taxes would favour non-corporate forest industry firms (proprietorships and partnerships). Unless they were taxed as well non-corporate firms would get free timber and free concessions.

Overall evaluation of corporation income taxes as forest charges: In spite of its simplicity, the corporation income tax is not a substitute for forest charges on concessions and on the timber cut and can not effectively reflect or collect more than a proportion of the stumpage values. Replacement of forest charges by a corporate income tax would favour the forest industry, which would then receive a free input, standing timber, would distort its use of timber and cause problems in utilization and forest management.

In addition to these problems related specifically to its application to the resource industries, the corporation income tax does have general problems of effectiveness, distortionary economic effects, and incidence (the question of "who really pays"). These are well-documented in the public finance literature and in literature on transnational corporations. For developing countries the issue of transfer pricing is an important aspect of the general problem of effectiveness of the corporation income tax in collecting both revenues and the value of resources provided to corporations. If transfer pricing reduces the effective tax rate, then the corporation income tax is an even less effective replacement for forest charges.

## 9.15 PROFIT BASED ROYALTIES

Profit based royalties differ from the corporation income tax just evaluated. They are levied on a different base. Profit based royalties attempt to isolate and tax the value of the resource itself; that is, the economic rent on the minerals, petroleum, the stumpage value of the timber in forestry. The resource rent tax, in particular, has attracted a great deal of attention as a means of collecting the economic rent is resource industries, and for that reason is reviewed here. Although designed for application in developing countries to mineral projects, it may also be a suitable alternative to forest charges in application to forestry projects under certain circumstances.

9.15.1 The Resource Rent Tax 1/

The resource rent tax proposed by Garnaut and Ross (1975) is designed to tax only the economic rent of resource projects, i.e., the value of the resources themselves. It does this by taxing profits over and above a normal rate of return, and by taxing them at high rates. By allowing a normal rate of return, it avoids taxing marginal investments, and taxes instead the above normal profits that reflect the economic rent of the project.

This basic resource rent tax is described with the aid of a hypothetical example of a resource development project illustrated in Table 9.3. The project illustrated could be a processing plant and logging operation drawing timber from a concession area set aside for it. Initial investment over three years is required to build the plant and develop logging operations. In the third year, production commences and revenue begin. Reinvestment in modernization of the plant is required in the eleventh year.

Assessment for the resource rent tax is based on the annual "net assessable receipts" (column 4 of Table 9.3): "assessable receipts" (column 2), minus "deductible payments" (column 3). Assessable receipts comprise gross sales revenues, plus any proceeds on the sale of assets. They exclude loan funds and shareholder investment funds received. Deductible payments comprise all payments for operating expenditures and capital expenditures and including payment of taxes other than the resource rent tax. They exclude repayment of loans or payments of interest or dividends.

Thus the resource rent tax, based on net assessable receipts, differs from the corporation income tax by allowing: (a) immediate 100% deduction of capital expenses, (b) no deduction of interest payments and (c) unlimited carry forward of losses. The resource rent tax is therefore close to a tax based on cash flows.

Each year from the beginning of the project, the value of net assessable receipts is accumulated at the "threshold rate of return" set by the Government. This threshold rate of return is, in principle, the normal rate of return allowed. Cumulative net assessable receipts are shown in column 5 of Table 9.3. The cumulative net accessable receipts of the previous year are carried forward, interest at the threshold rate of return on this amount is added, and then the current years net assessable receipts is added to give a year end figure. A 10% threshold rate of return is used in Table 9.3.

Until the initial capital investment has been recovered and the threshold rate of return of 10% earned, the cumulative net assessable receipts will be negative. Once the cumulative net assessable receipts become, positive

1/ The description of The Resource Rent Tax draws on Garnaut and Ross (1975). Uncertainty, Risk Aversion and The Taxing of Natural Resource Projects; and Garnaut and Ross (1977), A New Tax for Natural Resource Projects: 78-91.

Table 9.3

HYPOTHETICAL EXAMPLE OF A RESOURCE RENT TAX

| | Calculation of Basic Resource Rent Tax | | | | | Supplementary Tax | | Combined Tax |
|---|---|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Year | Assessable Receipts | Deductible Payments | Net Assessable Receipts | Cumulative Net Assessable Receipts Carried Forward at 10% Threshold Rate | Resource Rent Tax on Returns over 10% at 60% Tax Rate | Cumulative Net Assessable Receipts Carried Forward at 20% Threshold Rate | Resource Rent Tax on Returns Over 20% at 25% Tax Rate | Total Resource Rent Tax =(6)+(8) |
| 1 | - | 100 | -100 | -100 | - | -100 | - | - |
| 2 | - | 300 | -300 | -410 | - | -420 | - | - |
| 3 | 50 | 100 | -50 | -501 | - | -554 | - | - |
| 4 | 200 | 50 | 150 | -401 | - | -515 | - | - |
| 5 | 200 | 50 | 150 | -291 | - | -468 | - | - |
| 6 | 200 | 50 | 150 | -170 | - | -412 | - | - |
| 7 | 200 | 50 | 150 | -37 | - | -344 | - | - |
| 8 | 200 | 50 | 150 | 109 | 65.4 | -263 | - | 65.4 |
| 9 | 200 | 50 | 150 | | 90 | -166 | - | 90 |
| 10 | 200 | 50 | 150 | | 90 | -49 | - | 90 |
| 11 | 100 | 150 | -50 | -50 | - | -109 | - | - |
| 12 | 200 | 50 | 150 | 95 | 57 | 19 | 4.75 | 61.75 |
| 13 | 200 | 50 | 150 | | 90 | | 37.5 | 127.5 |
| 14 | 200 | 50 | 150 | | 90 | | 37.5 | 127.5 |
| 15 | 200 | 50 | 150 | | 90 | | 37.5 | 127.5 |

the resource rent tax is applied to these positive net assessable receipts. In the example, the resource rent tax is levied at a rate of 60% on net assessable receipts (column 6). Columns 1 to 6 illustrate the basic resource rent tax in which profits in excess of a 10% normal rate of return on the investment are taxed at a 60% rate.

In the example the processing plant requires re-investment in year 11 to modernize it. This requires a partial shutdown, causing a drop in assessable receipts, and resulting in negative net assessable receipts for that year.

Columns 7 to 9 illustrate a modification of the resource rent tax in which profits in excess of a 20% rate of return are taxed at an additional 25% rate. This represents a combined resource rent tax rate of 85% on profits in excess of the 20% rate of return. (The basic rate of 60% plus the additional 25% rate).

### 9.15.2 Evaluation of the Resource Rent Tax

The resource rent tax has generated considerable interest, extensive evaluation and a series of hybrid forms. There is no room to review the several articles evaluating the resource rent tax or these hybrid forms.1/

Rather the evaluation here will outline some of the major points of evaluation that are relevant to forestry projects.

Financial revenue to the government: Revenues especially from highly valuable (i.e., highly profitable) concessions and forestry projects are potentially quite large because of the high tax rates on profits in excess of the threshold rate of return. Revenues from less profitable concessions and projects would be lower, or even zero if they do not reach the threshold rate of return.

With a resource rent tax the government may have to wait a long time before receiving revenue. This is apparent in the example of Table 9.3. The resource rent tax allows the company to recover its capital investment and earn the threshold rate of return before the tax starts to collect revenue. This long wait for government revenues may generate political concerns and difficulties. These difficulties can be reduced, and revenues earned in early years, if the resource rent tax were combined with the corporation income tax, or with forest charges on the timber cut.

Because the resource rent tax first allows a threshold rate of return, and then taxes accessable receipts at high rates, government revenues

1/ See for example, Sumner 1978, Progressive Taxation of Natural Resource Rents; Garnaut and Ross 1979, The Neutrality of the Resource Rent Tax; Kemp and Long 1979, The Under-Exploitation of Natural Resources; Mayo 1979, Rent Royalties; Emerson 1980, Taxing Natural Resource Projects; Palmer 1980, Mineral Taxation Policies in Developing Countries.

are likely to fluctuate. Revenues received will fluctuate as new projects become profitable, as additional investments or expansions take place, as production expands or contracts, and as world market prices increase or decline. Revenues from the resource rent tax will fluctuate more than those from the corporate income tax.

Transfer pricing problems can result in government revenue losses in the same way as with the corporate income tax. In fact, with higher tax rates the incentives to transfer profits are stronger, and transfer pricing problems could be even more severe than for corporate income tax.

Administration cost and practicality: To apply the resource rent tax it is necessary to have a readily identifiable entity engaged in exploiting the forest. The company must be involved in operation of concessions and in logging if the resource rent tax is to capture a share of the stumpage value of timber. The company may also be involved in processing the timber, in which case any above normal profits earned from processing the timber can also be taxed. However, if the company is engaged in other non-forestry activities, receipts and payments related to these activities should be excluded in calculating the resource rent tax and this can cause accounting difficulties.

Transfer pricing of equipment or other inputs, and of logs or processed products sold can cause administrative difficulties of the same nature as for the corporation income tax, as well as the reduction in revenues mentioned.

Thus, the primary pre-requisites for an effective resource rent tax are reliable accounting procedures on the part of companies and well developed government auditing procedures. Where these are achieved, and transfer pricing problems overcome, the resource rent tax can be a relatively straight forward and easy to administer system.

If a corporation income tax is already levied, the additional accounting required to reclassify assessable receipts and payments to conform to the resource rent tax will be minimal. Thus, a resource rent tax levied on resource industries can be conveniently combined with a corporation income tax which is in place and is functioning well.

Economic efficiency in utilization and forest management: In application to mineral developments one of the principle advantages claimed for the resource rent tax is its ability to capture a substantial share of the economic rent of the resource without distorting investment decisions or recovery of lower grades, the neutrality of the tax. This claim has been a focus of discussion in the literature on the resource rent tax referred to above. The issues of the neutrality of the tax, and its effect on investment, utilization of lower grades, etc. appears to depend on the practical questions of how the tax is applied in specific circumstances. In application to forestry, the resource rent tax would seem to hold promise. If carefully designed, it should be able to encourage the utilization of marginal timber and stands, and the processing of marginal logs.

Distribution of economic effects, revenue and income: The economic effects of the resource rent tax on employment, regional development, or prices

of forest products. The resource rent tax, if effective, might reduce the profits below those previously earned, and if so reduce the incentives for a rapid expansion of the industry or even lead to some contraction of forestry activity. The magnitude of these impacts would be hard to predict, except in specific circumstances.

As the resource rent tax is designed to capture the value of the resources involved an obvious distributional effect will be the redistribution of income from profits to increased government revenues, if the tax is effective.

Overall evaluation of the resource rent tax: The resource rent tax has an advantage in attempting to collect the value of the resources being utilized. It also has an advantage as a complementary charge to the corporation income tax. It can respond to some of the problems of the corporation income tax identified in the previous section. While the corporation income tax is unable to adequately reflect the stumpage value of the timber cut the resource rent tax is designed to do just that. On the other hand, one of the problems of the resource rent tax is the long period of time before tax revenue collections begin. Corporate income taxes yield revenue early in the life of a project. By combining the resource rent tax and the corporate income tax, some of the advantages of each are achieved and the disadvantages of each minimized. The economies of scale in administration favour the joint administration of both. Garnaut and Ross themselves suggested combining the resource rent tax with the corporation income tax or charges on the timber cut (Garnaut and Ross 1975, Uncertainty, Risk Aversion and the Taxing of Natural Resource Projects: 283; Garnaut and Ross 1977, A New Tax for Natural Resource Projects: 87-88). Several of the studies evaluating the resource rent tax have also argued for, and demonstrated the efficiency and superiority of such a combination over either charge alone (Palmer 1980, Mineral Taxation Policies in Developing Countries: 530-540; Emerson 1980, Taxing Natural Resource Projects: 134-144).

## 9.16 JOINT VENTURES OR FULL GOVERNMENT OWNERSHIP OF CONCESSIONS, LOGGING OPERATIONS, OR PROCESSING PLANTS

Examples of either joint ventures with private sector companies, or of full government ownership and operation of concessions, logging operations, or processing plants were presented in the previous chapter. They illustrated a diversity of types of arrangements found in tropical countries. The examples also illustrated some of the advantages of these arrangements. They can complement forest charges as revenue sources. They constitute a source of information on logging, hauling and processing costs and a source of experience on which to base forest charges.

Although they are not truly forest charges, joint ventures, or full government ownership represent alternative forest revenue arrangements to forest charges on concessions or timber cut.

### 9.16.1 Evaluation of Joint Ventures and Government Ownership of Forestry Operations

Financial revenue to the government: Government participation in forestry operations can serve to collect, as profits, at least a part of the value of the concessions, or of the timber cut. They will collect that part not collected by forest charges. The proportion collected as profits will depend on the nature of the participation, on the forestry operations undertaken, and on the levels of prices received and costs incurred by the operation.

If the participation is in the nature of a joint venture with private sector firms, then only a proportion of the profits from the concession or timber cut can be collected. The proportion will depend on the equity participation in the jointly owned operating company, or on the working interest in costs and revenues of the joint venture partnership arrangement. If the operation is fully owned by the government then 100% of any profits will accrue to the government.

The share of the value of concessions and timber cut, collected as profits will also depend on the forest operations undertaken. For example, government owned sawmills that buy logs from private sector logging operations will not be able to capture the stumpage value of the timber. The stumpage value of the timber will be captured instead by the logging companies or perhaps dissipated in overexpansion of logging.1/

Similarily, government ownership of concessions will not enable the government to collect the value of the concession or the stumpage value of the timber if the timber is allocated easily and without competition to private sector logging companies. The government would need to be engaged in logging as well. If the market for logs is also non-competitive, government participation in processing might also be required to collect a part of the stumpage value.

To collect the profits from government ownership or participation, the government need not undertake the actual logging or processing operations. Contract loggers can be hired, or logs custom sawn, as illustrated by some of the examples of the previous chapter.

The proportion of the stumpage value collected also depends on the efficiency of the government operations compared with private sector operations, on the costs paid, and on the prices received for the logs and processed products sold.

Joint ventures with private sector or foreign partners are susceptible to the problems of transfer pricing of input or outputs already men-

1/ Government owned sawmills can capture a portion of the stumpage value of the timber cut only if they can exert some monopsony power on the private logging companies, purchasing logs at low prices because they are the only buyer.

tioned. For example, the private partner may sell logging or processing equipment to the joint venture at higher prices. Alternately it may market the logs or sawnwood at prices below those obtainable elsewhere. Small reductions in log prices or products can transfer a substantial share of the profits to the private partner, its sale agent, or its subsidiary. These dangers of loss of revenue must be balanced against the benefits of technical or managerial expertise, the marketing connections brought by the private partner, and the additional profits resulting from these contributions.

Administration cost and practicality: Government administration will be minimal for joint ventures in which the private partner provides the organizational planning and managerial activities required for operation of concessions, logging operations and forest management. The government will still require people who are skilled and knowledgeable in these activities, in order to participate in decisions and look after the governments interest.

Full government ownership of concessions, logging operations, or processing activities requires skilled manpower to plan, organize and undertake the actual activities. This will involve both substantial implementation costs to start up and substantial annual operation costs. These can be recovered out of revenues from operations, but only later as profits are earned. Alternatively, if operations are carried out by contractors, manpower requirements may be less, but the government will still require the skilled manpower to plan and organize the operations, and to oversee and supervise the contractors undertaking logging, trucking, or forest management activities such as planting and thinning.

Economic efficiency in utilization and forest management: Joint ventures, or full government ownership and operation of concessions, logging operations, or processing plants provides much more opportunity for, and greater flexibility in achieving the government's objectives in utilization of the forest, in utilization of logs and production of processed products, and in forest management. The examples drawn from the countries surveyed in the last chapter illustrated these opportunities. Nevertheless, joint ventures, and/or government owned operations must be given clear objectives and performance standards by which it will be evaluated, otherwise they may pursue only their own objectives, the maximizing of profits from their activities.

Distribution of economic effects, revenue and income: Joint ventures and government ownership can also serve to pursue distributional objectives to stimulate employment, regional development, influence prices and availability of forest products, and thereby influence the incomes of various groups or overall income distribution.

Overall evaluation of joint ventures and government ownership: Joint ventures, or full government ownership is a highly flexible revenue tool and forest policy tool. It can serve to reflect and capture forest revenues not reflected in and captured by forest charges. Thus it can serve to complement existing forest charges. Joint ventures and government ownership of concessions, logging, or processing operations can also provide information on prices, costs and other factors which will assist in setting the level of forest charges.

## 9.17 SUMMARY

The present chapter has reviewed and evaluated a full range of forest charges and alternative forest revenue arrangements. The advantages and disadvantages, applications and problems of each have been evaluated within the framework of the four broad criteria established previously (in Chapter 7).

Table 9.1 provides a convenient summary evaluation of the 14 types of forest charges and forest revenue alternatives reviewed in this chapter. It is useful both as a summary of the evaluation and for comparing alternatives.

The classification of charges by the base on which they are levied, and their evaluation in terms of the four criteria allows countries to utilize the evaluation in the review of their own particular forest revenue arrangements, and of alternatives suitable to their particular circumstances.

Although it has been necessary, at times, to refer to the level of charges both in the previous chapter and in this chapter, the evaluation within this chapter has focussed on the structure of forest charges, independent of the level of charges. The next chapter turns to a systematic review of methods of setting the level of these forest charges.

# Chapter 10

## SETTING THE LEVEL OF FOREST CHARGES

### 10.1 INTRODUCTION

At the beginning of Chapter 8, two dimensions of forest revenue systems were singled out for separate analysis: (a) the types of forest charges, classified by the base upon which the charges are levied, and (b) the level of forest charges and the methods of establishing that level. It was argued that the separate analysis of forest charges in terms of these two dimensions facilitated the separation of those issues related to the structure of forest charges from the more contentious issues related to the level of charges.

Chapters 8 and 9 surveyed and evaluated the full range of types of forest charges. Although it was at times necessary to refer to the level of the charge evaluated, a systematic analysis of the level of charges and an evaluation of the methods of establishing the level was reserved until the present chapter. In this chapter six methods of establishing the level of forest charges are reviewed, and then evaluated, drawing on the experience of the tropical countries surveyed.

### 10.2 METHODS OF ESTABLISHING THE LEVEL OF FOREST CHARGES

The six methods of setting the level of forest charges are:

- administratively set, fixed-rate charges
- value related (ad valorem) charges
- formula approaches to setting forest charges
- negotiation of forest charges
- open bid and sealed-bid auctions
- public log markets.

Each of these six methods is described, reviewed, and evaluated in turn, along with examples drawn from the tropical countries surveyed. Each method is evaluated in terms of the four criteria established earlier, in Chapter 7, namely: financial revenue to the government; administration cost and practicality; economic efficiency in utilization and forest management; and distribution of economic effects, revenue and income. The format of the evaluation parallels that used in Chapter 9 in the evaluation of the fourteen types of forest charges.

Table 10.1, presented here, summarizes this evaluations of these six methods of setting the level of charges. It provides both a guide to the

Table 10.1

METHODS OF SETTING THE LEVEL OF FOREST CHARGES AND THEIR EVALUATION

| Method of Setting the Level of Charges, and Description | Evaluation: Financial Revenue to the Government; Administration Cost and Practicality; Economic Efficiency in Utilization and Forest Management; Distribution of Economic Effects, Revenue and Income |
|---|---|
| Administratively Set, Fixed-Rate Charges<br>- by schedules of Charges, or Forest Tariffs established in Legislation, Forest Regulations, Codes or Ordinances.<br>- widely used.<br>- usually fixed rates, adjustment of levels requires revision of rates. | Revenue: In principle can be effective but requires appraisal. In practice rates low and not adjusted for inflation or changing prices.<br><br>Administration: Simple and easy if set at low rates. But more demanding if rates are higher and reflect stumpage values. To reflect stumpage values, administratively set rates will depend heavily on appraisals. Rates difficult to adjust for inflation. Review and revision takes time.<br><br>Efficiency: In principle flexible and able to encourage utilization and forest management. In practice, low rates do not provide sufficient leverage to influence forest management and rates do not vary sufficiently to reflect differences in stumpage values.<br><br>Distribution: Flexibility of administratively set charges can be used to encourage employment, or economic activity, etc. But low charges that vary little limit these possibilities.<br><br>Suggestions: Periodic review should be required by legislation. Escalation formulae for annual adjustment are suggested, based on price indices. |
| Value Related (Ad Valorem) Charges<br>usually a single ad valorem rate, but can be a set of rates with different rates for species, etc.<br>ad valorem rates are applied to market prices, declared prices, or posted prices established by the government.<br>usually used for export taxes on logs or forest products. | Revenue: Ad valorem charges are usually more effective revenue sources than administratively set charges. With charges based on % of price, adjustment to price changes and to inflation is automatic and prompt. Ad valorem charges can reflect a part of the increase in stumpage values due to prices and grades but cannot capture all of it.<br><br>Administration: Ad valorem charges are simple in structure, even if several rates are applied. They are flexible and automatic in adjustment to changing prices and inflation. Establishment of posted prices may be required, involving administration cost and manpower.<br><br>Efficiency: Ad valorem based charges can partly, but not fully, reflect some of the factors determining stumpage values (prices and grades). They can not reflect logging cost and distance. Thus they can not easily nor fully achieve utilization and forest management objectives.<br><br>Distribution: Because of their simple structure ad valorem charges can not serve to achieve desired economic effects. They are too blunt an instrument. The distribution of stumpage value between revenue and profits is affected by the level of rates.<br><br>Suggestions: Both ad valorem rates and posted prices can be varied by species etc. to reflect stumpage values, as done in the Ivory Coast, for example. |

Table 10.1 (continued)

| Method of Setting the Level of Charges, and Description | Evaluation: Financial Revenue to the Government; Administration Cost and Practicality; Economic Efficiency in Utilization and Forest Management; Distribution of Economic Effects, Revenue and Income |
|---|---|
| Formula Approaches to Setting Forest Charges<br>- levels of charges determined by variables such as prices, cost, factors, distance, etc., and by parameters such as fixed deductions and fixed coefficients.<br>- more flexible than ad valorem charges since formulae can include other variables and parameters.<br>- levels adjusted regularly (monthly, quarterly, annually) based on new prices etc.<br>- Sabah, Malaysia provides a good example of the formula approach. | Revenue: A more effective revenue source than administratively set charges. Usually more effective than ad valorem charges, as additional variables and parameters enable the formula to match stumpage values. More responsive than ad valorem charges to price changes.<br><br>Administration: Care and attention is required in the design of the formula and in design of operational procedures. If carefully designed, then operation will not be difficult. Before implementation the formula should be tested with a wide range of possible variables of prices, costs, etc. (a sensitivity analysis). A key requirement is the regular availability of prices and other data on which to base the formula.<br><br>Efficiency: If the formula based charges can approach stumpage values, then utilization and forest management will be improved. Including a distance factor in the formula could help to shift overcutting from near stands.<br><br>Distribution: Formula approaches, by including appropriate variables and parameters, can contribute to other economic objectives. The distribution of stumpage value between revenue and profits is determined by the formula.<br><br>Suggestions: Formulae should be kept as simple as possible to facilitate their application, yet remain effective. Sabah's formula which includes a simple "basic allowance" deduction for logging costs, is an example. In some cases a distance factor might be included in the formula. |
| Negotiation of Forest Charges<br>- charges can be negotiated in conjunction with the other terms on concessions.<br>- to bargain successfully the government will require data and information on prices, costs, profit levels, etc. | Revenue: The level of charges and revenues collected depend on the government's bargaining power. Competition among firms can be encouraged by restricting concessions available, and by negotiation with two or more potential concession holders.<br><br>Administration: Low costs if the government enters negotiation unprepared, but preparation, which can be demanding of time and manpower, is costly. Negotiation can be demanding of senior officials time and put them under pressures.<br><br>Efficiency: In theory, flexible. In practice negotiation cannot easily adjust charges to achieve utilization and forest management objectives at the same time as other objectives.<br><br>Distribution: In conjunction with negotiation of other terms, can serve to achieve economic development, but in practice difficult. Distribution between forest revenue and profit depends on relative bargaining power.<br><br>Suggestions: Negotiation is best if restricted to initial lump-sum or annual bonus payments on concessions, but not used for charges on the timber cut. Competition should be encouraged to strengthen the government's bargaining power. Escalation clauses should be negotiated along with conditions for re-opening negotiations. |

Table 10.1 (continued)

| Method of Setting the Level of Charges, and Description | Evaluation: Financial Revenue to the Government; Administration Cost and Practicality; Economic Efficiency in Utilization and Forest Management; Distribution of Economic Effects, Revenue and Income |
|---|---|
| Open-Bid and Sealed-Bid Auctions<br>- open-bid, or oral-bid auctions are suitable where there are a large number of bidders who can gather together at the same time, or where several blocks of timber are sold.<br>- sealed-bid auctions are suitable where there are fewer bidders or a few dominant bidders, where bidders cannot gather together, and for sale of single blocks of timber.<br>- open-bid auctions can be by ascending bids or descending bids.<br>- sealed-tender auctions seem to result in slightly higher bids in many situations although the difference is not great. | Revenue: If competition among bidders can be encouraged, auctions can be a very effective in setting the level of charges to maximize revenue and reflect stumpage values.<br><br>Administration: Once the auction process is established, administration will be relatively easy. Stumpage appraisal or appraisal of the value of concession is less important, or even unnecesary. Auctions can provide information on values of use in setting charges by other methods.<br><br>Efficiency: If bidding is competitive, and reflects stumpage values or the value of concessions, then efficient use of the timber and concessions will result. However, if financial values differ from economic values, then additional regulations may be required.<br><br>Distribution: Auctions will allocate timber to its financially best use. If auctions are competitive, stumpage values will be distributed primarily as revenue to the government with only normal profits earned by the industry.<br><br>Suggestions: Competition should be encouraged by limiting timber supply to industry needs, advertising, choosing open-bid or sealed-bid auctions as suitable to the situation, making timber available in smaller lots by open-bid, and auctioning large concessions by sealed-bid. Introduction of auctions should be initially limited to competitive situations. Prices bid will provide guidance in setting the level of charges under other methods. |
| Public Log Markets<br>- public log markets serve as an alternative to forest charges. Revenue comes from the sale of logs.<br>- public log markets consist of (a) a log assembly yard, (b) grading and scaling facilities, (c) log selling procedures (log auctions, etc). | Revenue: Revenue is based on the prices received for the logs sold, less logging and transport costs. Logging can be by a government body or undertaken by contractors. Log markets can be an effective revenue source if they are centrally located, operate efficiently and at low cost, generate competition among log buyers, and allocate logs to their most valuable use.<br><br>Administration: Avoids the need for stumpage appraisal. Facilitates supervision of logging and forest management. Evasion low. Requires government supervision of logging contractors, or supervision of logging operations. Requires planning of logging. Involves financing of road construction and logging operations.<br><br>Efficiency: Important advantages in utilization and forest management, and in control of logging activities.<br><br>Distribution: Can serve to stimulate economic activities, production of processed products, employment, etc. Stumpage values will be distributed largely to government as revenue if log markets are competitive, and if logging is efficient (or contractor rates are low and competitively set).<br><br>Suggestions: It is suggested that log markets be introduced in a limited way, in situations where they can achieve competition and operate efficiently. Log prices obtained and contractors rates for logging and transportation can aid in setting the level of charges by other methods. |

analysis to follow and a summary of the evaluation.

The process of setting the level of forest charges is closely linked to that of disposal of timber and timber rights. In open-bid or sealed-tender auctions of standing timber, both the disposal of timber, and the establishment of the level of the charges takes place simultaneously, in the allocation of the timber to the highest bidder. In negotiating the terms and conditions of a concession, the financial terms related to the level of charges will be agreed upon in conjunction with the terms and conditions involved in disposal of the timber rights.

Despite these close links, the present chapter focusses on the price setting dimensions of timber disposal. The allocation of timber and timber rights, and the establishment of the terms and conditions of concessions or shorter term forest utilization contracts are appropriately dealt with separately. Another FAO forestry paper is devoted to this topic (Schmithüsen 1977 Forest Utilization Contracts on Public Land).

## 10.3 ADMINISTRATIVELY SET, FIXED-RATE CHARGES

Establishment of the level of forest charges through administrative decisions is the most widely used method of setting the level of forest charges in developing countries. Administratively set charges, established by legislation, regulations, codes, or ordinances, are a simple and easy approach to setting the levels of charges. Charges are specified in a schedule, or forest tariff, by species grade, diameter class, locality, or other characteristics deemed important.

Administratively set charges offer a simple and easy method of setting the level of forest charges. Although they may not maximize revenue, the level of charges can usually be established at low administrative costs, and with little in the way of manpower requirements.

In spite of their strong advantages and widespread use, there are difficulties with administratively set, fixed-rate charges, both in establishing the level of charges and in up-dating them to capture a reasonable share of the value of concessions, or of the stumpage value of the timber cut. Some suggestions for overcoming these problems are offered below.

### 10.3.1 Examples of Administratively Set, Fixed-Rate Charges

Because of their widespread use there is a variety of examples of administratively set, fixed-rate charges among the developing countries surveyed. Some of these examples may illustrate useful variants of application to other countries.

Liberia: For Liberia, all of the principal forest charges described in Chapter 8 are administratively set, fixed-rate charges, defined by schedules

in the Forest Regulations, and established by the Forest Development Authority under Liberia's Revenue and Finance Law.

While some of the charges, such as the "Land Rental Fee" on concessions, have remained unchanged for an extended period, Liberia's most important forest charge, the volume based charge on export logs, titled the "Industrialization Incentive Fee" (formerly termed "Export Stumpage Fee"), has been adjusted relatively frequently (five times between 1973 and 1980) to reflect changing prices and circumstances. In addition new charges, such as the volume based "Reforestation Fee" on timber harvested from concessions and the "Forest Products Fee" on exports of processed wood products, were introduced and their levels subsequently revised. Thus administratively set, fixed schedules of charges do not seem to have detered adjustment in the level of charges or the introduction of new charges.

In the administratively set schedule of charges for the "Industrialization Incentive Fee", rates per cubic metre are specified for 28 species. Under the "Forest Product Fee" rates are specified for 28 species as well as for three level of processing.

These schedules of charges provide considerable flexibility in setting the level of charges for different species, although in practice, the rates specified do not vary sufficiently to fully reflect the value of the more valuable logs. In its annual report, the Forest Development Authority observed that "... it is patently obvious that the concentration [in exports] has been on increasing the easy-to-sell, high valued species." (Liberia, Forest Development Authority 1979 Annual Report:33). This suggests that the range of rates levied could be wider and the rates on the high valued species raised.

Reliable information both on logging, log transportation and processing costs, and on the prices of export logs and processed products has been a major constraint in setting the levels of Liberia's forest charges. To aid in setting the level of forest charges, an FAO project developed a methodology for timber appraisal (FAO 1976 Liberia Natural Resource Development, Appendix 5 "Manual for Estimation of Margin between Log Production Cost and Log Value F.O.B. Liberia Ports") which is discussed in the next chapter.

Ivory Coast: For the Ivory Coast, the major forest revenue sources are the value related, ad valorem export taxes on logs and on processed products (taxe d'exportation, or Droits Uniques des Sortie, DUS) discussed below (Section 10.4). Although not as important in terms of revenue, the Ivory Coast forest revenue system includes a number of the other charges which are administratively set, fixed-rate charges. These include the following charges surveyed in Chapter 8:

- Concession Permit Fee (tax d'atribution) (Section 8.3): an initial one-time charge on concessions.

- Public Works Fee (taxe de Gravaux d'intérêt général)(Section 8.3): an initial one-time charge on concessions.

- Annual Area Charge (taxe de superficie) (Section 8.4): an annual charge based on the area of the concessions.

- Felling Tax (taxe d'abattage) (Section 8.7): a volume based charge that varies with species class and between export logs and those used domestically.

- Special Tax for Small Areas (permis de coupe) (Section 8.7): a volume based charge, levied in place of the above charges on concessions in the north (Savana Zone).

The rates in effect in 1980 for these administratively set charges on concessions and on the timber harvested have remained unchanged from the mid-1970's, or even earlier, with some dating back to 1966 (Republic de Côte D'Ivoire, Ministère des Eaux et Forêt 1979 Code Forestier et Réglementation Forestière).

Ghana: With the exception of the value related (ad valorem) export charges on logs and sawnwood all other charges are administratively set, fixed-rate charges. These include the following charges surveyed in Chapter 8:

- Lease and Licence Rentals (Section 8.4): an annual area based charge levied on the total area of the timber leases and licences.

- Silvicultural Fee (Section 8.8): an annual area based charge applied only to the area to be cut-over, or actually cut-over each year.

- Stumpage Fee or Royalty per Tree (Section 8.6): levied on 39 species of trees at set rates per-tree.

The rates under these charges were set initially in 1962 when uniform charges were adopted across the country. All charges were revised in 1965 and stumpage charges doubled for most species (Page, Pearson and Leland 1976 Capturing Economic Rent from Ghana Timber:27). Stumpage charges were revised again in 1975 based on average log prices of 1968 to 1972. As a result, stumpage charges from 1975 remained unchanged and lagged behind the rise in timber prices. In common with other countries, area based annual ground rental charges have been revised less frequently and also raised less than charges on the timber cut. Thus over time, they have become a less important source of forest revenue.

Nigeria: Nearly all forest charges in Nigeria are administratively set. The levels of charges are established in the forest tariff of the individual states. These administratively set, fixed-rate charges include the following charges surveyed in Chapter 8:

- Per-Tree, Stumpage Charges (Section 8.6): charges per tree that vary by species and, in some states, by diameter as well.

- Volume Based, Out-Turn Volume Charges (Section 8.7): charges that vary by species.

- Area Based Charges on the Area Logged (Section 8.8): charges per hectare cut-over, that vary by forest reserve or by region of the state.

The revision of the levels of charges by the individual states has required a review of the trends and present levels of prices of forest products and logs; a review of the trend and present levels of logging, trucking and sawing costs; the establishment of new rates; and finally the approval of the new tariff by the state commissioner responsible for forestry and/or the state legislature. As a consequence, revision of rates is not easy, has been infrequent, has involved sizeable jumps in rates, and has lagged behind increases in forest product prices and changes in stumpage values. Intervals between revisions in per-tree, Stumpage Charges has varied among states, averaging between 3 years and 8 years. Stumpage Charges in several states remaining unchanged from 1973 or 1974 through 1981. Between 1978 and 1980, the levels of per-tree, Stumpage Charges in several states were raised substantially (with charges for the lower valued species being raised proportionately more). This brought charges in those states to between 13.00 Naira and 60.00 Naira/tree (US $20.00 to $90.00/tree) for the more valuable species and to between 3.30 Naira and 30.00 Naira/tree (US $5.00 to $45.00/tree) for the less valuable species.

The levels of the volume based, Out-Turn Volume Charges remained relatively unchanged in most states from the mid 1950's, through the 1960's, and until the end of the 1970's, with only minor revisions to rates at intervals of roughly four to five years. Between 1978 and 1980, volume based, Out-Turn Volume Charges in several states were also raised substantially (with the rates for the lower valued species raised the most). This brought the level of the volume based Out-Turn Volume Charges in these states to between 14.00 Naira and 15.00 Naira/$m^3$ (US $21.00 and $23.00/$m^3$) for the most valuable species, and to between 5.60 Naira and 15.00 Naira/$m^3$ (US $8.40 to $23.00/$m^3$) for the lesser valued species.

The Area Based Charges on timber cut on concessions, initially established in several states in 1968 and 1969, also remained virtually unchanged until the end of the 1970's. Again between 1978 and 1980 these area Based Charges on timber cut were raised in several states. The new rates ranged from two to twenty times the previous rates per hectare, with a median increase to about five times the previous rate.

The Nigerian Federal Department of Forestry, in a memorandum to the National Council for Agriculture and Rural Development in 1978 had recommended that the Council "... approve in principle an immediate increase in the Forest Tariff, to a minimum of 3 times the present rates. ..." The memorandum also provided a proposed standardized tariff and suggested rates (Nigeria, Federal Department of Forestry 1978 "Memorandum on Regeneration of Nigeria High Forest: Call for Review of Tariff on Forest Produce and Introduction of Mechanization in the High Forest Zone").

The individual states set their own forest charges, but not all states have increased their charges, nor have rates been increased rates for three types of charges. Thus the uniformity of rates, and the standarization of the forest tariff among states, for which the Federal Department of Forestry had hoped has not yet been achieved.

Indonesia: Indonesia levies a number of charges based on the volume of timber cut and on logs exported. These include a diverse set of charges

levied by various government departments for a variety of purposes. The most important charges are value related, ad valorem type, export charges, discussed below in Section 10.4. However, several are administratively set, fixed-rate charges.

The more significant of these administratively set, fixed-rate charges, identified in Chapter 8 include the following:

- Additional Royalty (Iuran Hasilhutan Tambahan) (Section 8.7, 8.11), a charge of 600-1,000 Ruphiah/$m^3$ (US \$1.00-\$1.70/$m^3$) in 1980, levied on export logs only.

- Dredging Fees (Bea Angkutan Langsung) (Section 8.7, 8.11) a charge of around 50 Ruphiah/$m^3$ (US \$0.10/$m^3$), levied on all logs.

- Industrial Contribution (Simpanan Wajib Industri) (Section 8.7, 8.11), a charge of 2,000 Ruphiah/$m^3$ (US \$3.20/$m^3$) in 1980, levied on export logs, repaid upon investment in processing plants.

Indonesia's charges on concessions, discussed in Chapter 8, are also fixed-rate charges, whose level is administratively set. These concession charges are:

- Timber Licence Fee (Section 8.3), an initial licence fee of 1,000 Ruphiah/ha (US \$1.60/ha) in 1980.

- Annual Concession Charge (Iuran Hak Pengusahaan Hutan, IHPH) (Section 8.4), an annual ground rental of 50 Ruphiah/ha/yr (US \$0.08/ha/yr) in 1980.

Sarawak, Malaysia: With the exception of the Export Tax on logs, a value related (ad valorem) charge, all other important forest charges in the Malaysian state of Sarawak are administratively set, fixed-rate charges.

Timber Royalties, based on either round log volumes or sawnwood, and described in Chapter 8 (Section 8.7), are the most important forest charges in Sarawak. Rates are administratively set for five species groupings. Following minor revisions to the level of a few rates in 1974, Royalty rates remained unchanged until 1980, when the rates for almost all species classes were increased by 50%. These newly established rates ranged from \$9.00 Malaysian/Hoppus ton (US \$2.80/$m^3$) for logs of the lowest valued species group, the "Swamp Species", to \$30.00 Malaysian/Hoppus ton (US \$9.50/$m^3$) for logs of the highest valued species group, the Meranti group (Shorea spp). Royalty rates for sawnwood, based on converted volumes, are set at twice the rates for logs, and thus are equivalent if 50 per cent of the log is recovered as sawnwood.

Other administratively set, fixed-rate charges include the Timber Cess (or Native Premium) of \$1 Malaysian/Hoppus ton (US \$0.25/$m^3$) levied on hill species, and the Timber Development Premium of \$2 Malaysian/Hoppus ton (US \$0.50/$m^3$) levied on the swamp species. Both have remained unchanged for a number of years.

Philippines: Until consolidated into a single charge in 1980, volume based forest charges comprised a set of roughly six administratively set, fixed-rate charges. These charges, surveyed in Chapter 8 (Section 8.7), included Regular Forest Charges of 0.60 Pesos/$m^3$ to 3.50 Pesos/$m^3$ (US \$0.08-\$0.47/$m^3$), plus levies to finance various Funds and Special Deposits.

For the Regular Forest Charge, rates for four species groups were established some years ago, under a Congressional Act. However, because of the difficulty in achieving the legislative approval for revision the rates remained virtually unchanged for years. To deal with the problem, the Bureau of Forest Development instead reclassified species into higher rated species groupings. As a result, 95% to 98% of the timber cut was reclassified to the highest group, paying 3.50 Pesos/$m^3$ (US \$0.47/$m^3$).

Additional volume based charges were also introduced, to fund reforestation, and for other forestry activities. Together with the Regular Forest Charges, they totalled between 6.35 Pesos/$m^3$ and 9.35 Pesos/$m^3$ (US \$0.85\$1.25/$m^3$) for logs used domestically and between 10.85 Pesos/$m^3$ and 13.85 Pesos/$m^3$ (US \$1.45-\$1.85/$m^3$) for logs exported (representing between 6% and 12% of log values, based on 1980 export log prices).

It is understood that later in 1980 these volume based charges were combined into a single charge of 20 Pesos/$m^3$ (US \$2.70/$m^3$), between one-and-one half and three times the level of the combined charges described above. This single charge was to be raised to 30 Pesos/$m^3$ (US \$4.00/$m^3$) in 1981.

Thailand: The major forest charges under the Forest Act, are administratively set, fixed-rate charges. These charges include the lump-sum Concession Fees, the per-tree Stumpage Fees, and the volume based Timber Royalties. Forest Improvement Fees are based on the Royalties, with the rates specified as twice the Royalty for teak and equal to the Royalty for non-teak species. Thus the level of the Forest Improvement Fees are dependent on the level of Royalties, and so they too are in essense administratively set.

Revisions to the level of these charges were made in 1963 and again in 1975. The 1975 revisions, which doubled the level of charges, were still in force five years later, in 1980.

### 10.3.2 Evaluation of Administratively Set, Fixed-Rate Charges

Financial Revenue to the Government: In principle, there is no reason why administratively established charges can not be an effective source of revenue. In practice there are several reasons why administratively set, fixed-rate charges might not yield as much revenue per cubic metre of wood as charges set by the other methods.

First, to accurately establish the levels of fixed-rate charges requires an accurate appraisal of stumpage values (or of the value of concessions for concession charges). Lacking both reliable data on which to base appraisals and the manpower to undertake the appraisals, developing countries may establish fixed-rate charges that are relatively low, so as to avoid setting charges above the stumpage values and seeing the timber left uncut.

The second reason for lower revenues from administratively set fixed-rate charges is that they are not easily adjusted for changing prices, costs and inflation. With inflation fixed-rate charges will, over time become smaller and smaller in proportion to the value of the logs, or of forest products. As a result, revenues from administratively set rates may fall behind those of other charges. Adjustment for changing prices or cost requires the establishment of a new schedule of charges. The revision of fixed-rate charges takes time and suffers delays.

Administration Cost and Practicality: In one respect, administratively set, fixed-rate charges are simple and easy to establish. A schedule of fixed-rate charges can be implemented easily, at relatively low cost, and with minimal demands on manpower. However, fixed-rate charges may not accurately reflect stumpage values, and may not collect much revenue.

To establish a schedule of fixed-rate charges that reflects stumpage values and collects a greater proportion of those stumpage values would be more demanding of manpower and relatively costly. Charges would need to be based on reliable stumpage appraisals and these, in turn, require reliable data on log and product prices; on logging, transportation and processing costs; and on forest factors and industry factors affecting these costs. Surveys of prices, cost studies and stumpage appraisals all require skilled manpower and can be costly.

In practice, lacking the information or the manpower to undertake appraisal of stumpage values, the level of charges may be set rather arbitrarily, without benefit of any appraisal, based perhaps on estimates of what the industry might accept, rather than on the stumpage value of the timber and what the industry might pay.

Administratively set, fixed-rate charges, because they are fixed, are less responsive to inflation, and to changing prices and costs affecting stumpage values, than are other methods of establishing the level of charges.1/

This results in several administrative problems. First, administratively set, fixed-rate charges can be difficult to adjust. An initiative is required by the forest service to instigate a review of charges. Revision is not automatic. Review and revision of rates impose additional work on the forest service, requiring re-allocation of personnel to undertake the review and revisions. New or updated stumpage appraisals will be required from time to time with manpower requirements both for data gathering and for carrying out the appraisals.

1/ Ad valorem charges whose level is value related, and formula based charges will be automatically adjusted for inflation, or price changes. Auctions of standing timber and public log markets will automatically reflect changing prices and costs and inflation in the bids or in the log prices received.

Second, the process of review and revision of charges takes time. The review itself takes time, and then once the proposed new rates are determined, their implementation will require further time, and may suffer delays. Schedule rates are usually contained in legislation or forest regulations which will require administrative, or legislative approval. These revisions must be fitted into the legislative or administrative schedule and may encounter considerable delays. As a result the new fixed-rate charges may be already out-of-date by the time they are implemented.

Finally, with inflation and infrequent adjustments, the adjustments can be large and dramatic, especially if inflation has been rapid. There may be criticism of such large increases. There may be pressures from the forest industry, which benefited from rising forest products prices and unchanging forest charges, to keep the increases down.

A more automatic adjustment of fixed-rate charges would help to overcome some of these problems. Such an adjustment is suggested below.

Economic Efficiency in Utilization: In principle administratively set, fixed-rate charges can be highly flexible. The schedule of rates can be set to reflect a wide range of factors, as illustrated by the examples from the selected countries. The level of these rates can be set to encourage or discourage the utilization of given species or grades, timber from given areas or stands; and to encourage or discourage utilization for certain uses such as domestic processing, or exports. Thus, in principle, administratively set fixed-rate charges are sufficiently flexible to achieve forest managemement and utilization objectives.

In practice, rates are not usually varied sufficiently to do so. As observed above and in the review and evaluation of per-tree stumpage charges and volume based charges (Chapters 8 and 9, Sections 8.6, 8.7, 9.6, 9.7), charges usually are not varied sufficiently to reflect differences in stumpage values, and as a result the more valuable timber is overcut. In addition, with rates commonly set at low levels, the charges can not have much influence on utilization or forest management.

For administratively set fixed-rate charges to achieve their potential for utilization and forest management objectives, the schedule of charges needs to be designed with care and with skill, and be based on reliable information and reliable appraisals of stumpage values, not an easy task.

Distribution of Economic Effects, Revenue and Income: Because of their flexibility, administratively set, fixed-rate charges can be designed to stimulate employment and economic activity within certain regions of the country, to influence the availability of processed products and product prices, or to achieve other economic effects. However, in practice, charges set at relatively low levels will have little leverage to do so.

If administratively set, fixed-rate charges are relatively low compared to those established by other methods, stumpage values will be distributed to the forest industry as profits, rather than to the government as revenue, or to consumers of processed products where the production of forest products is stimulated and prices decline.

Overall Evaluation: Administratively set, fixed-rate charges have advantages of basic simplicity. They can be administratively easy if stumpage appraisals are not undertaken in setting rates. On the other hand, accurate establishment of levels is dependent on appraisals. The revision of rates to update the levels for inflation and changing conditions imposes additional administrative demands.

Because of the difficulties in updating administratively set forest charges a means of ensuring a more frequent and automatic review is desired. To ensure a regular review, and the legislative acceptance of that review, a requirement for periodic review can be written into the legislation or the forest regulations. Alternatively, escalation clauses can be introduced into the legislation or regulations. For example, a simple escalation formula could be developed for the annual adjustment of the schedule of charges based on price indices available from the central statistical office of the government. The choice might include the consumer price index, gross national product deflator price index, industrial commodities price indices, or forest product prices or price indexes as available. Ideally the adjustment should be based on the changes in forest product prices, but figures on forest products price are not usually available nor sufficiently reliable to use in adjustment of forest charges. The use of forest products prices to adjust forest charges might also encourage dispute and disagreement from the industry about prices and with the adjustment of charges. Adjustment based on an index such as the consumer price index, while less closely tied to timber values, offers advantages of impartiality as well as simplicity. Over the longer term, it might then be worthwhile to convert the adjusting formula to one based on forest product prices for sawnwood, plywood or other forest products, or even to a formula based on both forest product prices and costs.

Even with escalation clauses a periodic review of the level and structure of fees and charges is still advised to bring them into line with changing stumpage values. However, a review will be required less frequently and the changes in rates less dramatic.

## 10.4 VALUE RELATED (AD VALOREM) CHARGES

The levels of value related charges are determined, usually as an ad valorem percentage of the prices of logs or forest products on which the charge is levied. Establishing the level of charges as an ad valorem percentage of the prices of logs or forest products is a simple and easy to administer approach. For this reason it is an approach that is widely used. It has some advantages over administratively set charges. With the level of charges set as an ad valorem percentage of prices, the level of charges per cubic metre, as well as revenues, will automatically increase as prices rise with inflation, thereby avoiding both the delays in revision and the need for frequent revision of rates.

In addition, the level of the charge per cubic metre is adjusted automatically for variations in prices resulting from changing market demand, and for variations in prices among species and grades of logs or forest products. Consequently a minimum set of rates, or even a single ad valorem

rate, can serve in place of a schedule of rates. Ad valorem charges are only applicable where market prices are readily identifiable however.

### 10.4.1 Examples of Value Related (Ad Valorem) Charges

Ad valorem charges are widely used to establish the level of charges, mostly of export charges for logs or processed products. The ad valorem rates are applied to FOB prices, or to posted export prices established by the government itself, a government agency or an independent body. The examples from the selected countries, illustrate a variety of value related charges and applications of posted export prices.

Ivory Coast: In the Ivory Coast, the export taxes (taxe d'exportation, or Droits Uniques de Sortie) applied to logs, and to processed wood products are examples of the type of value related (ad valorem) export taxes common throughout French speaking West and Central Africa.

The export tax on logs is the major forest charge in the Ivory Coast and the most important component of the forest revenue system. It is a value related charge derived by applying the ad valorem tax rates to posted export prices (valeurs mercuriales) established for 47 species of export logs.

These valeur mercuriale prices for logs are established by the Ministry of Finance, following discussion with the Ministry of Water and Forestry, and other ministries concerned. The valeur mercuriale prices for these 47 species are based on FOB log prices, but are generally set somewhat below FOB prices. For the major export species, valeur mercuriale prices averaged 75% of FOB prices over the period 1974 to 1980. However, for the higher valued species, valeur mercuriale prices were much closer to, and in come cases even exceeded, the FOB prices. For the lower valued species they were roughly 50% to 60% of FOB prices. Valeur mercuriale prices for the 47 species are revised approximately annually to adjust for changing prices and inflation.

The export charges are then based on ad valorem tax rates applied to these valeur mercuriale prices, with ad valorem rates established for four species groupings. Ad valorem rates, in 1980, ranged from 24% for low valued species to 44% for high valued species, with rates of 24%, 30%, 36%, and 44% for the four species groupings. 1/ These ad valorem rates on export logs are also revised from time to time. From 1974 to 1980 they have been revised roughly every two to three years and the rates increased slightly.

With almost annual adjustment of the valeur mercuriale prices, along with periodic revision of the ad valorem rates, export charges have kept pace with changes in log prices, and with general inflation. In addition, the higher valeur mercuriale prices for the more valuable species (set closer to or even above FOB prices), plus higher ad valorem rates, result in considerably higher

1/ An additional ad valorem tax on export logs, the Shipper's Tax (taxe au bénéfice du Conseil Ivorien des Armateurs) is levied at 0.6% and is also based on the valeur mercuriale prices.

export taxes on these more valuable species. Lower ad valorem rates and lower valuer mercuriale prices for the less valuable species result in lower export charges which helps to encourage both their harvest and export.

For processed products, export taxes are levied on the FOB prices declared, rather than on posted export prices. As the tax rates on processed products are lower than those on logs, there is less incentive to under-declare FOB prices, and so posted export prices are less necessary. Ad valorem export tax rates on most processed products were revised in 1979 and most rates reduced. Ad valorem export tax rates on sawnwood ranged from 2% to a maximum of 11% in 1980 depending on species and the product. Rates on veneer and plywood in 1980 were 1% or 2%.1/

Indonesia: In Indonesia, the level of a number of forest charges surveyed in Chapter 8 (Section 8.7, 8.9, 8.11) are determined by ad valorem rates based on posted export prices of logs, sawnwood, or other products.

Posted export prices, termed "check prices", are established quarterly by the Government in discussions between the Department of Trade, the Department of Forestry, and the forest industry organization, M.P.I. (Masyarakat Perkayuan Indonesia). They are based on timber market information and prices from Indonesian embassies in Japan and other consuming countries, as well as other sources. These prices, established quarterly, are then applied for the following three month period. Check prices are specified in United States dollars rather than in Indonesian Ruphiah, in US $/m$^3$ of roundwood for logs and in US $/m$^3$ of processed products for sawnwood.

Check prices for logs are specified for about a dozen species groupings of logs, for three groupings of log grades and for three economic regions within Indonesia.

In the second quarter of 1980, the check price of logs of the highest priced grouping, the Meranti group species, "Prime/First" grade logs, from Region I (east and south Kalimantan), was set at US $160/m$^3$. Check prices of other species and grades from other regions ranged downward from this price. Check prices for Region II were 12% to 15% lower, and those for Region III 20% to 25% lower than those for Region I. Check prices of "Second/Third" grouping were 5% to 10% lower, and those of the "Local" grade 17% to 22% lower than those of the "Prime/First" grouping. The Meranti species group carried the highest check prices, the Kapur group was priced about 25% lower and the Jelutung group about 40% lower than the Meranti group. Although the general level of check prices is reviewed and raised or lowered at each quarterly review, and the check prices of some of the species groupings or grade groupings altered slightly, in general the structure and pattern of check prices described remains more or less the same.

1/ The ad valorem Shipper's Tax (taxes au bénéfice du Conseil Ivorien des Armateurs) is also levied on processed products at 0.6% of the FOB price of processed products.

The structure and pattern of check prices for logs provides an opportunity to vary the forest charges, not only to reflect the stumpage values of logs, but also to influence utilization of species or grades of timber, to reflect forest management objectives, or to achieve regional development objectives.

These check prices for logs serve as a base for the Timber Export Tax (Aloksi Devisa Otomatis, ADO), Indonesia's most important forest charge. The Timber Export Tax rate in 1980 was set at 20% of the check price. The rate was raised from 10% to 20% in 1978.

The check price also serves as the base for the Royalty (Iuran Hasilhutan, IHH) levied on all logs cut, whether exported or locally processed. The Royalty rate in 1980 was 6% of the check price of logs. Although the rate has remained unchanged, the Royalty has risen substantially as the check prices have been increased to reflect rising log prices.

Finally, the check price serves in a rather unusual way as the base for the MPO Export Tax, a withholding tax levied on corporations and based on their exports of logs or processed products. This tax is 40 Ruphiah per US dollars of check price. The MPO Export tax is equivalent to an ad valorem tax of a little over 6%, and thus is roughly equal to the Royalty (IHH) in revenue.

The system of posted export prices is also used for charges on processed products and exports of products. Charges on processed products are less important revenue sources. For sawnwood, check prices are established by species groupings and grades, and specified in terms of United States dollars per cubic metre of processed wood. On semi-processed sawnwood exports, the Export Tax (Pajak Export) in 1980 was 5% of the check price of sawnwood, increased from 0% in August 1979. The rate on veneer, plywood and fully-processed sawnwood remained at 0%.

The Indonesian ad valorem approach based on the system of check prices has several advantages. First, basing the charges on the check prices ensures that the relationship between timber prices and forest charges is maintained. As timber prices increase over time, or decline with market downturns, adjustments in the check prices ensures that the Royalties and Export Taxes follow. Thus adjustment of the level of charges is both quick and automatic. Second, the use of check prices rather than actual FOB prices avoids the incentives for the under-declaring of FOB prices which would reduce forest charges payable. Third, the use of check prices, based on market prices in consuming countries, reduces the problems raised by transfer prices of logs and processed products between related subsidiaries of transnational corporations, although it can not avoid them altogether. Fourth, the use of check prices allows a government to establish a structure of check prices to encourage utilization of certain species of timber, grades of logs, or timber from certain regions, and to discourage over-cutting of others. Although the check prices could be used for these objectives, it appears that the differences in check prices among regions, grades and species groups in the Indonesian system are designed primarily to reflect differences in timber values, or logging and transportation costs.

In spite of these advantages, there are nevertheless, problems and disadvantages to the use of check prices. First, they require the collection and analysis of the market prices from which the check prices can be established and revised. Although not very difficult where log markets and forest product markets are competitive, and if market data on world prices or prices in consuming countries are available, it is more difficult if markets are not well organized, or if sales are at transfer prices between subsidiaries of transnational companies. Establishment of check prices may be difficult for countries in which most logs or forest products are sold and used domestically since markets are often local, and prices less well defined.

The Indonesian system of ad valorem rates has the advantage of simplicity. Forest charges are a simple percentage of the check price. However, with an ad valorem Royalty rate of 6% and an ad valorem Timber Export Tax rate of 20% on export logs, Indonesian ad valorem forest charges can capture only 6% plus 20% - a combined 26% - of any increase in log prices as additional revenue, leaving the remaining 74% of any price increase as additional profit to the forest industry. A formula approach such as that of Sabah, Malaysia, described in Section 10.5, below, may be better able to address this problem.

Sarawak, Malaysia: The Export Tax on logs, based on the declared FOB value, is the only value related (ad valorem) forest charge in Sarawak. It is levied in addition to the Timber Royalties discussed above (Section 10.3). From 1974 to 1980 the Export Tax was 5% of the declared FOB value of logs exported. The rate was raised to 10% in 1980.

Philippines: For the Philippines, export taxes on logs, timber, veneer and plywood provide examples of value related (ad valorem) forest charges. Nearly all other forest charges in the Philippines, such as those discussed above (Section 10.3), are administratively set fixed-rate charges.

The export taxes on logs are based on "guide prices" established by the Central Bank, and revised monthly. These guide prices correspond roughly to FOB prices of logs. The guide prices are used to avoid the problems of under-declaration of prices which might occur if export taxes were based on declared FOB prices of individual log shipments.

Export tax rates for logs have varied considerably over time. Rates on logs, originally set at 10%, were reduced to 4%, eliminated in early 1974, and then reimposed at 20% in 1979. In spite of the increase in export tax rates, log export restrictions and log export quotas have made the export taxes on logs a less important revenue source for the government.

Export tax rates on lumber, veneer and plywood have remained at a uniform ad valorem rate of 4% of FOB values for long time. As a result of the lower tax rate, and the lesser incentive for under-declaring of prices, the Central Bank normally accepts the declared FOB prices rather than utilizing the guide prices for processed products. Export restrictions for lumber, veneer and plywood are less stringent, and so exports and revenues from the export tax on processed products are less restricted than those on logs.

The only other ad valorem charges in the Philippines are those on minor forest products such as rattan, resins, tanbank, vines and buttresses.

Forest charges for these are set at 10% of the market value of each, but based on "assessed market values" that are laid down in the Forest Regulations, rather than declared values, market prices or posted prices. Thus ad valorem charges on minor forest products are, in practice, equivalent to administratively set, fixed-rate charges.

### 10.4.2 Evaluation of Value Related (Ad Valorem) Charges

Financial Revenue to the Government: With ad valorem based charges, the adjustment of the level of forest charges in price changes and inflation is both automatic and prompt. Thus ad valorem charges are likely to be more effective than administratively set, fixed-rate charges in responding to inflationary changes in log or product prices, and in collecting revenue.

The effectiveness of ad valorem based charges, in capturing a share of the stumpage value of the standing timber is illustrated in Table 10.2 by an ad valorem export charge on logs. Table 10.2 evaluates the impact of both price increases and increases in logging costs on stumpage values. Stumpage values of standing timber are compared with the export tax revenue per cubic metre collected from an export tax based on a given ad valorem percentage of the export price of logs.

Initially (Situation A, column 2), with export logs selling at a price of US $80.00/m$^3$, and with transport costs to port and logging costs as given, the residually determined derived demand stumpage price is calculated as US $20.00/m$^3$

In this initial situation (Situation A, column 2), export tax rates of up to 25% of the export price of logs will reflect a proportion of the stumpage value. An export tax of 20% will collect US $16.00/m$^3$, 80% of the stumpage value. Export Taxes above 25% would discourage production.

At the initial price level, a relatively low percentage ad valorem export charge will collect a reasonable share of the stumpage value. However, it will no longer do so as prices rise.

With a doubling in export prices to US $160.00/m$^3$ (Table 10.2, Situation B, column 3), the stumpage value does not just double. It increases by five times, to US $100.00/m$^3$. At the former 20% ad valorem rate, government revenues doubles to US $32.00/m$^3$. However, the 20% ad valorem export charge, rather than collecting 80% of the stumpage value, as before, now collects only 32% of the stumpage value (US $32.00/m$^3$ in revenue compared to stumpage value of US $100.00/m$^3$). To collect 80% of the stumpage value, as before, the ad valorem rate would have to be raised to 50%.

If logging costs now double to US $80.00/m$^3$ (Table 10.2, Situation C, column 4), stumpage value is reduced, and a lower ad valorem rate would be called for. Stumpage value is reduced to US$60.00/m$^3$ (compared to Situation B). To reflect stumpage value, the ad valorem rate should not exceed about 37%. Situation C might be used to illustrate a more marginal stand with higher logging costs. Comparing Situations B and C, suggests that royalty rates should be adjusted up or down to reflect differences in logging costs and other

Table 10.2

COMPARISON OF STUMPAGE VALUES AND AD VALOREM EXPORT TAX RATES UNDER CHANGING EXPORT LOG PRICES AND LOGGING COSTS

| Determination of Stumpage Value & Comparison with Export Tax Rates | | Situation A Initial Level of Log Prices and Costs (US $/m³) | Situation B Higher Log Prices (US $/m³) | Situation C Higher Log Prices and Logging Costs (US $/m³) |
|---|---|---|---|---|
| (1) | | (2) | (3) | (4) |
| **Determination of Stumpage Values** | | | | |
| Export price of logs (US $/m³) | | 80.00 | 160.00 | 160.00 |
| Less: Transport cost to port (US $/m³) | | 20.00 | 20.00 | 20.00 |
| Roadside Value (US $/m³) | | 60.00 | 140.00 | 140.00 |
| Less: Logging cost (US $/m³) | | 40.00 | 40.00 | 80.00 |
| Stumpage value of standing timber (US $/m³) | | 20.00 | 100.00 | 60.00 |
| **Export Tax Revnues** | | | | |
| At ad valorem rates of | 10% | 8.00 | 16.00 | 16.00 |
| | 20% | 20% 16.00 | 32.00 | 32.00 |
| | 30% | 24.00 | 48.00 | 30% 48.00 |
| | 40% | 32.00 | 64.00 | 64.00 |
| | 50% | 40.00 | 80.00 | 80.00 |
| | 60% | 48.00 | 60% 96.00 | 96.00 |
| | 70% | 54.00 | 112.00 | 112.00 |

cost factors affecting stumpage values. If ad valorem rates were raised to 50%, as in Situation B, then marginal stands represented by Situation C will not be cut.

This simple illustration identifies some of the major problems faced in designing a forest revenue system in general, and, in particular, the problems of ad valorem forest charge in reflecting stumpage values.

Administration Cost and Practicality: Ad valorem charges can be based on a single uniform ad valorem percentage rate, as is common. This is extremely simple. A single ad valorem percentage rate will automatically result in charges per cubic metre that vary with prices, species, grades or other characteristics identified. For example, a uniform ad valorem rate will result in a 60% greater charge per cubic metre for species priced 60% higher. Thus less variation in ad valorem rates between species, etc., is required than for administratively set, fixed-rate charges. Variation in ad valorem rates will still be required if the charges are to accurately reflect stumpage values. It is possible to vary the ad valorem rates, as is done by the Ivory Coast.

With ad valorem based charges, adjustment of rates will be required less frequently than for administratively set, fixed-rate charges, an administrative advantage. An unchanged ad valorem percentage rate will automatically result in an increased charge per cubic metre as prices rise in response to inflation, or other factors. A 30% increase in prices will result in a 30% rise in the charge per cubic metre, without any need to alter the ad valorem rates.

For these reasons ad valorem charges offer administrative advantage of simplicity, along with some flexibility and a degree of automatic adjustment to changing conditions.

As ad valorem charges require readily identifiable prices upon which to base the charges, they are most commonly utilized for export charges. Ad valorem export changes based on the declared FOB prices of shipments are administratively simple. They are suitable where ad valorem rates are low. But, at higher ad valorem rates, under-declaration of FOB prices is encouraged, and it may then be better to use posted export prices instead.

The establishment and revision of posted export prices will require reliable market data on prices, as well as the skilled manpower to analyze and evaluate the price data, and from then to establish or revise the posted prices. Given reliable market data, and once an appropriate system has been established, the regular review and revision of posted prices need not be difficult, judging from the experience of countries that are using posted export prices.

Economic Efficiency in Utiltization and Forest Management: Ad valorem charges can reflect some of the factors affecting stumpage values. For example, they can reflect part of the variation in stumpage values attributable to variation in the log or product prices to which the rates are applied. However, a single ad valorem rate will not be able to fully reflect stumpage values. As shown, a low rate may satisfactorily reflect the stumpage value of

the less valuable timber, but it will capture only part of that of the more valuable timber. Over-cutting of the more valuable timber will continue. If the ad valorem percentage rate is raised, the charge per cubic metre on the lesser valued timber may exceed its stumpage value and the timber will be left uncut. Thus an ad valorem charge can only partially achieve utiltization and forest management objectives.

To more fully reflect stumpage values and achieve utilization and forest management objectives, it will be necessary to vary the ad valorem rates. For example, in the Ivory Coast higher ad valorem rates are levied on the more valuable species and are applied to posted export prices that are set almost equal to, or even slightly above FOB prices. Lower ad valorem rates are levied on the lower valued species and are applied to lower posted export prices set at perhaps 50% to 60% of FOB price. Thus the resulting charges per cubic metre will vary more widely than log prices and so, perhaps, reflect more accurately the stumpage value of high and low priced species.

While ad valorem charges can, at least partially, reflect stumpage values with respect to prices, species and grades, they can not reflect differences due to factors such as distance, logging costs, ground conditions or stand conditions. Thus ad valorem charges can not serve to influence utilization, or forest management, unless these factors are explicitly brought into the system of charges. For example, ad valorem charges can not be used to discourage over-cutting of near stands nor to encourage cutting of distant stands, unless distance is specifically included as a factor.

Distribution of Economic Effects, Revenue and Income: As a result of their basic simplicity of structure, ad valorem charges themselves do not provide much scope for use as instruments to influence employment, regional development, prices or foreign exchange earnings. To address these objectives, a variety of rates would be required. Export charges can have significant effects on employment, prices, etc., as a result of the domestic processing incentives generated by export taxes and illustrated by the examples of Chapter 8 (Section 8.11) and the evaluation of Chapter 9 (Section 9.11). However these effects result from the export taxes themselves, from the fact that export charges are levied on export logs, but not on logs processed domestically, rather than from the structure of the ad valorem rates.

With ad valorem charges the distribution of stumpage value between the government and the forest industry will depend, not only on the ad valorem rate, but also upon the logging and other costs incurred. In general, the proportion of stumpage values captured will be greater the higher the ad valorem rate, but the exact proportion of stumpage values captured cannot be easily specified. Stumpage values depend on both prices and costs.

Overall Evaluation of Value Related (Ad Valorem) Charges: Ad valorem rates have strong advantages of simplicity, and of automatic adjustment to inflation and to changing prices. Ad valorem charges also automatically vary between species in response to differences in prices. Thus ad valorem charges can reflect, at least a part of the variation in stumpage values. By varying rates between species groups and varying posted export charges, as done in the Ivory Coast, ad valorem charges can be made to reflect stumpage values more

closely, and thereby achieve utilization and forest management objectives more effectively.

## 10.5 FORMULA APPROACHES TO SETTING FOREST CHARGES

The formula approach to establishing the level of forest charges is an extension of the ad valorem based approach. In the ad valorem approach, the charge is established as a specified percentage of the price (whether FOB prices or posted prices). In essence ad valorem charges are derived by a simple formula with one variable, price.

In formula approaches to setting the level of forest charges, the levels of the charges are based on a relationship, not only with prices, but also with other factors, such as costs, and perhaps distance, stand conditions, or terrain.

Establishing the level of forest charges by a formula helps to overcome some of the problems faced by administratively set charges; the adjustment of charges for changing prices and costs, and the delays in their implementation as revised schedules of charges. In addition, formula approaches, by including other parameters and variables in the formula, attempt to reflect stumpage values more precisely, and consequently can be better forest revenue sources.

With forest charges established by formula, the charges are automatically revised as the prices of logs or processed products change, and as the costs and other factors included in the formula change. With the formula specified, these adjustments will take place monthly, quarterly, or annually, as the case may be, and implemented immediately, thereby overcoming a major problem of administratively set charges.

### 10.5.1 Examples of Formula Approaches

The forest revenue system of Sabah, Malaysia is one of the most effective revenue systems among developing countries. Sabah's royalty formulae, the center piece of its forest revenue system, is an excellent example of the formula approach, an example which may be of interest or application to other countries.

Sabah, Malaysia: Sabah's forest revenue system includes formulae both for export logs, for logs processed in Sabah, and for other forest products such as Mangrove pulpwood chips.

These formulae, first introduced in 1970 were revised in June 1979 following a study by the Task Force on Forest Revenues (Sabah, Malaysia 1977 Report of the Task Force on Forest Revenues). The Task Force recommended that the formula approach be strengthened, with changes in the basic allowances to reflect increases in logging costs, and an increase in the royalty coefficient to capture a greater share of the increase in log prices since 1970. These were adopted in 1979, along with an additional formula for higher priced logs.

The Government of Sabah also requested a study of the forest revenue system by FAO, which began about the time when the Government implemented the 1979 revisions. The FAO study supported both the general conclusion of the Task Force study and the 1979 revisions adopted. The FAO study also found the formula approach appropriate and the general structure of the formulae satisfactory. It suggested a number of refinements and simplifications (FAO 1980 Sabah Timber Industry Royalty Appraisal and Market Study, Terminal Report).

The Royalty formulae for export logs are the most important of the formulae in terms of revenue, since Sabah currently exports over 90% of its log production. They are also of greatest interest in terms of their potential for application to other countries. These Royalty formulae for export logs were described in Chapter 8. As revised in 1979, the formulae are as follows:

Where: R = Royalty Malaysian $/Hft.

FOB = FOB log price in Malaysian $/Hft. (derived from prices received by the Sabah Foundation for export logs)

For all species classes other than Class A (Class B, C, D, E, Other)1/

- where FOB is $1.80 or less R = 0.1 (FOB)

- where FOB is $1.80 to M $8.00 R = 0.1 (FOB) + 0.5 (FOB - $1.80)
  This is simplified to R = 0.6 (FOB - $1.50)

- where FOB is $8.00 or more R = 0.1 (FOB) + 0.6 (FOB -$2.66)
  This is simplified to R = 0.7 (FOB - $2.28)

For Class A species2/ R = 0.25 (FOB).

Based on these formulae, Royalties per Hoppus cubic foot for export logs are calculated monthly for each species class (class A, B, C, D, E and Other) using the average net FOB prices of logs received by the Sabah

1/ The royalty formulae (for Class B, C, D, E, Other species) converted to the equivalent in cubic metres and US dollars and based on an exchange rate of M $2.25 = US $1.00 are as follows:
a. where FOB is US $22.00/$m^3$ R = 0.1 (FOB) US$/$m^3$
b. where FOB is US $22.00 to US$98.50/$m^3$ R = 0.6 (FOB - 18.50) US $/$m^3$
c. when FOB is US$98.50/$m^3$ or more R = 0.7 (FOB - 28.00) US $/$m^3$.

2/ It is something of a puzzle why logs of class A species are treated separately. Both the Task Force and the FAO study suggest the inclusion of class A under the other formulae.

Foundation, the government enterprise which is the major concession holder and a major log exporter.1/

Two key features of the formulae are: (a) the deduction from FOB prices and (b) the marginal, or incremental royalty on price increases or higher valued species classes. These result in Royalties which more closely reflect stumpage values and make possible higher Royalties that are more senstitive to varying conditions or price changes.

The first feature, the deduction from FOB prices approximates a basic allowance for average logging costs, transportation costs and normal profits on these operations. These deductions are equivalent to a "cost allowance" of $1.50 Malaysian/Hft. (US $18.50/$m^3$) or $2.28 Malaysian/Hft. (US $28.00/$m^3$) depending on the level of log prices.2/

The second key feature of the formulae is the marginal, or incremental Royalty. For species classes priced between $1.80 and $8.00 Malaysian/Hft. (US $20.00 to $98.50/$m^3$) the marginal, or incremental Royalty is 0.6. Thus the royalty equation captures 60% of any price increase, leaving 40% as additional profit for the forest industry. For species classes priced above $8.00 Malaysian/Hft. (US $98.50/$m^3$) the marginal or incremental Royalty is 0.7, and thus the equation will capture 70% of price increases. The formula also provides the industry with a 60%, or 70% reduction in the Royalty for any reduction in log prices. Thus the government shares both in any increase or decline in log prices.

By including a deduction in the formulae representing, if only crudely, a rough "cost allowance" for logging, transportation and normal profits, it is then possible to incorporate a higher marginal, or incremental Royalty. The Royalty formulae is then better able to reflect the stumpage value of the timber, and to collect a larger share of stumpage value as revenue.

As a result of these features, Sabah's Royalties, derived from the formulae were responsive to the rapid increase in export log prices in the 1970's, so that Sabah's Royalties are claimed to be among the highest forest charges in the world on tropical timber. For example, for the Class B species

1/ Net FOB prices are arrived at by deducting stevedoring costs and agents commissions from the value per Hoppus cubic foot received on board the ship.

2/ For log prices from $1.80 to $8.00 Malaysian/Hft. (US $22.00 to $98.50/$m^3$) the deduction in the formula is $1.80, equivalent to a "cost allowance" of $1.50 Malaysian/Hft. (US $18.50/$m^3$) in the simplified formula. For log prices above $8.00 Malaysian/Hft. (US $98.50/$m^3$). The deduction in the formula is $2.66, equivalent to a "cost allowance" of $2.28 Malaysian/Hft. (US $28.00/$m^3$) in the simplified formula. This higher cost allowance for log prices above $8.00 Malaysian/Hft. is necessary to adjust for the higher marginal Royalty and to ensure a smooth progression of royalties.

group, which accounts for over 60% of Sabah's log exports and contains the most valuable species, the Royalty rates in April 1980 were set at $5.89 Malaysian/ Hft., (US$76.00/$m^3$). The additional Timber Development charge of $0.50 Malaysian/ Hft. (US $6.50/$m^3$) raised total export charges to $6.39 Malaysian/ Hft. (US $82.40/$m^3$). These export charges represented 58% of the FOB log price of class B species, which was then $10.69 Malaysian/Hft. (US $138/$m^3$).

Sabah's royalty system and the level of Royalties do not appear to have deterred either log production, or exports. Log exports rose rapidly through the 1970's, until export quota's were introduced, and exports subsequently pressed against the quotas. Thus, it might have been possible to raise Royalties on export logs and still achieve the same level of exports as was allowed under the quota.

Royalties for export logs of Class A species are calculated under a separate formula: R = 0.25 (FOB) M$/Hft. as already noted. This formula is equivalent to an ad valorem Royalty of 25% of the export price. The formula for Class A species does not include a basic allowance representing costs and as a result the marginal royalty rate applied can not be as high. Without the basic allowance Royalties might be too high to allow an adequate return at low prices, while not capturing an adequate share of the stumpage value at higher prices. Consequently the formula for Class A species is not as effective as the other formulae, in reflecting stumpage values and as a forest revenue source, nor is it as responsive to changing log prices. For example, the Royalty on the Class A species groupings in April 1980 was set at $2.05 Malaysian/Hft., based on an average net FOB price of $8.20 Malaysian/Hft. Yet the royalty for Class E, the lowest valued species grouping, calculated by the more sophisticated formula, at $3.27 Malaysian/Hft. was more than 50% higher than that on Class A, although the FOB price of Class E species was actually lower ($6.95 Malaysian/Hft.).

Royalties on logs processed in Sabah are calculated under a separate formula. For logs processed in Sabah the Royalty formulae are:

Based on logs R = 0.07 (FOB)

Based on Sawnwood R = 0.15 (FOB)

Where: R = Royalty in Malaysian $/Hft.

FOB = FOB log price in Malaysian $/Hft.

Royalties for logs processed in Sabah can be paid either on the log input, or on the sawnwood produced, as explained in Chapter 8 (Section 8.9). Like the Royalty formula for export logs of Class A species, these formulae are equivalent to an ad valorem charge of 7% on logs or 15% on sawnwood (with both based on log prices).

### 10.5.2 Evaluation of Formula Approaches to Setting Forest Charges

Financial Revenue to the Government: Formula approaches, like ad valorem set charges, are likely to be more effective than administratively set

charges as revenue sources. Like ad valorem charges, adjustment to fluctuations in log, and product prices and to general inflation, is both automatic and timely.

Formula approaches, such as that of Sabah, Malaysia, which include a fixed deduction, reflecting cost or other factors, are able to apply a higher marginal charge to incremental price increases, and to the differences in prices between species and grades. Consequently, they can better reflect stumpage values, changes in stumpage values over time, or variations in stumpage values between species; and thus capture a higher proportion of that stumpage value.

As a result, revenues from formula approaches will rise over time in response to increases in the prices of logs or processed products upon which the formula is based, and likely rise more than revenues from ad valorem charges. Revenues will also fluctuate over time in response to cyclical changes in demand for logs or products, again more than revenues from ad valorem charges. While revenues from formula based charges can be higher than those from ad valorem charges, they are also likely to be less stable over time.

Administration Cost and Practicality: If the formula has been kept simple, and is carefully designed, with the administrative procedures for its implication carefully worked out, then the administration of the formula approach, and its regular application in setting forest charges should involve routine procedures, require a minimum of manpower, and involve minimal annual operating cost. Thus if efficiently designed, the formula approach to setting forest charges should involve fairly substantial manpower requirements and administative costs in the design and implementation stage, but relatively low manpower requirements and costs in its operation. Investment of manpower in the design and implementation can pay off through savings in annual operating costs and manpower.

In establishing the formula, care is required to ensure that the formula parameters are correct and will remain appropriate with rising prices, and under fluctuating market prices, changing costs and inflation. Establishing the parameters of the formula will require estimates of logging, transportation and processing costs, and some form of stumpage appraisal, if forest charges are to reflect stumpage values, generate revenue and achieve the forest management and utilization objectives.

To be sure that the formula is designed to remain appropriate under changing conditions of prices, costs and other factors, a sensitivity analysis of the formula should be carried out. This can be done by testing the formula, calculating the charges for a full range of alternative conditions of prices, cost changes and other factors, that might be encountered; in each case comparing the calculated charges with the stumpage values applicable to that set of conditions. If the charges defined by the formula differ markedly from the stumpage value applicable to the particular set of conditions, then the parameters of the formula can be adjusted to bring the calculated charges into line with the stumpage value.

Revision of the formula will be required from time to time, but revision will certainly be less urgent than for administratively set charges. Revision should also be required less frequently than for ad valorem charges.

The key requirement of the formula approach is the availability on a regular basis (monthly, quarterly or annually, depending on the frequency of adjustment of the charges) of reliable prices for logs or processed products, the data upon which to base the formula. These prices should approximate competitively established prices received by the forest industry, and not be influenced or manipulated by the firms involved.

If there is some uncertainty about the prices, or if forest industry firms can influence the prices, then the formula should be based on derived prices that reflect the prices adjusted for any imperfections, manipulations or aberrations. Examples include the posted export prices used for ad valorem export charges and discussed in the previous section (Section 10.4): the valeur mercuriale prices used in the Ivory Coast, the "check prices" used in Indonesia and the "guide prices" used in the Philippines. Sabah's formula utilized the export prices obtained by the quasi government Sabah Foundation.

Certainty of liability for the forest industry should pose no problem if the formula is relatively simple, easily understood and known in advance. The actual forest charge per cubic metre will depend on the price of the logs or forest products about the time the timber is cut, and so is not known before hand. Nevertheless firms in the forest industry may be happier with charges which vary with log or product price, and so leave them with more stable profits.

Economic Efficiency in Utilization and Forest Management: If the formula used can reflect those variables that affect stumpage values - variables such as species, grade, diameter, location, stand conditions and ground conditions - then utilization will be encouraged and forest management objectives achieved. However, the more variables that are included, the more complex the formula, and the greater the chance of problems. Utilization and forest management objectives should be achieved with as simple a formula as possible.

Sabah's royalty formula is simple, yet it can reflect stumpage values reasonably well. It is based on prices for a limited number of species groups (six in all), but not log grades, and it includes a simple fixed deduction to allow for logging costs.

The basic allowance for logging costs is an important component of the Sabah's formula. It contributes greatly to the formula's effectiveness in reflecting stumpage values among species. As a result it will help to encourage the increased utilization of the lower valued species and a reduction in over-cutting of the more valuable species.

If formula approaches do not include distance in the formula, over-cutting of nearby stands will be encourged, while distant stands are under-cut. To overcome this and encourage efficient utilization, a distance factor could be included in the formula where feasible. Such a distance factor was considered by the FAO study as a workable addition to Sabah's royalty system.

(FAO 1980 Sabah Timber Industry Royalty Appraisal and Market Study, Terminal Report). In Sabah, the Sabah Foundation already includes a distance factor in the contract prices it pays its logging contractors.

Distribution of Economic Effects, Revenue and Income: Formula approaches provides scope for adjusting forest charges to encourage employment, forest activities in selected regions, domestic processing, or the availability of processed products. These economic objectives can be achieved by varying the factors in the formula, by including additional factors, or by using two or more formulae. Sabah, for example applies separate formulae to export logs and to those processed domestically.

The distribution of the stumpage value of timber between revenue to the government and profits to the forest industry will be determined by the structure of the formula chosen, and on the parameters within that formula. If the formula and parameters are set appropriately, then the formula can work to collect for the government a reasonable share of the value of the timber, leaving companies with a normal rate of return, and the remaining share of the value of the timber as additional profits.

For example, Sabah's formula for export logs, priced above $8.00 Malaysian/Hft. (US $98.50/$m^3$), is set to collect 70% of any price increase or variation in price between species groups leaving 30% to the forest industry. If the basic allowance of $2.28/Hft (US $28.00/$m^3$) reasonably reflects the logging costs and normal profit, and if the prices used reflect the prices obtained, then the formula will reasonably reflect stumpage values, and the shares of stumpage values will be 70% to the government, 30% to the forest industry.

Overall Evaluation of Formula Approaches: Formula approaches, if carefully designed and kept simple, have advantages in administration which can reduce manpower requirements and administrative costs. The formula can include a cost allowance (such as that of Sabah, Malaysia) and so collect a reasonable proportion of stumpage values. They can also be used to encourage desired patterns of utilization or forest management, although care and skill is required to ensure the desired results are obtained. Some level of timber appraisal will be required in establishing the parameters of the formula. There is scope for more extensive, but cautious, application of formulae in setting charges.

## 10.6 NEGOTIATION OF FOREST CHARGES

Negotiation of the level of forest charges has been used in a few countries, and on larger concessions, to establish the level of charges, in conjunction with the negotiation of the other terms and conditions of the concession.

In spite of the seeming simplicity of negotiation, there are complexities, problems and dangers to this approach. For effective negotiations, the government requires knowledge of the forest industry, the value of logs and forest products, and the costs of logging, hauling and processing. The companies have this information already, and thus are in a stronger bargaining

position, giving them the advantage in negotiations. Without detailed information on costs and revenues, the government is likely to remain in a weak bargaining position. As a result, the forest charges agreed to may be relatively low, and perhaps collect only a small share of the value of concessions, or of the stumpage values of the timber cut, leaving the larger share to the concession holder as profits.

Only if the government has reasonable knowledge of prices, costs and industry conditions, and therefore reasonable bargaining power, should it consider negotiation as a means of establishing the level of certain charges.

### 10.6.1 Examples of Negotiation of Forest Charges

Negotiation of forest charges is not widely used. It is most often applied in special circumstances, and thus not easily documented. Only two illustrations are presented from the countries surveyed.

Liberia: Prior to the establishment of a standard concession agreement in 1973, concession agreements were negotiated individually. This apparently resulted in considerable variation in the terms and conditions, particularly those relating to tax reductions and to the establishment of processing plants but also, in some cases, for forest charges. For example, two major concessions reportedly have a lower negotiated volume based "Severance Fees" and two have a negotiated reduction in the volume based export charge, the "Industrial Incentive Fee".

Ghana: Prior to the establishment of a uniform national concession policy and uniform national forest charges in the early 1960's, forest concessions and forest charges were negotiated between the companies and the individual Stools, the titled chiefs who hold the land in trust for the local residents. With many Stools throughout the country, each had little individual bargaining power in negotiating concession terms or forest charges. As a result both charges and concession terms varied widely, and forest charges were said to be relatively low.

### 10.6.2 Evaluation of the Negotiation of Forest Charges

Financial Revenue to the Government: The level of charges and the revenues collected depend very much on the bargaining power of the government. As suggested in the opening paragraphs, the bargaining power depends on the information and knowledge available to the government and on its ability to use this knowledge.

Negotiation involves bilateral discussion between government and the potential buyer(s). Where competition between users can be introduced through simultaneous negotiation with two or more potential buyers, higher negotiated charges may be achieved. Potential buyers should be made aware of these competitive negotiations, both to stimulate agreement to higher charges and in fairness. Competition can also be encouraged for example by restricting the number of concessions available so that the number of potential concession holders exceeds the concessions available.

In negotiation of forest charges, it is important that escalation clauses be included for the adjustment of charges over time for inflation, price increases, or cost increases. In addition, the conditions for the reopening of negotiations should be spelled out. If so, then higher overall charges and greater revenues are more likely, and uncertainty on the part of the industry over arbitrary reopening of negotiation will be reduced. It is better for both sides that uncertainty be reduced. Commonly in negotiations both the adjustment of charges over time and the conditions for reopening of negotiations have been overlooked, and agreed charges have remained unchanged over long periods. With inflation, these fixed charges agreed to have shrunk in importance.

Administration Cost and Practicality: In negotiation, administration costs and manpower requirements will obviously depend on the seriousness with which the negotiations are taken. Negotiation will be simple and easy, with low administration cost, only if the government takes negotiating lightly and comes to the negotiating table unprepared. But in such cases, with weak bargaining power, the government may have to settle for relatively low charges that yield less revenue.

If the government is to enter neogitations well prepared, then negotiations can involve significant requirements for information and for manpower, with implications for administration costs. First, considerable manpower and costs will be required in collecting information on costs and prices, and in appraising the value of the timber and of the concessions both to the buyer and to itself. Second, negotiation will require a considerable amount of the time of senior officials, not only in the actual negotiations themselves, but also in preparations, and in directing the information gathering and analysis beforehand.

Finally, negotiation can result in considerable tensions and pressures on forestry administrators from firms seeking to obtain timber or concessions at low charges. This can place officials in difficult positions.

Negotiations which lead to differing charges among concessions can result in a confusing structure of charges and in increased administration costs. Consequently, it is suggested that negotiations be in terms of lump-sum bonus payments on concessions, leaving the structure of forest charges on the timber harvested uniform and unaltered.

Economic Efficiency in Utilization and Forest Management: Negotiation has the advantages of flexibility. In theory negotiation can achieve forest charges that reflect the value of timber as well as differentials with respect to species and other characteristics. If so, then negotiation could be effective in directing timber to its most efficient and most valuable use, in encouraging full utilization of less valuable species and in discouraging overcutting of more valuable species. In practice, however, negotiation has not been successful in both establishing the levels of several charges, and in maintaining the appropriate relationship amongst charges required to reflect their relative value. Negotiation is better suited to establishing a single overall level of charges, leaving the structure of charges to be determined by other means.

Distribution of Economic Effects, Revenue and Income: Negotiation of the level of charges, in conjunction with the negotiation of other terms and conditions on concessions may be used to influence economic development. The levels of negotiated charges can be used to influence employment, regional development, the availability of forest products, or foreign exchange earnings. For example, lower charges negotiated on logs processed locally can lead to increased employment and availability of processed products. Lower charges negotiated in a particular region of the country can stimulate activity within that region. However, again, in practice, negotiation may not be successful in achieving these objectives.

The distribution of the stumpage values of timber cut, and of the value of concessions between revenues to the government and profits to the forest industry is an obvious outcome of the negotiations process. The opening paragraphs emphasized the importance of the government's bargaining power in negotiating charges. The bargaining power of the two sides, and their skill in using it, are key factors determining the levels of charges and the distribution of stumpage values.

Overall Evaluation of Negotiated Charges: Negotiation of forest charges theoretically offers advantages of flexibility in establishing a structure of charges which can achieve the objectives of revenue, utilization, forest management and economic development. Yet, in practice negotiation can not achieve all of these.

Negotiation is more appropriate to establishing the level of concession charges than to charges on the timber cut. Negotiation of the level of concession charges such as licence fees, annual ground rentals, or other concession fees can serve to capture a share of the value of the concessions identified in Chapter 6. These values will vary among concessions, and so may be conveniently reflected in concession charges.

Negotiation is not as appropriate in establishing the level of charges related to the volumes of timber harvested. The negotiation of volume based charges on individual concessions could easily result in a complex and confusing structure of charges, with different rates for each concession and increased administration costs resulting from the variety of separate rates.

## 10.7 OPEN-BID AND SEALED BID AUCTIONS

Auctions can be used to allocate timber, or to allocate concessions and other timber rights. Auctions simultaneously allocate timber, or timber rights, among users and establish the level of forest charges. However, the present study is concerned primarily with their "price setting" role in establishing the level of charges.

Auctions can take place either by open, oral bidding, or by sealed-tender bidding. Bidding is usually based on the monetary terms, and in terms of the price per cubic metre on timber cut; or as an initial, bonus payment on lump-sum timber sales, concessions and other timber rights. However, bidding could serve to establish the level of any of the types of forest charges discussed in the two previous chapters. It is also possible to include other

terms and conditions in the bidding, for instance silvicultural terms, regeneration terms, road construction proposals, although this is uncommon.

Under certain well defined conditions of competition among buyers auctions can work well to identify the buyer's willingness-to-pay, and to capture that value in the form of forest charges on the timber or concessions.

### 10.7.1 Open-Bid Versus Sealed-Bid Auctions

Open-Bid Auctions: In open-bid auctions, commonly termed oral auctions, bidders usually gather in one place at the same time. Bids are signalled orally or visually to the auctioneer. The level of each bid, and perhaps also the bidder, is known to all bidders.

Bidding can proceed either with ascending bids from buyers until the highest bid is achieved or by decending bids, called by auctioneer, until a bid is offered and a buyer identified.

In the ascending bid system, the bidding begins at an "upset price" which can be either a minimum, reserve price, or the appraised price.1/ Bids are raised and freely announced until there is no bidder willing to make a higher bid. Thus the sale is made to the most eager bidder, at a price just above the maximum willingness-to-pay of the second most-eager bidder.

In the decending bid system, the bidding is started at a price certain to be above the maximum willingness-to-pay of any buyer, and is lowered by the auctioneer in increments until a bid is received. Thus the price bid will be below the maximum willingness-to-pay of the most eager bidder, but may not be above that of the second most eager bidder or other bidders. The bidding should not be allowed to fall below the "upset price", known only to the auctioneer, and based on this seller's minimum price.2/

Sealed-Bid Auctions: In sealed-bid, or sealed-tender auctions bidders have time to consider whether to bid and to decide on the level of the bid. Bids, or tenders, are submitted in writing, and in sealed envelopes, thus the term sealed-tender auction. Bids are opened only after the deadline. Unless there is collusion among bidders, the bidders will not know each others bid.

The usual practice in calling for sealed-tender bids is to award the sale, or contract, to the highest bidder. Bidders will enter bids which are slightly above their estimates of other anticipated bids but below their own maximum willingness-to-pay value. Thus bids will depend on the bidder's assessment of the valuations of other bidders.

1/ For timber concessions the upset price should be at least the government's minimum value of the timber of the concession, as identified in Chapters 5 and 6 (Sections 5.1 to 5.4 and 6.3).

2/ For timber, or concessions, this would be the government's minimum price mentioned above.

An alternative approach, not commonly used, but one worth considering, is to invite bids on the understanding that the sale or contract will be awarded to the highest bidder, but at a price equal to the second highest bid. Bidding the maximum willingness-to-pay will be the dominant strategy under this approach, since it maximizes the probability of winning the award, while the benefit obtained will depend on the bid of an independent bidder. Thus it may achieve higher prices.

Comparing the Levels of Bids in Open-Bid and Sealed-Bid Auctions: In comparing open-bid and sealed-bid auctions the level of bids generated is an important concern. The prevailing view is that, in general, sealed-bid auctions will generate slightly higher prices than open-bid auctions, because collusion or tacit cooperation among bidders is facilitated by open-bidding (Johnson 1979 Oral Auction Versus Seal Bids; Mead 1966 Competition and Oligopsony in the Douglas Fir Lumber Industry:188). This view is borne out by theoretical analysis and by experimental results.1/ This has been generally confirmed in studies comparing the prices bid on timber sales.2/

In controlled experimental auctions, with uniformity among bidders, sealed-tender auctions yielded prices that were somewhat higher than those of either ascending bid or descending bid open-bid auctions. The difference was statistically significant (Coppinger, Smith and Titus 1980 Incentives and Behavior in English, Dutch and Sealed-Bid Auctions).

In application to timber, it has recently been argued that even where there is no collusion among bidders, sealed tenders can result in higher prices (Johnson 1979 Oral Auction Versus Sealed Bids: An Empirical Investigation). It is argued that where some bidders possess a known comparative advantage, an advantage of lower cost, for example, then sealed tenders will encourage more bids, and a higher winning bid (Johnson 1979: 317-321). A comparison of prices bid on U.S. Forest Service Timber Sales in Idaho and Montana States showed that sealed bidding yielded higher prices than open-bidding in situations where some bidders have cost or other advantages (Johnson 1979: 326, 330-332). Prices in sealed-bid auctions were roughly 10 per cent higher than in open-bid auctions and this difference was statistically significant.

1/ Vickery 1961 Counterspeculation, Auctions, and Competitive Sealed Tenders; Coppinger, Smith and Titus 1980 Incentives and Behavior in English, Dutch and Sealed-Bid Auctions.

2/ Johnson 1979 Oral Auction Versus Sealed Bids: An Empirical Investigation: 315-335; Haynes 1980 Sealed Bidding and Activity of Outside Bidders for National Forest Timber: 334-346; Mead 1966 Competition and Oligopsony in the Douglas Fir Lumber Industry: 139-141, 187-190, 196-200, 205-207; Mead 1967 Natural Resources Disposal Policy - Oral Auction Versus Sealed Bids: 194-224; Mead 1968 Competition for Federal Timber in the Pacific Northwest - An Analysis of Forest Service and Bureau of Land Management Timber Sales.

Another study of U.S. Forest Service Timber sales, based on sales in Washington and Oregon States, showed both that sealed bidding by itself resulted in higher prices, and that the presence of outside bidders resulted in higher prices under either bidding method (Haynes 1980 Sealed Bidding and Activity of Outside Bidders for National Forest Timber: 346). If sealed bidding encourage outside bidders then it can lead to higher prices on both counts.1/

In summary, the theoretical analysis, confirmed by both experimental analysis and by the empirical analysis of timber sales concludes that sealed-bid auctions can, and do lead to somewhat higher prices bid, especially where the number of bidders is small, collusion is possible, and some bidders have cost or other bidding advantages. Sealed-bid auctions can also lead to higher prices if they facilitate the entry of additional "outside" bidders.

Situations in Which To Use Open-Bid or Sealed-Bid Auctions: Open-bid auctions are appropriate and effective where there are a relatively large number of independent and similar bidders, where there are several blocks of timber to be sold, and, of course, where bidders can gather together at the same time. Sealed-bid auctions are likely to be both more appropriate and more effective where there are fewer bidders, where a single block of timber or concession is being sold, or where bidders are not able to gather together.

With a large number of bidders, an open-bid auction can encourage competition among bidders and generate high bid prices, pushing bids higher in the ascending bid procedure, or ensuring higher bids in the descending bid procedure.

With few bidders, or a few dominant firms, under open-bid auctions bidders know who their competitors are. Open-bidding facilitates direct collusion, or the development of a tacit "cooperative understanding" among bidders which can result in lower prices bid. In sealed-bid auctions, a bidder does not know who his competitors are. Outside bidders may enter. As a consequence, collusion or cooperation among bidders is more difficult. Bidders cannot as easily know how high a bid will be required to obtain the sale. As a result, sealed-bids are likely to realize higher prices in situations in which few bidders are involved.

Where there are several blocks of timber or concessions to be sold, an open-bid auction facilitates their sale. Bidders that are unsuccessful on the first block can bid again on the second, or third block; or successful bidders can bid for further timber supplies. This would not work so well under sealed-bid auctions. Bidders might obtain more timber than they could utilize if they submitted high tenders, or not at all timber if they submitted low tenders. Sealed-tenders work well where only one block of timber, or only one block of timber is sold at a time.

1/ There has been increased use of sealed-bidding on U.S. timber sales in recent years. Earlier studies had not been able to demonstrate a statistically significant relationship between higher prices bid under sealed-bidding in spite of careful study, perhaps because only about 10 percent of timber sales were by sealed-bidding in the earlier period (Mead 1966 Competition and Oligopsony in the Douglas Fir Lumber Industry: 197, 205).

Open-bid auctions are probably best held periodically and at definite times, with a sizeable number of blocks of timber available. It will then be worthwhile for bidders to gather, and thus competition is increased.

Where it is difficult or costly for bidders to gather, timber is better sold by sealed-tenders, in which case sales are better spread out with frequent auctions of single blocks, so that those who are unsuccessful can soon submit a tender at the next auction.

### 10.7.2 Examples of Auctions for Establishing the Level of Forest Charges:

Auctions have been used for the sale of timber in a number of tropical countries. They have generally been used in special circumstances, but their success suggests there is scope for their wider use. The examples illustrate some of the applications of auctions in setting forest charges.

Nigeria: Auctions have been applied on a limited basis in Nigeria. Gmelina plantation timber was sold by auction from 1960 to 1966 in Alepaka Forest Reserve, Anambra State. The plantation areas were to be clearfelled and replanted. The standing timber was inventoried to assess the stocking (volume per hectare). A price was then determined by the Forestry Department for each block. The block was advertised, sealed, tenders called and the highest bid accepted.

Sabah, Malaysia: Sealed-tenders have been used in Sabah, Malaysia to both allocate cutting rights, and establish the level of forest charges on Special Licences, in situations where there is competition for the Licenses. The tender prices in the late 1970's, ranged from $0.20 Malaysian/Hft to $0.30 Malaysian/Hft. (US $2.50/$m^3$ to US $3.80/$m^3$) in addition to normal Royalties.

Although the Special Licences are each smaller in area, and shorter in duration than Concession Agreements, they are an important form of tenure in Sabah. They are more numerous and involve a larger total area. In 1980, Special Licences (of 5 to 20 years duration) outstanding numbered 114 and covered about 8.4 million ha.

Peninsular Malaysian States: A number of the peninsular Malaysian States have levied a Premium on timber licences in addition to the volume based Royalty and Silvicultural Cess. The Premium, usually an area based charge, was intended to reflect increases in timber values and variations in these values among licences. (FAO 1973 Logging and Log Transportation in Peninsular Malaysia: 186-187; Noordin 1977 Assessment of Forest Revenue Based on Inventory Data).

Although the Premium was usually administratively set, a number of states used sealed-tender auctions to establish the levels. Tender prices in the 1970's rose over time reflecting increasing timber values. They averaged two to three times the administratively set rates (Noordin 1977 Assessment of Forest Revenue Based on Inventory Data).

Thailand: In Thailand, both plantation timber and salvage timber on areas to be cleared for plantations are commonly sold by auction. The Royal Forestry Department establishes a minimum price for the plantation timber auctioned. Auctions are held at the regional forestry offices, with bidding by sealed-tender. These auctions have yielded prices three to five times the administratively established royalty rates.

Although the volume of timber sold by auction is, at present, small with Thailand's commitment to the development of plantations, the volume of both salvage timber and plantation timber available for sale by auction will grow substantially.

### 10.7.3 Evaluation of Auctions for Establishing the Level of Forest Charges

Financial Revenue to the Government: Where competition among bidders can be encouraged, auctions can be an effective method of establishing both the level of charges on the timber cut and the level of concession charges. Under competitive auctions, bids will approach the maximum willingness-to-pay of the second highest bidder, as explained above, and revenue to the government will be maximized. Under competitive conditions, prices bid on blocks of timber of differing species, sizes and qualities, in different locations and at differing distances from ports or processing plants will reflect the at differing stumpage values of the timber. Thus auctions can be a flexible means of setting charges to reflect timber values and maximize revenues.

Auctions can also be utilized to establish the level of charges on concessions, and other timber rights, whether they be the initial lump-sum or annual charges described and evaluated in Chapter 8 and 9 (Sections 8.3, 8.4, 8.5, 9.3, 9.4, 9.5). Auctions are ideal for establishing such charges, since it is difficult to determine by appraisal the value to buyers of concessions or other timber rights.

Competition for concessions can be encouraged if the concessions offered are not so large that they are only of interest to a few bidders, if they are well advertized, and if the supply of concessions available is restricted so that the potential bidders exceed the concessions available. Similar conditions apply in encouraging competition in auctions of blocks of timber.

If forest charges are set by means of auctions, then charges are likely to be more responsive to changes in stumpage values and in the values of concessions. Consequently, revenues are likely to be more variable than under other methods, but also higher provided the auctions achieve competitively bidding.

Administration Cost and Practicality: There are certain once-only administrative costs involved in establishing auction procedures. In addition, there are the operating costs of advertising, carrying out the auction process, ensuring sufficient bidders to achieve a competitive auction, and so forth. Apart from these administrative costs the cost of an auction may be relatively low.

If auctions operate satisfactorily, with competitive bidding, then the need for the accurate appraisal of stumpage values, and of the value of concessions to establish the level of charges on timber and concessions is greatly reduced. The manpower demands for and costs in information gathering of prices and costs; in estimating forest product prices, processing costs transportation costs, and logging costs; in deriving stumpage values; and in setting charges are reduced if not eliminated.

For most countries, the competitive conditions necessary for auctions to function effectively are likely to occur only in certain situations; to be found only in certain parts of the country, or to apply only to certain types of timber or timber rights. Thus while timber appraisal will still be required for setting charges by other methods, the level of charges achieved by auctions can assist the appraisal process. Auctions of timber or concessions, even in limited areas, can provide useful information from the prices bid on the general levels of stumpage values; on differences in stumpage values between species and location, with distance, etc.; and on values of concessions. Thus auctions can complement and support other methods of setting the level of forest charges.

Economic Efficiency in Utilization Forest Management: Under competitive bidding by either open-bid, or sealed-bid auctions, if bidding comes close to reflecting the value of the timber involved, the forest charges established by bidding will approximate the relative value of the different species, qualities, locations and other characteristics of the timber involved. Under such circumstances higher valued species will attract higher bids, low valued species minimal bids; near or more conveniently located stands higher bids, distant or less well sited stands low bids. As a result, incentives for over-cutting higher valued, or near stands will be dampened by the higher charges bid and the utilization of lower valued species, or more distant stands encouraged by the lower charges bid.

Forest charges established by auctions will serve both to allocate the timber among bidders, and allocate timber to its fiancially most valuable use. If the timber is of more value to one bidder because he has a more efficient processing plant, then he will be able to out-bid others, and the timber will be allocated to him at the higher charge bid. Or, if timber is of higher financial value as sawlogs than as export logs, then auctions will allocate the timber to that use, and at a level of charge reflecting the value in that use. Thus efficiency in utilization and in forest management will be encouraged, but only if bidding is competitive and if all the economic benefits and costs are reflected in the financial values to the bidders. Where there are economic benefits to the utilization of the timber for certain purposes, then constraints on the allocation of timber by means of the auction process may be appropriate. For example, it may be economically desirable to reserve a certain volume of timber for local use, or for local processing, or to auction it separately.

Distribution of Economic Effects, Revenue and Income: Where competition among bidders is obtained, auctions can be expected to result in forest charges that approach the value of the timber, or concessions, to the bidders. In such circumstances, the stumpage value of the timber will be collected by

the government as revenue rather than as above-normal profits by the forest industry.

The distribution of economic effects on employment, regional development, prices and foreign exchange earnings will be the result of the allocation of the timber to its financially most valuable use and to the highest bidder. Since auctions allocate timber to the highest bidder, they are neither suitable nor appropriate for achieving distributional objectives. Distributional objectives can be served only through introduction of constraints, such as mentioned above, in which a certain volume of timber is reserved for allocation to local uses or for local processing.

Overall Evaluation and Guidelines for Auctions: If competition among bidders can be relied upon or encouraged, open-bid or sealed-bid auctions can work well to establish charges on timber and on concessions which approach the value of the timber, or that of the concession. If competition among bidders can be achieved, forest charges will reflect the relative value of different species and qualities of timber in different locations, etc. Utilization of lower valued timber will be encouraged, over-cutting of high valued species discouraged. Charges will approach the value to the buyer and revenues will be maximized. Administration will be relatively easy. Timber appraisal will be less necessary, and thus data requirements on prices and costs less pressing.

However, all these advantages depend crucially on the government's ability to encourage competition among bidders. The greater the level of competition that can be encouraged, the closer will the bidding approach the buyer's maximum willingness-to-pay.

Auctions can be usefully introduced in a limited way, applying them to the sale of certain timber, or to certain areas, choosing those situations in which competition is present, or can be encouraged. It is suggested, for example, that timber be sold in relatively small blocks to make them attractive to a large number of bidders, and to enable almost all bidders to obtain at least part of their timber supply. This will both encourage competition and provide all bidders with an equal opportunity.

The limited use of auctions will provide information on the value of timber to buyers, which will guide both timber appraisal and the setting of charges on other timber.

## 10.8 PUBLIC LOG MARKETS

For developing countries, public log markets offer some distinct advantages, not only in establishing the level of forest charges, but also in forest management, in allocating timber among various uses and in encouraging economic development. The public log markets in Thailand provide a good illustration of their application and potential.

In developed countries, public log markets have been seriously proposed for the sale of public timber in the United States. They have been carefully evaluated, but have not yet been tried (Mead 1976 Log Sales vs. Timber Sales; Clawson 1978 Public Log Markets as a Tool in Forest Management). These

proposals for the United States, along with their evaluation, and the practical experiences in Thailand provide a useful framework for the evaluation of the potential for application of public log markets in developing countries.

### 10.8.1 Description and Operation of Public Log Markets

The basic structure of a public log market consists of (a) a log assembly yard, to which logs would be delivered, (b) grading and sorting facilities and (c) procedures for the sale of logs either by periodic auction, or on a regular basis at established prices. While this basic structure of public log markets is explained and one or two variations are described, there is opportunity for variations in the structure and operation of a public log market, to suit the conditions of individual countries, or particular locations and circumstances.

Public log markets should normally be located at some natural log assembly point, where the log transportation system converges, where there is a concentration of processing plants, or where logs are transferred between transport modes. However, log markets might also be established at locations where the government wishes to develop wood processing centers.

To function well any private firm or public agency should be able to send logs to the public log market for sorting, grading and sale. The sale of privately owned logs through the log market would increase the volume of logs handled and lead to a broader and more competitive log market, more competitive bidding and higher prices for all logs.

At the log assembly yard, logs would be graded and sorted into a reasonable number of grades, based on species, size and quality, and related to their uses for sawnwood, plywood, export logs, furniture stock, etc.

Where the logs are sold by auction, graded logs would be sold at regular weekly or monthly auctions in lots of relatively small size, so as to make them accessible to as many bidders as possible, and thus attract the highest prices.

Some of the logs could be sold at fixed prices based on auction prices, or on "market clearing" prices, adjusted up or down so as to maintain a balance between minimal inventories and steady prices. Negotiated sales of some logs are another alternative. A combination of auction sales and these other two selling methods, for which auction prices provide a benchmark, might be a feasible alternative in many situations.

Log markets avoid the problems, both of timber appraisal prior to setting forest charges for standing timber, and the surveying of standing timber prior to its sale.

On the other hand, disposal of public timber through public log markets requires government involvement in joint ventures, or full government ownership and operation of concessions, as described in the previous chapter (Section 9.16). This involves the government in a much more active role in

logging, in planning and overseeing logging operations, in hiring and supervising logging contractors, and in laying out and constructing roads.

### 10.8.2 Examples of Public Log Markets

The most complete example of public log markets is that of Thailand. There are other examples of situations which have some of the characteristics of public log markets.

Thailand: In Thailand, the log markets operated by the government owned Forest Industries Organization illustrate the operation of successful and well-established log markets. The state owned Forest Industries Organization, mentioned in Chapter 8 (Section 8.16), is the largest concession holder in Thailand. It controls over three-quarters of the mature teak forests, has almost sole responsibility for the extraction and marketing of teak and yang (Diterocarpus spp.), and undertakes most of the harvesting itself. It also operates three large sawmills, several plants for further wood processing and a number of small transportable sawmills operating in the forests.

About half the logs produced in the Organization's logging operations, but not utilized in Forest Industries Organization sawmills, or in the government owned Thai Plywood Company, are transported to two central log storage yards near Bangkok, and sold by public auction.

These log storage yards provide the basis for the log market. Sorted and graded logs from the storage yard are sold at twice-monthly auctions by sealed-tender bidding. A fixed minimum price is established. The auctions have been successful in achieving competitive log prices, with 30 to 50 processing plants or other bidders involved at each auction.

The inferior teak logs not utilized in the Forest Industries Organization transportable sawmills are sold locally at periodic auctions.

### 10.8.3 Evaluation of Public Log Markets

Financial Revenue to the Government: Public log markets are based on the sale of the primary product and on log values rather than on the sale of standing timber and on stumpage values. Thus the net financial return to the government is derived from the prices received for the logs, less the costs incurred in logging and transporting the logs to the log market. If the log prices received are high, and logging and log transportation costs (or payments to logging and trucking contractors) are reasonable, then the net financial return to the government will be high and will reflect stumpage values.

Public log markets can be an effective revenue source if they achieve log prices which approach the buyers' maximum willingness-to-pay values. Log markets will do so if they are efficient and competitive, that is if they:

- are centrally located to minimize the costs of transporting logs.
- operate efficiently and at low cost.

- generate sufficient competition among bidders to ensure bids approaching the buyers' maximum willingness-to-pay value of logs.

- encourage the allocation of logs to their highest value use through competitive bidding.

An efficient and competitive log market is necessary to realizing high forest revenues, but it is not sufficient. It is also important that logging and log transportation be efficiently organized and carried out at low cost.

The government may undertake the logging and log transportation activities itself, although it is more likely to rely on contractors. Where the government relies on contractors for specific logging and log transportation activities, it will still be necessary to plan the overall operations efficiently if costs are to be minimized. To minimize costs it will also be necessary to supervise and coordinate the activities of contractors.

Finally, where contractors are utilized for logging and log transportation functions, it is important that competition for contracts be encouraged. Competition among contractors will ensure that contract rates for logging and transportation reflect the costs involved and a reasonable return on the investment by efficient contractors. Open-bid or sealed-bid tendering on logging contracts will contribute to competition.

Competition will be improved if the contract logging and log transport industry is encouraged, if entry of new contractors is encouraged, and if relatively small contractor operations are encouraged wherever warranted.

Administration Cost and Practicality: Public log markets offer several administrative advantages and cost savings. However, new administrative initiatives would also be required.

The sale of timber through public log markets would avoid the elaborate and costly process of timber appraisal needed in establishing of the level of charges by most other methods.

The supervision of utilization standards, silvicultural requirements, selective logging operations, regeneration, plantation thinning, etc. could be easier, as the logging would be carried out by the forest service, by a public agency, or by contractors directly responsible to the forest service.

Administrative problems of evasion will be minimized under public log markets. The logs are scaled by the agency operating the log market prior to sale. Payment by purchasers can be required prior to their removal.

Alongside these advantages, the sale of timber by public log markets would require new initiatives. The forest service, or a new public agency, would have to undertake initiatives in planning and coordinating logging activities, the transportation network and log transportation activities. It would need to encourage bids from, and select logging and log transportation

contractors, supervise contractors, and enforce their performance in meeting logging and forest management conditions. Alternatively, the forest service or the public agency would have to develop its own capability in logging and log transportation, or in both.

The development of these capabilities would involve significant implementation costs and manpower requirements, although they would be partly or fully offset by reductions in costs and manpower for appraisal of standing timber, for policing logging activities and for enforcing regulations.

The government will have to fund the initial costs of financing road construction and logging activities although these costs will be recovered later from the sale of logs on the log markets. These initial expenditures, will be more than repaid if public log markets result in higher net revenues resulting from greater competition for logs and better allocation of logs among users and end uses.

Economic Efficiency in Utilization and Forest Management: Public log markets offer important advantages in the utilization of logs and of the forest resource, and advantages for forest management.

In the utilization of logs, public log markets work to direct logs to their highest value use, and to the production of the most valuable processed products. The grading and sorting of logs into uniform lots by species, sizes and quality, tailored to the end uses, and the sale of these lots by auction will help to direct logs to their most appropriate use. In addition, with an input of logs of uniform species, size and quality, both the production of processed products and the recovery from the logs can be greater. If log markets also encourage the grouping of processing plants nearby, then it will also facilitate the utilization of waste wood for pulp chips, panel boards, pulp, etc.

Thus, log markets can extend to smaller non-intergrated firms, the benefits already achieved by large integrated firms, the benefits from allocation of logs to their best use and the benefits from utilization of waste wood in production of other products.

In addition to the better utilization of logs, public log markets provide opportunities for improved utilization in the forest. With forest revenues collected from log sales rather than from standing timber, it will be economical to harvest timber as long as the anticipated log prices cover the marginal or incremental costs of harvesting and delivering the logs. The marginal or incremental "costs" involved in harvesting additional timber from a stand may be quite low, especially if the logging roads are already in, and logging is already underway on the area (see Chapter 4, Section 4.4). If so, even low priced logs can cover their marginal, or incremental, harvesting costs, generate additional forest revenues and be of positive marginal stumpage value. The removal of lower priced species, smaller diameter trees and logs, and lower quality timber will be encouraged, with fuller utilization of the forest achieved.

In addition, public log markets can facilitate forest management and incorporate non-market, economic values into harvesting decisions. Trees that

should be removed for silvicultural or forest management reasons can be cut and the logs sold in the public log market, even if the prices received do not cover the logging and transportation costs. Rates per cubic metre paid logging contractors can also be set to encourage removal of certain trees or stands for silvicultural, or forest management purposes (even though the prices received might not cover the costs and the timber would not be harvested by private operations).

For example, in the management of high forest stands, removal of undesirable species can be encouraged by higher contract logging rates per cubic metre which reflect the economic benefits of their removal. Salvage logging of plantation sites can be encouraged by higher contract logging rates that reflect the economic benefits from clearing the site. Likewise, in the selective cutting of high forest stands, trees of the more valuable species can be discouraged by lower contract logging rates that make it unattractive to remove those trees.

In addition to the contract rates, contract terms and conditions can also be written to require, or encourage, desired silvicultural activities.

Distribution of Economic Effects Revenue and Income: Public log markets, if sited at appropriate locations, can serve as catalysts in the development of the forest products industry, or in regional development. By selling logs in smaller lots suited to end uses, graded and sorted by species, quality and size, public log markets can make it easier for small processing plants to compete against larger integrated companies. This may make possible the establishment or expansion of a local processing industry to utilize the timber supplies more fully.

The location of log markets can provide a significant incentive for the concentration of sawmills, veneer and plywood plants, furniture factories and other wood processing industries, and the establishment of wood processing centres. With the sorting of logs, individual plants can concentrate on production of specific products. The concentration of the processing industry at centres may also encourage the development of new processing industries based on wood wastes and producing products such as particle board, hardboard, or even wood pulp. Thus, log markets can play an important role in regional development.

Log markets will also result in increased employment. Employment per cubic metre of timber harvested will be increased if a greater proportion of the timber is processed rather than, for example, exported as logs. Employment will be further increased if log markets lead to fuller utilization of the forest, and to the utilization of waste wood for by-products.

Where log markets encourage production of processed products they may also result in lower prices and greater availability of forest products within the country, or in increased foreign exchange earnings from exports of processed products.

Where log markets are able to operate effectively and bidding is competitive, the distribution of the stumpage value of the timber will be predominantly as revenue to the government, rather than as profits to the

industry. Increased employment in processing would result in increased employment incomes and could result in higher wages, and increased availability of processed products could result in lower prices for these products.

Overall Evaluation and Guidelines for Public Log Markets: As apparent from the above evaluation, public log markets can offer significant advantages for forest revenues, in allocating timber among uses, in forest management, as well as in collecting revenue. Competition among buyers in the log market can lead to bidding that approaches the maximum willingness-to-pay of the buyers, and it will direct logs to those buyers who can make the best use of the logs and toward the most valuable products. The result can be increased forest revenues.

The opportunities for more direct control of logging operations will facilitate improved utilization of the forest and better forest management. Public log markets also avoid the administrative problems and manpower requirements of stumpage appraisals to set the level of charges.

One of the major constraints on public log markets is the administrative demands and manpower requirements in planning logging operations and in supervising logging contractors. Another is the once-only initial investment required for road construction and in financing the start-up of logging operations. These disadvantages can constrain the application of public log markets for most countries.

Both because of these administrative constraints, and because public log markets function best with competition among buyers, it is suggested that public log markets be introduced in a limited way, and restricted to situations in which competition among buyers can be ensured. The limited introduction of log markets in one or two locations would make it possible to gain experience in the operation of log markets, and in the planning and supervision of logging operations, within manageable manpower and budget requirements. These would provide training and experience to staff and allow for the later expansion of log markets to other areas.

Log markets are particularily promising for tropical countries with diverse forests and many species. They can facilitate both fuller utilization of the timber and improved forest management.

## 10.9 MINIMUM FOREST CHARGES

This chapter has been concerned, thus far, with establishing the level of forest charges, based on the stumpage value of timber to the forest industry and the value of concessions to concession holders, the values to buyers identified in the exchange model of Chapter 3. However, the other consideration in setting the level of charges is the value of timber and concessions to sellers, the basis for minimum forest charges.

The conceptual basis for minimum forest charges on the timber cut was established in Chapter 5. Minimum charges should at least cover the administrative costs of selling the timber, unless there are economic benefits from harvesting the timber.

Higher minimum charges would be justified if standing timber is expected to be of greater financial value to the government in the future, or if there are significant alternative uses for the timber. If timber is expected to be of greater value in the future and will be sold at higher forest charges, minimum forest charges today should be set to reflect the discounted present value of the higher future revenues expected.1/ Higher minimum charges will also be justified if there are significant alternative economic uses of the forest and the standing timber, for food, game, leaves, bark, medicines and a host of other minor products; or for erosion control, watershed protection and other values. Most of these alternative uses involve non-market values and require economic analysis for their evaluation.2/

It is important that minimum forest charges be established on the timber cut, to avoid selling timber too cheaply, at prices below the cost of selling it, below the value in other uses, or below the value of the future uses. After all, the timber if left will still be available for sale next year.

On the other hand, where there are economic benefits from harvesting the timber of certain species, in certain areas, or under certain situations, then the minimum charges should be lowered to reflect these benefits and to encourage harvesting. Some of these economic benefits include those from salvage logging, silvicultural harvesting or improved utilization, and were identified in Chapter 5.

The establishment of minimum charges on concessions is equally important. The conceptual basis for minimum concession charges was presented in Chapter 6 (Section 6.3). The basis for minimum concession charges parallels that for minimum charges on timber. Minimum charges on concessions should reflect the administrative costs to the government in allocating and supervising concessions. Higher minimum charges on concessions would be justified if concessions are expected to be of greater financial value to the government in the future, or if alternative uses of the concession areas are of significant economic value. These alternative economic values, mentioned in discussing minimum charges on the timber cut, include a number of non-marketed uses and environmental values.

The establishment of minimum forest charges on timber and on concessions requires both financial analysis of the administrative costs involved, and economic analysis of the alternative uses of the standing timber and of the concession area. Ideally minimum charges should vary with species, location and other factors. However, in practice it may be simpler, easier and perhaps

1/ The concept of discounted present values was discussed in Chapter 5. The concept and the mechanics of discounting are explained in Gregersen and Contreras 1979 Economic Analysis of Forestry Projects: 99-110.

2/ Chapter 7 of Gregersen and Contreras 1979 Economic Analysis of Forestry Projects discusses the shadow pricing of forestry outputs where market prices are absent or inadequate measures of economic values.

safer to apply a uniform minimum charge on all species of timber throughout the country, and a uniform concession charge to all concession areas.

## 10.10 SUMMARY

This chapter has reviewed and evaluated six methods of setting the level of forest charges. They represent a diversity of approaches to settng the level of charges. The advantages, disadvantages, benefits and problems of each method have been evaluated within the framework of the four broad criteria established in Chapter 7, and previously applied to the types of forest charges.

Table 10.1, presented at the beginning of the chapter, provides a convenient summary evaluation of the six methods of setting the level of charges.

From the review and evaluation of these six methods of setting the level of forest charges, as well as the survey of their application in tropical countries, two conclusions emerge. First, while each method has advantages and disadvantages that make each suitable to specific situations, no single method of establishing the level of forest charges is likely to be ideal for all situations. For example, public log markets can be suitable where there is strong competition for logs, where there are benefits from integrated utilization of logs, and where the forest administration is equipped to operate the log market, plan and supervise logging activities. Open-bid or sealed-bid auctions of standing timber can be suitable where competition for standing timber exists, or can be encouraged. Under such conditions auctions can have important advantages.

Formula approaches and ad valorem charges have advantages in the adjustment of charges for price changes and inflation, but are only suitable where log or forest product prices are available, or if posted prices can be established.

Administratively set, fixed-rate charges are widely applicable, but have significant problems. To reflect stumpage values, or the value of concessions, and to yield significant revenues, they rely on appraisals of stumpage values, or of concessions. In addition, they have proven difficult to adjust for changing stumpage values and inflation.

Negotiation of forest charges is of limited application. It is recommended only for setting the level of initial lump-sum concession charges, and where the government's bargaining power approaches that of the forest industry.

The second conclusion which emerges is that several of these methods can assist in setting the level of charges established by some of the other methods. For example, stumpage prices bid in open-bid, or sealed-bid auctions can provide information on stumpage values, which, in turn, can help in establishing the levels of administratively set charges, the levels of ad valorem rates, or for establishing the parameters in formula approaches. Public log markets, for example, will generate log prices which can serve as a basis for

ad valorem charges. Public log markets will also provide information on logging costs, log hauling costs and stumpage values, useful in establishing setting the levels of administratively set charges, the levels of ad valorem rates, and the parameters of formula approaches.

Thus there may be gains from a planned and integrated combination of methods of setting the level of forest charges, provided each is applied where its strengths and advantages are found.

# Chapter 11

# STUMPAGE APPRAISAL

## 11.1 INTRODUCTION

Stumpage appraisal is the estimation of the financial value to the concession holder of standing timber to be logged and marketed as logs or as processed products, the buyers willingness to pay in the bargaining model framework of Chapter 3. Stumpage appraisal is an extension of this framework and an application of the derived demand model of stumpage value discussed in Chapter 4.

Stumpage appraisal can be helpful as a guide in establishing forest charges where there is competition among buyers of standing timber, as in open-bid and sealed-bid auctions. Where there is no competition among timber users, some form of stumpage appraisal is required. Without an appraisal charges can easily be set too low, too high or incorrectly. If set too low, there will be substantial loss of revenue and overcutting. If set too high timber will be left, with loss of revenue. If set incorrectly cutting activities will be distorted, utilization and forest management frustrated. Some form of stumpage appraisal is required in establishing the level of administratively set, fixed-rate charges, the level of ad valorem rates, the parameters in formula approach, or in guiding negotiations on forest charges.

Stumpage appraisal is often more important for developing countries than in the developed countries. Yet in developing countries the information required to undertake a stumpage appraisal (information on market prices of products, costs of manufacture, costs of logging and transportation costs) are often less easily obtained and less reliable than in the developed countries. In addition, developing countries are often short of the administrative training, skills, expertise and manpower to undertake the timber appraisal under these more difficult circumstances. There is no simple solution to these divergent demands for, and abilities to carry out, appraisal. Rather than hoping to implement sophisticated timber appraisal arrangements based on imprecise figures, the solution must be to depend on revenue systems that are where possible self adjusting and automatic and to utilize simple appraisals to establish reasonable levels of forest charges.

This chapter is intended as an overview survey of stumpage appraisal, not as a comprehensive guide, or appraisal manual. It focusses first on the basic objectives, concepts and principles of stumpage appraisal, in order to provide a framework within which the main components of stumpage appraisal, information needs, problems and issues are reviewed.

In this review, the stumpage appraisal systems of some developed countries are introduced (e.g., US Forest Service, US Bureau of Land Management, British Columbia (Canada) Forest Service). Also, the experiences of developing countries in stumpage appraisal and in estimation of logging costs are drawn upon. Examples of appraisals in tropical countries are reviewed.

Finally, suggestions for stumpage appraisal in tropical countries are proposed.

## 11.2 OUTLINE OF STUMPAGE APPRAISAL

In practice stumpage appraisal is far from simple, requiring perhaps an operational inventory of the stands appraised; the determination of market prices of logs, or processed products for the best use of the timber; estimation of logging, transportation and processing costs, as appropriate; and determination of an allowance for profit. These and other problems are discussed below.

In outline stumpage appraisal is simple. The value of the standing timber is calculated as the selling price of the logs, or processed products produced, less the cost of processing, transportation and logging, and an allowance for profit. Appraised stumpage values are therefore residual determined, based on the derived demand for the standing timber in various alternative uses. Stumpage appraisal represents an application of the derived demand model of stumpage value, presented in Chapter 4.

The basic outline of stumpage appraisal is illustrated in Table 11.1. The starting point of stumpage appraisal in Table 11.1 is the export price of logs. To be an appropriate starting point, the log prices used should reflect competitively determined average prices for the species, grades and qualities of logs being appraised.1/ From this starting price are deducted operating costs moving backwards to the standing tree: stevedoring charges, port charges, hauling costs, loading costs, skidding costs and felling costs. Deduction of operating costs from log prices leaves the amount available for profit and forest charges, termed the "conversion return". This conversion return is then divided between profit and forest charges.

The conversion return and stumpage value can be defined symbolically:

Where: $R$ = selling price /$m^3$

$C$ = operating cost including depreciation /$m^3$

$M$ = allowance for Profit /$m^3$

$S$ = stumpage value /$m^3$.

$R = C + M + S$

Conversion Return = $R - C = M + S$

Stumpage value = $R - C - M$.

1/ If there are few log buyers, with market power on the side of the buyers, market prices will reflect less than the full value of the timber.

Table 11.1

A SIMPLIFIED STUMPAGE APPRAISAL CALCULATION
BASED ON EXPORT LOGS

| | Value per cubic meter of logs (converted to US$) |
|---|---|
| Export price of logs | 150.00 |
| minus handling hauling cost and logging costs | 60.00 |
| equals Conversion Return: the amount available for profit and stumpage charge | 90.00 |
| minus allowance for profit | 15.00 |
| equals appraised stumpage charge | 75.00 |

Table 11.2

A SIMPLIFIED STUMPAGE APPRAISAL CALCULATION
BASED ON PLYWOOD PRODUCTION

| | Value per Cubic Metre of Product (converted to US$) | of Logs |
|---|---|---|
| selling price of plywood | 480.00 | |
| equals selling price of plywood per cubic metre of logs used (recovery factor 0.50 $m^3/m^3$ of logs) | | 240.00 |
| selling price of pulp chips | 60.00 | |
| equals selling price of chips per cubic meter of logs used (recovery factor 0.30 $m^3/m^3$ of logs) | | 18.00 |
| equals selling price of plywood and chips per $m^3$ of logs used | | 258.00 |
| minus plywood manufacturing converted to a per cu $m^3$ of log input basis | | 90.00 |
| minus log handling, hauling and logging costs | | 60.00 |
| equals Conversion Return: the amount available for profit and stumpage charge | | 108.00 |
| minus allowance for profit and risk (in logging and plywood manufacture) | | 40.00 |
| equals appraised stumpage charge | | 68.00 |

The determination of the appropriate allowance for profit is an important aspect of stumpage appraisal. The several methods of stumpage appraisal are distingushed primarily by their approach to estimating this allowance for profit.

This simplified stumpage appraisal in Table 11.1 illustrates the residual nature of stumpage values, as well as their dependence on accurate prices and cost figures and on reliable profit allowances. For example, if the export price of logs is underestimated by 10%, this adds $15.00 to the price of logs and $15.00 to the appraised stumpage value, a 20% increase in the appraised stumpage price. Similarily, a 10% fluctuation in the world price of logs results in a 20% change in the appraisal stumpage value. In this particular example, as logging costs happen to be smaller than the appraised stumpage value any over- or under-estimates of logging costs will have a smaller percentage impact on the appraised stumpage value. However, for low valued species, with lower appraised stumpage values, the impact of any inaccuracies in logging cost estimates on stumpage values would be proportionately larger.

The allowance for profit has a direct impact on appraised stumpage values. If the allowance for profit is too generous, appraisal stumpage values will be too low. If the allowance for profit is too small, appraised stumpage values will be higher than the forest industry will be willing to pay.

If the market for logs is not a competitive with well defined market prices, if processed products represent an alternative use of the logs, or if the logs go directly to a processing plant operated by the concession holder, then stumpage appraised must start from the market prices of the processed products and by-products. Table 11.2 outlines a stumpage appraisal based on plywood prices and can be compared with the appraisal based on export log prices presented in Table 11.1 above (both tables are presented on page 217 above).

In Table 11.2 the value of the plywood produced from a cubic metre of logs is estimated at US$240.00/$m^3$ of logs, based on the market prices of plywood and a recovery of 50% (two cubic metres of logs required for each cubic metre of plywood).

The recovery of more than a single product from the logs is also illustrated in Table 11.2 by the recovery of pulp chips. The value of this by-product is also adjusted for the recovery of chips and the value added to that of the plywood produced from a cubic metre of logs. Reliable estimates of recovery factors is important. They can have a significant influence on appraised stumpage values, as they affect the rather high values of products and enter at an early stage in the appraisal process.

From the value of plywood and chips produced from a cubic metre of logs plywood manufacturing costs are deducted. The usual means of measuring manufacturing costs is based on plywood output rather than log basis, so these too need to be converted to a log input basis.

Log handling, hauling and logging costs are deducted, as in Table 11.1, to arrive at the conversion return, the amount available for profit and stumpage charges. The allowance for profit in this case must include both logging profit and plywood manufacturing profit. Deduction of the allowance for profit leaves the appraised stumpage value.

Basing stumpage appraisal on the market price of plywood involves extra steps, the estimation of additional costs and the possibility of introducing additional inaccuracies. Yet, it may be necessary if there is no competitive log market, or if processed products represent a more valuable use. The appraised stumpage value will obviously vary depending on the products produced. It may be that logs, lumber, plywood or some other products yield the highest stumpage value. In this illustration it turns out that export logs yield a slightly higher appraised stumpage value than plywood and pulp chips; US$75.00/$m^3$ as export logs versus US$68.00/$m^3$ as plywood and pulp chips. However, it could have turned out the other way.

Stumpage appraisal should be based on the highest value use that is feasible. In the illustration, stumpage charges should be based on the US$75.00/$m^3$ appraised value as export logs if export logs are a feasible use. However, if there is an export ban on unprocessed logs then forest charges should be based instead on the lower US$68.00/$m^3$ appraised value of logs for plywood production and pulp chips.

### 11.2.1 Analytical Methods of Stumpage Appraisal

The analytical methods of stumpage appraisal, outlined above, differ primarily on how they divide up the conversion return between profit and stumpage value, that is, on how they establish the allowance for profit. There are two general methods; the overturn method and the investment method (Explained in Davis 1966 Forest Management: 394-400; Forbes 1955 Forestry Handbook: 15.18-15.25).

Overturn Method: In the Overturn Method the allowance for profit is determined either as a proportion of the conversion return itself, or as one of three ratios between profit, operating costs, or selling price. A proportional division of the conversion return between profit and forest charges is simple. A 50-50 split is a common proportion.

Alternatively, the allowance for profit is determined on the basis of one of three ratios. These three versions of the Overturn Method, and the corresponding ratios, are defined and described in turn. They are defined in symbols using the following terms:

Where: R = selling price /$m^3$

C = operating cost including depreciation /$m^3$

M = allowance for profit /$m^3$

S = stumpage value /$m^3$

The three ratios are:

P = profit ratio

Q = selling value ratio (ie. return on sales)

O = operating ratio

1. Profit Ratio: In this version of the Overturn Method, the allowance for profit is expressed as a proportion of the sum of production costs and stumpage value, expressed as decimal fraction:

$$P = \frac{M}{C + S}$$

By rearranging terms and with a given profit ratio the allowance for profit /$m^3$ is:

$$M = P(C + S)$$

By substitution this allowance for profit /$m^3$ can be expressed as:

$$M = \frac{P \times R}{1 + P}$$

This later formulation allows direct calculation of the allowance for profit from the assumed percentage profit ratio, and the selling price of the logs, or products.

2. Selling Value Ratio: In this version, the allowance for profit is calculated as a percentage of the selling price, expressed as a decimal fraction:

$$Q = \frac{M}{R}$$

By rearranging terms and with a given selling value ratio the allowance for profit can be determined directly, as a proportion of the price of the logs or product:

$$M = Q \times R$$

3. Operating Ratio: In this version of the Overturn Method the allowance for profit is established as the ratio of operating costs plus stumpage over the selling price:

$$O = \frac{C + S}{R}$$

By rearranging terms and substitution the allowance for profit /$m^3$ can be expressed is in terms of the operating ratio:

$$M = R(1-O)$$

Once the operating ratio is assumed, the allowance for profit can be calculated directly from selling prices.

Although the Overturn Method may use one or other of the three ratios, in practice it makes no difference which ratio is used. The three ratios are mathematically related. As shown each can be derived directly from the others. In all three the allowance for profit turns can be expressed as a percentage of the selling value.

Overturn Methods are appropriate where operating costs are the major cost factor and therefore provide a reasonable basis for determining the allowance for profit. In such circumstances, working capital and risks are closely related to the operating costs.

Investment Method: In the Investment Method the allowance for profit is related to the investment in capital equipment and working capital. It is most appropriate to stumpage appraisal on concessions involving large investments in developing logging operations, or processing plants.

The average annual investment is calculated from the initial investments and their scrap values, plus the average working capital requirement. To determine the allowance for profit an appropriate rate of return is applied to this average annual investment. The appropriate rate of return should reflect the rate of return earned by similar investments elsewhere, and the risks involved in the particular forestry situation to which the appraisal applies.

### 11.2.2 Direct Methods of Stumpage Appraisal Based on Transactions Evidence

Rather than deriving stumpage values analytically, as outlined above, based on market prices of logs or products and cost estimates and an allowance for profit, stumpage values may be arrived at directly, from transactions evidence of sales of standing timber. This method of stumpage appraisal is relatively straight forward but requires the existence of competitive markets in which standing timber is sold to a large number of actively competing independent firms. Consequently, it will be of limited application to developing countries, only in special situations.

In the direct method the stumpage prices received from sales of standing timber are used as the basis for stumpage appraisal. A sample of a large number of sales is analyzed, for example by regression analysis or other statistical techniques, to identify the effect of various factors on the stumpage prices received and the magnitude of these effects. Factors such as species, size, quality, stand density, distance, end uses, etc., are evaluated, and the significant variables identified. These variables and the magnitude of their influence on prices then serve for the appraisal of stumpage values of other stands.

## 11.3 STUMPAGE APPRAISAL IN DEVELOPED COUNTRIES

Perhaps the best known and most developed stumpage appraisal systems are those of the United States Forest Service, applied to the sale of public

timber from the National Forests; the United States Bureau of Land Management, applied to the sale of public timber from public lands under BLM management; and the British Columbia Forest Service, applied to the sale of public timber from Crown lands in the Canadian province of British Columbia. They are also the most sophisticated and the most complex. The stumpage appraisal chapter in the U.S. Forest Service Manual, for example is about 150 pages long. The U.S. Forest Service Timber Appraisal Handbook for Region Six (The Pacific Northwest) extends to over 300 pages.

It is not possible to review these stumpage appraisal methods in any detail. Nor is it appropriate. They have been developed within the context of their particular forest administrations, and based on the information, data and expertise available.

The U.S. Forest Service and British Columbia Forest Service appraisal systems are reviewed briefly, with references provided for those who wish to survey them in detail.

### 11.3.1 United States Forest Service Stumpage Appraisal

The U.S. Forest Service uses several methods of stumpage appraisal. The Overturn Method is the most commonly used method. Appraisals are based on estimated sales of the manufactured products (lumber, plywood, veneer, and by-products such as pulp chips). The allowance for profit is based on profit ratios: sales and costs figures are derived mostly from industry experience.

The investment method is used only in limited circumstances. It has been used for stumpage appraisal of large blocks of timber for which a processing plant was to be built, such as found in Alaska (Davis 1966 Forest Management: 394). It is now applied primarily in the valuation of young growth timber and under special circumstances.

The direct method, based on transactions evidence, is used in the southern and eastern United States, where there are large areas of private forest land and a viable private market for standing timber.

The U.S. Forest Service appraisal systems are described in detail in the Forest Service Manual and the Timber Appraisal Handbook of Region Six, the Pacific Northwest (United States Forest Service 1977 Forest Service Manual Title 2400 Timber Management, Chapter 2420 "Timber Appraisal"; United States Forest Service 1979 Timber Appraisal Handbook). They are described in less detail and evaluated in Davis (1966 Forest Management: 380-419).

### 11.3.2 British Columbia Forest Service Stumpage Appraisal

Stumpage appraisal in British Columbia is based on the Overturn Method, with the allowance for profit determined by means of profit ratio. The B.C. Forest Service uses two appraisal systems: one for coastal British Columbia, another for the interior of the Province. In coastal areas, appraisals start from the selling price of logs sold on the Vancouver open log

market. In interior areas of the Province, appraisals start from lumber prices and the price of the by-product, pulp chips.

The British Columbia appraisal system is decribed by Juhasz (1976 Methods of Timber Appraisal in British Columbia: 56-88). Stumpage appraisal has been evaluated, both by a government task force and more recently in a government white paper (British Columbia, Task Force on Crown Timber Disposal 1974 Timber Appraisal; British Columbia, Ministry of Forests 1980 Alternatives for Crown Timber Pricing).

## 11.4 STUMPAGE APPRAISAL AND LOGGING COST STUDIES IN DEVELOPING COUNTRIES

Stumpage appraisal in developing countries is not as detailed, nor as complex as the examples from the United States and Canada, surveyed above. Such complex and detailed systems are not likely to be appropriate to most tropical countries. Developing countries face different problems and constraints, and have different objectives.

### 11.4.1 Examples of Stumpage Appraisal and of Logging Cost studies in Developing Countries

The examples presented below illustrate the experiences of several tropical countries in applying stumpage appraisal and in deriving estimates of logging costs. The examples are selective, but are illustrate a variety of approaches and ideas of application to other countries.

Liberia: A methodology for the estimation of logging costs, and for appraisal of the margin between log production costs and FOB log prices (the conversion return, defined above) was developed as a component of a project undertaken by FAO for the Government of Liberia in the 1970's (FAO/UNDP 1976 Liberia Natural Resource Development: Establishment of a Concession Secretariat, Forest Concessions; Appendix 5 Manual for Estimation of Margin Between Log Production Cost and Log Value FOB Liberia Port).

The manual provided a detailed framework, and a step by step methodology, including worksheets, for the calculation of logging costs. It was suggested that the calculation be updated annually, if possible, and that forest charges also be revised annually, based on these production costs and on market prices (FAO/UNDP 1976 Liberia Natural Resources Development: 2, 21, 25, 26).

The report also recommended improved market intelligence to monitor world prices for logs and processed products and recommended revised forest charges (FAO/UNDP 1976 Liberia Natural Resources Development: 21-27).

Sabah, Malaysia: In proposing revisions to the royalty formulae in 1977, a government appointed Task Force on Forest Revenues recommended improved market intelligence for log prices. The Task Force also recommended that the Forestry Department ultimately base Royalties on appraised stumpage values, taking into account logging and transportation costs. However, it also recognized the problems and difficulties in doing so. In the interim it proposed

retention of the royalty formulae and proposed revisions to the formulae (Sabah, Malaysia 1977 Report of the Task Force on Forest Revenues).

A follow-up study by FAO, undertaken at the request of the Government of Sabah, addressed the question of market intelligence and reviewed the royalty formulae system, suggesting minor revisions and simplifications to the formulae (FAO/UNDP 1980 Sabah Timber Industry Royalty Appraisal and Market Study).

The FAO study developed a manual for estimation of logging costs (FAO/UNDP 1980 Sabah Log Production Cost Allowance Estimation). Cost estimates were developed were used to evaluate and suggest minor revisions to the basic allowance in the royalty formula. They were also used to estimate profit margins under alternative royalty formulae, and so to evaluate alternative formulations of the basic allowances and royalty coefficients in the royalty formulae. The methodology and procedures were written to facilitate the annual revision of the cost estimates.

Sarawak, Malaysia: As a component of an FAO study for the Malaysian state of Sarawak, a review of the royalty system for the Hill Dipterocarp forests developed estimates of logging costs and suggested revisions to royalty levels based on them (FAO 1980 Forest Development Project, Sarawak, A Royalty System for the Hill Dipterocarp Forests of Sarawak). In the interim royalty rates were increased by 50% (see Chapter 10, Section 10.3).

Penniusular Malaysian States: A method of estimating forest charges was adopted in Selangor State in 1974, based on forest inventory data, current logging costs and market log prices (Noordin 1977 A Method of Forest Revenue Assessment Based on Inventory Data). The appraisal was used to establish a Premium, levied as a per acre charge on areas to be cut (in addition to the volume-based Royalty and the Silvicultural Cess).

A forest inventory was used to estimate the volume per acre of the area to be cut. Market values of logs, by diameter class are used to establish a market value of the timber on the area. The basic Premium was calculated at 20% of this market value. Adjustments to the basic Premium are made by means of a percentage reduction in the Premium for low volumes per acre, for higher elevations and for distance from main roads.

Papua New Guinea: A relatively simple royalty appraisal system was introduced in 1974-75, following a review of the royalty system. The new royalty appraisal system was designed for simplicity, for low cost of implementation and administration, for minimum reliance on cost information, and for the easy review and adjustment of Royalties. The system was patterned on the on the appraisal system of the Australian state of Tasmania (Yauieb 1980 Choice of Sales and Marketing Systems in Tropical Hardwood Forests).

A basic Royalty is established, to serve as a maximum Royalty for the whole country. Allowances for six cost factors are deducted, to arrive at the Royalty applicable to the particular timber involved. The allowances deducted under each of the six factors are specified in quantitative terms, for each of the six factors. The six factors are:

Total Timber Volume Available: The smaller the volume available, the larger the deduction (5 classes).

Access to Market: Based on the distance to port, or market. The greater the distance, the larger the deduction (3 classes).

Climate: Based on the length of the wet season. The longer the wet season, the larger the deduction (3 classes).

Stand Quality: Based on stand density, size of tree, defect and species composition (3 classes).

Log Haulage Distance: Based on average road distance to conversion plant, or log export point. The longer the distance, the greater the deduction (5 classes).

Topography and Soils: Based on slope, soil conditions and the number of stream crossings (3 classes).

An index is used to adjust the level of Royalties over time. It is based on the Consumer Price Index (Yauieb 1980 Choice of Sales and Marketing Systems in Tropical Hardwood Forests).

Other Logging Cost Studies in Tropical Countries: In addition to the examples surveyed, a variety of cost studies of logging, hauling and processing have been undertaken by forestry departments, government agencies and organizations within the countries surveyed. These studies have been undertaken for a wide range of purposes, cover a wide variety of situations, and differ greatly in degree of detail.

Further cost studies have been developed as a component of many FAO projects in individual countries. (See for examples FAO 1973 Logging and Log Transportation in Peninsular Malaysia). These often provide a framework and approach which can be updated to assist in appraisals.

Finally FAO has undertaken a number of more general logging studies to assist countries in evaluation of logging methods and in developing cost estimates (see, for example, FAO 1974 Logging and Log Transport in Tropical High Forest; FAO 1976 Harvesting Man-Made Forests in Developing Countries; FAO 1977 Planning Forest Roads and Harvesting Systems; FAO 1978 Assessment of Logging Costs from Forest Inventories in the Tropics).

All of these cost studies can provide experience, or guidance in developing cost estimates for stumpage appraisals, and in the revision of forest charges.

## 11.5 COMPONENTS OF STUMPAGE APPRAISAL

Previous sections introduced and outlined the structure of stumpage appraisal, outlined the several methods used, and introduced examples from

developed and underdeveloped countries. In this section, each of the components of stumpage appraisal is discussed in turn, highlighting the important considerations involved in each.

### 11.5.1 Forest Inventory

In developed countries, such as the United States and Canada, a stumpage appraisal is usually undertaken for each tract of timber being sold. An operational forest inventory of the tract is first undertaken to identify the species composition, tree sizes, grades and qualities of timber, and used to identify volumes per hectare, tree sizes, ground conditions and other factors influencing logging costs as well as to weighted the prices in the appraisal and establish averages.

In developing countries, stumpage appraisal normally serves to establish the level of forest charges that will be applied generally, not just to a single tract. Thus detailed inventories of each tract, are not required prior to their sale. Nevertheless, general forest inventory information will be required for the appraisal. Inventory information on average volumes per acre, average tree sizes, etc. is needed to estimate appropriate logging costs. Inventory information on log grades and log sizes is required to establish an average market price of the logs, in determining the likely output of sawnwood products, and in estimating sawing costs for appraisals based on processed products.

### 11.5.2 Prices of Logs or Processed Products

As stumpage values are derived from the value of the products produced from the timber, the selling prices of logs or processed products are the logical starting point for stumpage appraisal. The prices should be those actually received for the most valuable products, and at the earliest identifiable stage of processing for which a competitive market exists. Thus if logs are the most valuable product, and the market for logs competitive, then appraisal should be developed from log prices. Extension of the appraisal through more advanced phases of processing significantly complicates the appraisal and requires additional assumptions about prices, costs and the recovery of processed product. Only where the market for logs is not competitive, or if processed products would yield higher stumpage prices, should appraisal be extended to additional stages.

Local log markets are usually closely linked to processing plants either through subsidiaries, through agreements on guaranteed supplies to one purchaser, or through financial arrangements, commonly in the form of loans to the loggers. In addition, there are often only a limited number of processing plants, perhaps only one, who are potential buyers. In such cases prices in local log markets are likely to underestimate the value to buyers, although it may not be easy to determine by how much, even in a specific country and situation.

Where local log markets are not competitive, prices could be based instead on export log prices. Export log markets are usually more competitive,

with more buyers and a greater degree of arms-length, independent buying and selling. Thus prices established in export log markets are likely to be closer to competitive market prices, and to the full willingness-to-pay value to buyers. Yet, export log markets, even when they involve a number of buyers or are world markets, may not be fully competitive. Export log buyers may recognize this interdependence, and thus may not compete strongly in purchasing logs, may operate only in certain parts of the country ("zones of influence"), or may purchase only from "regular customers". In addition, log buyers may extend credit, or assist in the financing of equipment purchases, and in exchange tie logging firms to selling to them at prices below the full market value.

Finally, logging companies may sell to parent companies, or to log buying subsidiaries, at transfer prices which do not reflect the value of timber. Although these transfer prices could be above competitive market prices if the company wants to earn profits within the country, they are more likely to be below the competitive market price, in order to transfer profits abroad. This is evidenced by logging subsidiaries which make losses each year, but continue in operation.

If the export log markets are not competitive, it may be possible to base appraisals on log prices from the more competitive log markets in consuming country, and then deduct loading, unloading, handling and storage charges, and ocean freight. Alternatively, it may be necessary or appropriate to base appraisals on processed products.

The prices upon which appraisals are based should be current. Yet the statistical data on prices of logs or products are historic, and are usually only available after a time lag. In addition, prices of forest products are subject to sudden and sometimes large fluctuations. Thus prices should be based on the most recent information available, covering a period long enough to average the fluctuations.

Because they are the starting point for stumpage appraisal, it is crucial that prices of logs or products should be as accurate and reliable as possible. As stumpage values are residually determined, any inaccuracies in the prices from which the appraisal starts will be carried through to stumpage values, to become a larger proportion of the residual stumpage values. As illustrated in Section 11.2, a 10% error in prices can become an error of 20%, or more in stumpage values.

### 11.5.3 Logging Costs

Accurate estimates of logging costs are difficult. Logging costs vary considerably both with stand conditions and logging conditions. Logging costs also vary widely depending on the equipment used, and may vary between logging operators depending on operator efficiency. Costs should normally be based on those of logging operators of average efficiency. Overhead costs are difficult to estimate and can vary widely. As they are fixed costs, costs per cubic metre are dependent, not only on the level of these fixed costs, but also on the level of utilization of logging plant and equipment.

Surveys of logging costs that take into account all these variables are difficult to carry out. Often cost estimates are built up synthetically for each phase of activities, felling, bucking, skidding, loading, etc. based on equipment capacities, hourly operating costs, and time and motion studies. These are illustrated by some of the examples and references mentioned above.

Contract logging rates may be used to measure logging costs where it is otherwise difficult to determine logging costs. Provided there are a sizeable number of contract loggers, and sufficient logging contracts to provide work for the contractors, contract logging rates can approximate logging costs including a normal profit on logging activities very well and, in addition, may be fairly easily obtained.

### 11.5.4 Transportation Costs

Trucking costs vary by distance, road conditions, size of load, and by waiting time for loading and unloading. Road maintainence and road conditions are important factors and have a very significant effect on logging costs.

Trucking costs are commonly a major component of the delivered cost of logs as a consequence of the high cost of imported equipment and spare parts, because of the often difficult road conditions and slow speeds required, and because of the frequency of repairs required. Usually truck hauling costs are developed synthetically, as are logging costs. As trucking costs are an important cost item, errors in their estimation can have a significant effect on the residually determined stumpage values.

Contract hauling rates can serve as a reasonable measure of truck hauling costs including a normal profit on trucking, just as contract logging rates can serve to approximate logging costs.

Water transport by log raft or barge on streams, lakes, or in coastal areas, varies widely with conditions, but usually is a relatively low cost item. Railway transport is less common, but more easily estimated from rail rates.

### 11.5.5 Processing Costs and Recovery Factors

Processing costs will be required for stumpage appraisal, either where log markets are not competitive and log prices do not reflect the value of the logs, or where processed products yield a higher stumpage value. Processing costs for sawnwood, veneer and plywood, or pulp and paper will depend on the timber, and its suitability for various products.

Sawing costs, for example, may be obtained from surveys of sawmills, or can be built up synthetically, based on engineering data, time and motion studies, etc. Sawing costs are highly variable depending on the sawmill equipment, sawmill layout, condition of the equipment, skill of the operating crew and efficiency of the management. Sawing costs also depend on log diameters and the quality of the logs, and on the particular sawn products produced. All

of these factors need to be taken into account in any survey of sawing costs; both to identify the magnitude of their effect on costs, and to enable them to be weighted in estimating average sawing costs. Because of the wide variations experienced in sawing costs and the number of variables affecting sawing costs, surveys of sawing costs will require large samples and measurement of a number of variables.

If accounting records are reliable and accurate, then surveys of sawing costs can be based on accounting figures. Alternatively, surveys of sawing costs may require visits to individual mills, to record throughput of logs, output of lumber, manpower, other cost items, and to undertake time and motion studies in order to build up cost estimates synthetically.

Synthetic cost analysis estimates will have to take the same factors into account. This will require separate estimates, based on each set of factors, and then the weighting of these estimates, to arrive at the costs applicable to the timber being appraised or average costs.

Overhead cost estimates will again prove difficult, just as for logging costs. Because of their relative size as cost factors, and their fixed nature, their importance in terms of costs per unit of sawnwood produced is highly variable, depending on the capacity utilization of the sawmill and the length of time it operates.

Custom sawing rates can serve to measure overall sawing costs, including a normal profit on the operation, provided that there are a sufficient number of custom sawing sawmills to maintain competition among them and sufficient business to keep them busy without undercutting of rates.

Figures on recovery rates are necessary since sawing costs, or the processing costs for other forest products, are usually based on the output of the processed product, rather than on the input of logs used. As stumpage values are based on roundwood volumes, it is necessary to translate sawing costs, or the processing costs for other products, into costs per unit of roundwood. For this, accurate recovery ratios (the volume of processed products recovered per unit of logs used) are required. As suggested above, a slight underestimate of this simple ratio can result in higher costs per unit of logs, and thus in lower appraised values. Alternatively, a slight overestimate of the recovery ratio can lead to the reverse. The actual recovery of sizes and grades of sawnwood for example, is also required to establish the selling value of logs in terms of the products produced.

### 11.5.6 Profit Allowance

The determination of an appropriate allowance for profit and risk involves difficult questions. The appropriate allowance should provide a percentage rate of return on capital equal to that earned elsewhere, but no more. The profit allowance should also recognize differences in risk among forest operations.

Because the profit allowance is meant to reflect the required rate of return on capital, the allowance should be based on, and applied to, the

capital involved in the logging, hauling, or processing stages, rather than on operating costs or on sales prices.

In the Investment Method of stumpage appraisal, described in Section 11.2.1, the profit allowance is based on the average investment in each stage of forest production. However, the determination of the average level of investment in logging, hauling and processing is not easy. The initial cost, scrap value and average investment of each item must be calculated and aggregated. Working capital estimates must be derived. Finally, appropriate rates of return must be chosen for each activity. Thus, although conceptually correct, the investment method involves problems of measurement and consequently, potential for error and inaccuracies. In the end it may be less accurate than the Overturn Method described in Section 11.2.1, in which the profit allowance is calculated as a percentage of the selling price of the logs or products, even though the investment method is the theoretically correct method.

The profit allowance under the Overturn Method should be based on an average rate of return on the capital investment and an average level of investment. The rate of return allowed under the Overturn Method could be too high or too low on individual stands, species or grades, since capital investment cannot be expected to vary with the selling price. The Overturn Method will allow higher profits, and higher rates of return on higher priced logs or processed products. This will encourage the cutting of high valued species and stands.

### 11.5.7 Adjustments

The updating of appraisals for changing prices and costs, and the adjustment of forest charges are in the interest of both the government and the forest industry. It means that the government will take on some or most of the risk involved in changing economic conditions, but the government will also benefit in terms of revenue from increased stumpage values. However, the updating of appraisals required to adjust forest charges also involves additional costs and manpower to collect information and revise the calculations.

### 11.5.8 Administration

Timber appraisals to set the level of forest charges have an obvious financial impact on both the government and the forest industry. Thus administration of appraisal policies and procedures warrants careful attention.

Appraisals require reliable information. In gathering and organizing data on prices and costs, a system of methods and procedures is required. To collect reliable information on prices, a market intelligence system is needed. This may involve a system for sampling market prices of given species, sizes and grades of logs, or processed products, and a system for analyzing the data and calculating average prices. Likewise, the creation of a system is required to gather data on logging, hauling and processing costs, as discussed above. Each of these components involves statistical design, the design of sampling

procedures, the design of analysis procedures, and even the design of appropriate forms.

The appraisal process itself requires establishment of methods and procedures for the application of this information to the estimation of stumpage values. These must be planned and designed to be appropriate to the situations experienced in the country itself.

Thus the smooth functioning of an appraisal system and the reliability of the appraisals depends very much on the care and skill applied to the design and implementation of the information systems and appraisal systems. A sound appraisal system also depends on the availability of trained experienced appraisal personnel both for implementation of the information and appraisal systems, and for their operation.

## 11.6 SUMMARY

This chapter has outlined stumpage appraisal, surveyed examples both from developed and developing countries and discussed the components required appraisal. While some form of stumpage appraisal is required under most of the methods of setting the level of forest charges, accurate appraisal are not easily achieved. Appraisals require reliable information and expert personnel.

The availability of reliable information on the prices and costs, discussed above, puts severe constraints on stumpage appraisal, especially because of the residual nature of stumpage values and the sensitivity of stumpage values to errors in estimates of prices, costs and recovery ratios. The availability of expert personnel places an additional constraint on stumpage appraisal. In view of these two constraints, stumpage appraisal systems should be designed to require a minimum of data on prices and costs, involve a minimum of calculations and provide estimates of stumpage values for a limited number of key categories and characteristics.

An obvious first step in strengthening the data base for appraisals is to implement a survey of prices of logs and forest products. A minimum number of key species and categories should be sampled initially. It is important that the categories and sampling procedures be tightly specified so that price trends can be established for use in updating forest charges.

Surveys of contractor rates for logging, for log hauling and custom sawing rates, offer a simple means of obtaining estimates of logging, hauling and processing costs. These rates, which include profits, will allow an appropriate rate of return if contractor rates can be competitively set. The survey of contractor rates can also provide information on trends in logging costs over time, and thus serve in updating appraisals for changes in costs.

These suggestions form the basis of a relatively simple and easily administered appraisal system, which is likely to be of more use in setting the level of charges than a more complex and perhaps less manageable system. They also provides the basis for developing the experience and expertise required to extend the appraisal system, as and when desired.

# Chapter 12

## FOREST REVENUE SYSTEMS: STRUCTURE AND PROPOSALS

### 12.1 INTRODUCTION

Throughout the study both the inter-relationships among the types of charges and the inter-relationships among the methods of establishing the levels of charges have been emphasized. This final chapter is intended to integrate the several types of forest charges and methods of setting their level into a basic forest revenue system.

### 12.2 OUTLINE OF A BASIC FOREST REVENUE SYSTEM

In previous chapters we have carefully avoided proposing a forest revenue system because the circumstances of individual countries, as well as the objectives, and the weight placed on each objective, will differ. Nevertheless, in the course of the review of alternative types of forest charges and the survey of examples drawn from tropical countries the framework of a basic forest revenue system has emerged. This basic forest revenue system outlined here can serve as the starting point for countries in the design or modification of their own forest revenue system. It may be necessary or desirable to introduce variants or additional charges to suit the situation in the individual country. Alternatives to the basic charges are suggested and other charges and their application to special circumstances are summarized.

The components of a basic forest revenue system proposed consist of the following:

1. Annual Ground Rentals on Concessions: Levied on all concessions and other short and long-term forest utilization contracts.

2. Volume Based Charges on the Timber Cut: Levied on all timber cut, whether used domestically, or exported.

3. Export Charges and Domestic Processing Incentives: Where it is desired to encourage the domestic processing of logs, a uniform export charge per cubic metre can be levied on log exports, in addition to the volume based charge.

These components provide the basic framework for a forest revenue system. Among the types of charges discussed there are alternatives for each component. A country may choose to substitute alternative charges drawn from those evaluated in Chapter 9 for one or other of the components of the basic system, to introduce combinations, or to add to the system to suit the country's own particular situation.

For each components of the basic system the rationale is discussed, followed by an examination of alternatives. Additional charges for special circumstances are discussed later.

## 12.3 ANNUAL GROUND RENTAL CHARGE

An annual ground rental is recommended on all concessions and other short or long-term forest utilization contracts.

The annual ground rental can serve to reflect the value of the concession generated by the security of timber supply, and by forest charges on timber cut which are below the stumpage value (see Chapter 6). Annual ground rentals based on the area of concessions are easy to administer. They can serve both to discourage the acquisition and holding of large concession areas, beyond the needs of the forest industry, and to encourage more efficient use of the areas held.

The levels of annual ground rental charges can be administratively set. However, because the value of concessions is not easily estimated, the level of annual ground rentals is best established by bidding in open or sealed-bid auctions of concessions, in those situations in which competition for concessions and bidding on ground rentals can be encouraged. The levels of annual ground rentals established by auction can then be used to establish administratively set annual ground rentals for other areas. Concession policies should be modified to encourage greater competition for concessions, reducing the number of concessions offered to ensure more bidders for each, and also reducing the length of tenure to do the same.

Minimum annual ground rental charges should be established, reflecting the administrative costs in supervising the concessions, and the opportunity costs of allocating the timber rights. The opportunity cost reflects the potential future value of the concession to the government; the foregone alternative uses for food, fuelwood, medicines, etc.; and the environmental benefits from erosion control, watershed management etc. which would be foregone (See Chapter 6, Section 6.3; Chapter 10, Section 10.9).

In summary then it is suggested that annual ground rental charges play a more important role in forest revenue systems, and, for most countries, that their levels be raised.

### 12.3.1 Alternatives to Annual Ground Rentals

Initial Lump-Sum Licence Fees An initial, lump-sum licence fee, levied on concessions or other forest utilization contracts, can serve as an alternative to annual ground rentals, reflecting the value of concessions and the security of timber supply provided by the concession.

The value of this security of timber supply is not at all easy to estimate. Consequently, the initial lump-sum payment is best established as a bonus bid on concessions through open-bid or sealed-bid auctions. Even if competition for concessions is weak or imperfect, an auction is likely to yield

a higher payment than some arbitrarily set charges. Negotiation with two or more potential concession holders may be an alternative method of establishing the level of the initial lump-sum bonus payments on concessions, but is a "second-best" choice.

A minimum initial lump-sum licence fee should be established, rather arbitrarily if necessary, both in order to reflect the costs to the government in granting the concession, and to encourage higher bidding.

Licence fees should not be expected to be a large revenue source, not as large as annual ground rentals. Yet they can be an important component of the forest revenue systems, serving to allocate concession areas, discourage the over allocation of concessions and reflecting financial costs borne by the government and opportunity costs. In some situations it may be desirable to levy an both initial lump-sum licence fee and an annual ground rental.

## 12.4 VOLUME BASED CHARGES ON THE TIMBER CUT

Volume based charges levied on the timber cut are recommended to reflect the stumpage value of the timber harvested. Volume based charges should be the major charge in the basic forest revenue system. In certain situations, one or other of the variants of volume based charges, alternative charges or a combinations of volume based with other charges mentioned in Chapters 8 or 9 can serve as substitutes.

Volume based charges should be levied on all timber cut, whether used domestically or exported, based on the stumpage value of the timber. Where a domestic log market exists, the level of volume based charges should be based on stumpage values of logs in domestic markets. Domestic processing incentives are then provided by additional export charges levied log exports, the third basic charge, discussed below.

Volume based charges can be based on measurement of roundwood volumes in the forest, at some central transportation point, as the roundwood enters the processing plant, or at export ports. The choice among the combination of points depends on the relative administrative ease, accuracy of measurements, ability to crosscheck volumes and ability to counter evasion.

Volume measurements can be based on the volumes of individual logs, as is most common, on stacked volumes, or on weight mesurements.

12.4.2 Varying Volume Based Charges to Reflect Stumpage Values: As suggested in earlier chapters, volume based charges that accurately reflect stumpage values will result both in greater revenues and in better utilization of the forest and forest management. Where administratively feasible, volume based charges can be varied by species group, log diameter, grade, or distance, the major factors affecting stumpage values. For simplicity in the forest revenue system, volume based charges should include a minimum of these key factors.

Species Groups: With the great diversity of species found in tropical forests, species is perhaps the most important factor affecting stumpage values. It is the factor most easily identified. Differences in forest charges by species, or species groups, are widely applied, so their feasibility has been tested.

In most countries the differences in market prices of logs or processed products between species results in significant differentials in stumpage values and makes it appropriate that forest charges differentiate between species. The advantages of forest charges that vary among species are two-fold. First, by setting stumpage prices to reflect differentials in stumpage values it is possible to collect greater revenue. A uniform charge would not collect the full value from high valued species and would discourage the cutting of lower valued species. Second, by setting stumpage prices to reflect differentials in stumpage values, profits earned in cutting high valued and low valued species will be more equal. Overcutting of high valued species will be reduced, while lower charges on the lower valued species will encourage their utilization.

In most countries, several dozen species are cut. Many of these species command approximately the same price. It is suggested that species be classified into four to perhaps at most, ten classes, based on log prices. These categories should be reviewed and revised at regular intervals of between two and five years, and species reclassified if their relative prices have changed.

Differentials in stumpage values among species are relatively easy to establish once average log prices have been established. If logging costs are roughly the same for each species, the absolute differences in log prices can be translated directly into equal differentials in volume based charges between species class.

Log Diameter: Volume based charges which vary by log diameter is a factor worth considering in a forest revenue system. One or two tropical countries do vary volume based charges by log diameter. Log diameter is an important measure of log quality as log diameters affect processing costs as well as the products produced, and therefore stumpage values. Varying volume based charges by log diameter will enable lower charges to be levied on small diameter logs, encouraging their utilization.

As log diameters (or girths) are usually recorded in the scaling of logs, it would be relatively easy to classify logs into diameter classes in the field, and then to apply the appropriate charge per cubic metre. Better still where log volumes are calculated by computer from field measurements the computer can be programmed to automatically apply the appropriate charge per cubic metre to logs of each diameter class and the amount levied summed in the billing of forest charges.

Alternatively, forest charges could also be adjusted for log diameters using average diameters. Diameters recorded in calculating the volumes of each species group would be averaged over the scaling period (daily, weekly, monthly) and this average used to apply the appropriate volume based

charge per cubic metre. The harvesting of smaller diameter trees or the utilization of small top logs from trees cut would introduce more small diameters into the scale return for the period and therefore result in application of a lower charge per cubic metre.

The incentives for improved utilization are perhaps the strongest advantage in varying volume based charges by log diameter. It provides a useful way of ensuring that volume based charges reflect the stumpage value of marginal timber, and of ensuring that volume based charges do not discourage utilization.

However, varying volume based charges by log diameter could encourage underscaling. By under-estimating diameters, not only would the reported volume be reduced, but the change per cubic metre applied to that volume would also be reduced. Tighter enforcement, cross-checks and check scaling would be required.

Log Grades: Differentials in stumpage values with respect to log grades can be significant. Where logs are graded, volume based charges might be varied by log grades. One or two of the tropical countries surveyed do so.

As logging and hauling costs are virtually the same for all grades of logs, the absolute differentials in stumpage values by log grade will be equal to the differences in log prices between log grades. Therefore, to reflect these differences volume based charges between log grades should approximate the absolute differences in log prices.

The grading of logs is more subjective than classification by species, or by diameters. Consequently, differentials in volume based charges by grade can be subject to abuse through the classification of logs to lower grades, thus reducing the charges payable. The incentive to do so will be stronger the greater the differentials in charges. Consequently differentials in volume based charges by grades are only recommended where log grading is well developed, grading is undertaken by independent graders and is free of influence from concession holders.

Distance: Transportation costs are a major component of the overall delivered cost of logs. Thus distance is an important variable worth incorporating into stumpage prices. Distance could be incorporated by means of an allowance per kilometre of distance, and applied either by concentric circles on the map, or by using actual road hauling distance to the cutting area as in Sabah, Malaysia. (The experience of the Sabah Formulation with contract logging rates).

Introduction of distance as a factor has advantages in reflecting more accurately the stumpage value of the timber stands, and therefore of collecting more of that value as revenue. It also has advantages for forest management by reducing pressures to overcut nearby areas while leaving distant stands uncut.

### 12.4.2 Alternatives to Volume Based Charges

Charges Based on the Area Logged: Charges based on the area logged have advantages that make them suitable in a number of situations. As the charge is fixed irrespective of the timber removed, they will provide a strong incentive for the full utilization of all merchantable timber within the stands logged. With high volume based charges this advantage becomes of more importance. Area based charges also avoid the necessity of scaling the timber removed, and the difficulties involved in doing so.

Area based charges are a particularily attractive alternative where stands of timber are allocated and the level of charges set by open-bid or sealed-bid auctions. Under such circumstances, an accurate pre-sale inventory and appraisal of the stand is less important, provided competition for the timber can be encouraged. Evaluation of the stand can be left to the judgement of bidders. Only minimum charges need be established.

Area based charges are recommended where high forest stands, salvage logging areas, or plantation stands can be sold by auction and full utilization is to be encouraged. They should be introduced where they are feasible, both to gain experience for their broader application, and to provide information on the stumpage values of stands which will then be of use in setting other charges.

Per-Tree Stumpage Charges: Per-tree charges are not recommended as an alternative to volume based charges, except in special circumstances. They are recommended only where logging operations are small and scattered, making supervision and scaling difficult, in plantations where trees of uniform size are cut and handled as tree lengths, or for products such as poles and other minor products.

A Two-Part Charge on the Timber Cut: This combination consists of an area based charge on the area logged, and a volume based charge on the timber cut. The area based charge can be a fixed amount per hectare, as the volume based component will account for the variations in the volumes, values and species on the area. Thus the area based charge can be simpler than when it must reflect the entire value of the timber. The volume based component can be lower than a separate volume based charge, because part of the value of the timber will be captured by the fixed, per hectare, charge. With lower charges per cubic metre, fuller utilization of the marginal species, trees and logs will be encouraged.

Although the combination involves the administration of two charges, it can have administrative advantages. The fixed area based charge is easy to administer and yields revenue early, prior to cutting. With the lower volume based charges on the timber cut, there will be less incentive for under-scaling, under-reporting, and evasion, and consequently less administrative problems.

A two-part charge on the timber cut is reasonably equitable. Payments are related to the timber cut. The increased utilization of timber from the area will provide opportunity for higher profits, and/or greater forest revenue.

## 12.5 EXPORT CHARGES ON LOGS AND DOMESTIC PROCESSING INCENTIVES

Export charges on logs, in addition to volume based charges on the timber cut, are recommended (a) to reflect higher stumpage values in export markets and (b) to provide incentives for domestic processing. Without the export charge, logs will be exported to the financially most profitable market without yielding additional forest revenue, and without generating domestic processing benefits. Thus an export charge should be designed as a supplement to the volume based charges where export logs yield higher stumpage values. Where stumpage values of domestically processed logs are higher than those of export logs, no export charge is warranted.

Several of the tropical countries surveyed put primary emphasis on export charges as the major forest charge and levy a separate charge on logs processed domestically. However, this creates problems and can distort the domestic processing incentives. The size of the domestic processing incentive is no longer readily apparent under this approach. In addition the domestic processing incentives will vary among species. High valued species will carry a high export charge, and thus a substantial domestic processing incentive. Low valued species will carry a low export charge, and thus a low domestic processing incentive. This can distort domestic production and timber harvesting, resulting in little harvesting or domestic processing of lower valued species.

The previous section recommended that volume based charges, or alternatives, be levied on all timber cut, whether used domestically or exported, with the levels of the volume based charges based on stumpage values in domestic uses. Thus the levels of the export charges should be set to reflect the difference between the stumpage value of export logs and the volume based charges already levied. Ideally, if the volume based charges fully reflect the differences in stumpage value with species, log diameter grade, distance, etc., then the additional export charge can be a uniform charge per cubic metre. If so, it will provide an equal incentive for the processing of high and low valued timber.

### 12.5.1 Alternative Domestic Processing Incentives

As an alternative, where export markets are the most profitable outlet for logs, domestic processing could be encouraged by volume based charges on all logs, combined with a rebate based on the output of processed products. The volume based charge would then be based on the stumpage value of logs in the export market. It would be equivalent to the combined level of the volume based charge and the export charge proposed above. The rebate, based on the output of processed products, would then serve to reduce the effective rate on domestically processed logs, thereby encouraging domestic processing.

There are advantages to this alternative approach. The higher volume based charges levied on all logs would make the logs a more expensive input, and encourage their more careful use in processing, encourage fuller utilization of logs and greater recovery of processed products.

The rebate proposed would be offset against the volume based charges levied on the log input, but would be based on the production of processed products. Separate rebates could be set for sawnwood, veneer, plywood, or other products, with higher rebates for the more highly processed products. The level of the rebate should be based on the level of effective protection required to achieve the desired degree of domestic processing.

As the rebate would be based on the output of processed products, it would provide a further incentive for the full utilization of the logs and for recovery of processed products.

In addition, the rebate would serve as a cross-check of volume based charges. With the rebate based on the output of processed products, and offset against volume based charges on the logs used, the rebate would discourage both the underscaling of logs and the overstating of the production of processed products. Any significant under-scaling of logs, or under-reporting of volumes to avoid volume based charges, would result in an unusually high recovery factor. Any overstatement of processed product production in order to claim a greater rebate would also result in an unusually high recovery factor. Thus the combination charge and rebate introduce a self-policing mechanism into the forest revenue system.

In summary, there are important advantages to this alternative of a volume based charge and rebate; in encouraging domestic processing, in utilization and in administration.

### 12.5.2 Export Charges on Processed Product

Export charges on processed products are generally not recommended, except in special circumstances, or for specific purposes. Export charges on processed products will offset the domestic processing incentives generated by export charges on logs. For this reason, they are usually set at a low level, have minimal impact, and yield minimal revenue. Export charges on processed products may be levied to collect part of the stumpage value of the timber, but usually this is better achieved through volume based charges on the timber cut.

### 12.5.3 Export Quotas and Domestic Processing Requirements

Export quotas, introduced to restrict log exports and to encourage domestic processing, are not recommended. A reduction in log exports is better achieved by higher charges on export logs, which would both reduce exports and yield additional revenue from those logs exported. Although the initial reduction in log exports is less certain than under export quotas, the level of the charges on export logs can be adjusted until the desired reduction in log exports is achieved. Higher charges on export logs are also more efficient, as log exports will be restricted to only those species, grades, etc. which yield the highest prices as export logs, leaving those most valuable in the domestic market for domestic processing. For the same reasons it is better to encourage domestic processing by higher charges on export logs than by regulations such

as those requiring a certain proportion of log production to be processed domestically.

In summary, export quotas and domestic processing requirements are not recommended. Their objectives can be better achieved by volume based charges and export charges on log exports.

## 12.6 CHARGES FOR SPECIAL SITUATIONS

Although the number and variety of charges in the forest revenue system should be kept to a minimum, there may be circumstances in which additional or alternative charges may be called for. These charges for special situations are drawn from among those surveyed and evaluated in Chapters 8 and 9.

### 12.6.1 Charges on Processed Products

Although charges on sawnwood and other processed products can serve as a substitute for volume based charges on the timber cut, they are only recommended in special circumstances. Charges levied on processed products rather than the log inputs result in "cheaper" logs and substitute higher charges on processed products. As a result they discourage both the full utilization of logs and the full recovery of processed products.

Charges on processed products are only recommended where the scaling of logs for volume based charges is difficult and the measurement of the sawnwood output or other processed products is easy and more reliable.

### 12.6.2 A Two-Part Charge on Logs and Processed Products

Alternately, charges on processed products can yield advantages when combined with volume based charges on the timber cut to form a two-part charge on the timber cut. Under this scheme, the volume based charge on the timber cut can be lower, thereby encouraging improved utilization in the forest of marginal species, trees and logs. However, this combination charge can still discourage the full recovery of processed products, as a consequence of the component part of the charge levied on processed products.

Incentives for underscaling of logs will be reduced, and the charges on logs and processed products can serve as a cross-check on each other. However, setting the level of the two components of the combination charge, and coordinating of the two will likely involve additional administration.

### 12.6.3 Charges on Equipment and Workers

Charges levied on logging equipment such as tractors, skidders, logging trucks or even power saws; or charges levied on processing plant and equipment such as sawmills, head-saw equipment, plywood plants, etc. can be useful in certain situations. Charges on workers or payrolls are generally not recommended as they discourage employment and can instead encourage capital

intensive logging and processing which may require imported equipment and foreign exchange.

Charges on equipment are unlikely to be a significant source of revenue, but they can facilitate the supervision and control of forestry activities, and are easy to administer. Charges on equipment that are a fixed annual fee can help to encourage efficient use of the equipment. Combined with lower volume based charges, they can also encourage improved utilization and recovery.

### 12.6.4 Profit Based Royalties

Profit based Royalties such as the Resource Rent Tax, evaluated in Chapter 9 (Section 9.15), have advantages, but are applicable only in specific and limited situations. They are applicable only to new projects, not to existing, already operating projects, in which the investments have already been made. They are applicable only to forestry developments which include the exploitation of a concession or area of forest resource and the extraction of the forest resource. Finally, they are limited to projects undertaken by a financial self-contained entity for which accounting records are available.

However, applied to these specific situations, profit based Royalties can offer advantages in capturing both the stumpage value of the timber cut, and the value of the concession. As suggested in Section 9.15, profit based Royalties to capture stumpage values can be combined with the corporate income tax on profits. Together the two can complement each other.

### 12.6.5 Joint Ventures or Full Government Ownership of Concessions, Harvesting Operations and Processing

Government operation of concessions and of logging and processing activities, or joint ventures with private sector firms, are recommended for limited application. These operations should be limited initially to ensure efficient supervision and management of operations, or efficient supervision of joint ventures. The government will then be able to capture its share of the stumpage value of the timber cut, as profits. The government can also derive useful information on prices, logging, hauling, and processing costs, and on stumpage values. This information can be of value in setting the level of forest charges elsewhere within the country.

### 12.6.6 Combining Forest Charges into a Forest Revenue System

An important theme throughout the study has been the interrelationships among forest charges. One forest charge can contribute toward the efficiency or effectiveness of another. The achievement of the best, most efficient and effective forest revenue system depends on the combination of charges chosen. The basic forest revenue system proposed illustrates some of the interrelationships between forest charges, and shows how individual charges can operate together to achieve an efficient system. The alternative charges as well as some of the charges suggested for special circumstances provide

further examples of how one charge can contribute to the efficient operation of another.

Care should be taken to avoid including too many charges in the forest revenue system. In spite of the individual advantages of each charge, there are collective advantages to a simple and uncomplicated forest revenue system consisting of a minimum number of charges.

## 12.7 ESTABLISHING THE LEVEL OF FOREST CHARGES

A forest revenue system should include several methods of establishing the level of forest charges, just as it includes several types of forest charges. One method of setting the level of charges can complement and assist another. For example, open-bid and sealed-bid auctions can yield information on stumpage values that are useful in establishing the level of administratively set charges, ad valorem rates, the parameters in formula approaches, or in the negotiation of charges. Public log markets can yield information on log prices, on logging and log hauling costs, and on stumpage value of use in setting the level of charges by other methods.

### 12.7.1 Suggested Strategy for Setting the Level of Forest Charges

For most countries, administratively set, fixed-rate charges will remain the primary method of setting the level of forest charges, but this method can be made more responsive to changes, and it can be supplemented by the other approaches discussed.

A suggested strategy for setting the level of forest charges is given below. Although the proposals are designed to complement and support each other, not all of them need be adopted. Together they represent a flexible set of suggestions designed for adaption to a variety of situations.

Adjustment of Administratively Set, Fixed-Rate Charges: As we have seen, one of the major problems of administratively set, fixed-rate charges is in keeping the levels of charges up-to-date. A simple escalation formula was suggested to adjust charges annually. Where available, the use of a price index, such as the consumer price index, published by the central statistical office is suggested. Other alternatives might be the Gross Domestic Product price index from The National Accounts, or an index of forest product prices, if available (see Chapter 10, Section 10.3).

Introduction of Formula Approaches to Setting the Level of Charges: Formula approaches such as that of Sabah, Malaysia offer promise of a simple, flexible and responsive method of setting the level of forest charges (see Chapter 10, Section 10.5). Their use is suggested where feasible.

Increased Use of Auctions to Establish Levels of Forest Charges: Where competition among forest industry firms exists, or can be encouraged, increased reliance on open-bid or sealed-bid auctions is recommended. Auctions can be used to allocate longer term concessions, and to establish concession

charges; or to allocate short term timber rights, and establish charges on the timber cut.

Auctions, at least initially, should be restricted to those situation in which the greatest degree of competition can be obtained, so as to ensure that the concession charges bid approach the value of the concession to buyers, and that the charges bid on the timber cut approach the stumpage value of the timber. These prices bid can then provide a reliable reflection of concession values and of stumpage values for use in setting the level of charges by other methods.

The limited introduction of auctions in the most favourable situations will allow the government to develop and refine auction procedures for wider application later.

Competition for concessions can be encouraged by reducing the number of concessions available. Competition for standing timber can be encouraged by making timber available in smaller lots, and thus accessible to a larger number of bidders. To encourage competition, large concessions with processing plants might be required to purchase a proportion of their log requirements from smaller logging firms, and smaller short-term concessions made available by auction to these logging firms. This would then provide the government with information on competitive stumpage values from which to set prices on the larger concessions. Sales of logs to processing plants would also provide the government with information on log prices.

In addition, the government might require a certain percentage of the timber or concessions be harvested by logging contractors. Contractor prices would provide the government with information on logging costs and aid in timber appraisals and in setting more accurate forest charges.

Limited Introduction of Public Log Markets: The establishment of public log markets in one or a few of the most suitable locations is also recommended. The locations selected should be positioned centrally located, near existing concentrations of processing plants, where the greatests benefits from integrated utilization are likely, and where competition for logs will be strong.

Public log markets involve the government in planning and supervising logging operations and log transportation. The government will need to either undertake the logging and log transportation itself, or hire and supervise contractors. In spite of the administrative demands in undertaking these activities, valuable experience would be gained and valuable knowledge of logging and transportation cost acquired.

The prices bid on logs at these public log markets, if they reflect competitive market prices of logs, can then be utilized in stumpage appraisal, and in the establishment and adjustment of forest charges set by other methods. Logging and hauling costs from government operations, or logging and hauling contractor rates, as well as the operating experience gained can aid in stumpage appraisal, and in setting or adjusting the level of charges established by other methods.

Surveys of Forest Product Prices: Where the export market is important to the country market intelligence on log prices and processed products prices in overseas markets is recommended. In addition, basic surveys of domestic market prices of logs and processed products should be undertaken where information on forest products prices and log prices are not available. These surveys should concentrate on developing accurate and reliable sampling approaches for a limited number of key species, grades, sizes, etc. Once established on a reliable basis, the surveys can be extended to become more comprehensive, as and when required. Public log markets can also contribute data on log prices.

The prices obtained will provide the starting point for the development or refinement of stumpage appraisal procedures. If the surveys are done on a consistent basis from year to year, they will also provide information on prices for the adjustment of forest charges over time.

Monitoring of Contractor Rates, Logging and Hauling Costs: Contractor rates for logging and hauling provide a simple and reasonable measure of logging or hauling costs, including a normal profit on investment, provided that contract logging and hauling is reasonably competitive; that is, if there are a reasonably large number of contractors, a reasonable number of concession holders hiring contractors, and sufficient contract work to keep contractors busy. A survey of contractor rates can be relatively easy to undertake.

In some countries custom sawing of logs is carried out. If so, then a survey of custom sawing rates is also recommended. Custom sawing rates under competitive conditions will reasonably reflect sawing costs and a normal profit on investment, and will provide useful information on sawing costs and on trends in sawing costs.

## 12.8 A CAUTIONARY NOTE: THINGS TO AVOID IN FOREST REVENUE SYSTEMS

Finally, to complete the structure of a forest revenue system, it is important to introduce a few cautions about things to avoid in designing a forest revenue system. Earlier analysis and recommendations focussed on "what-to-do". Things to avoid are just as important, as forest revenue arrangements, once established, are not easily changed. Problems may be created that are not easily corrected, and they can encourage special interest groups with vested interests to protect. For example, low forest charges may result in a large, profitable and influential, but not particularly cost efficient logging industry, with vested interests in keeping charges low to subsidize its inefficiency. Or overly-generous domestic processing incentives may encourage a large, but inefficient processing sector with a vested interest in maintaining the generous processing allowances.

A number of important things to avoid are enumerated below. The list is selective, rather than exhaustive. Other things to avoid may be important in certain countries, and so the reader is invited to add to the list from his own experience.

Avoid Too Many Different Charges: The previous sections introduced a basic forest revenue system of fairly broad applicability. Alternative charges

and charges suitable to special circumstances have also been suggested, to allow the basic forest revenue system to be adapted to the special circumstances or the objectives of different tropical countries. However, only a limited number of these charges should be applied to a specific situation, or country. This caution was voiced above.

There are dangers in including too many charges in the forest revenue system. Increasing complexity increases the problems in the coordination of charges, and of the levels of these charges. If possible, the forest revenue system should be limited to three or at most four key charges.

Avoid Too Many Variables: While inclusion of additional factors in the structure of forest charges may enable them to reflect the values involved more adequately, it greatly increases the complexity and administration problems, almost geometrically! Volume based charges, for example, theoretically might reflect stumpage values better if they were varied by species, diameter, grade, distance, stand conditions and ground conditions. However, the number of combinations can quickly get out of hand. It may be better to include only one or two factors, perhaps only species group and distance for example.

Avoid Several Charges Levied on the Same Base: Some countries levy a number of charges on the same base. Sometimes they are levied by different government departments and jurisdictions. As a result, it may be difficult to coordinate the charges, or perhaps even to be sure of the total level of the combined charges. This situation can easily arise over time, as additional charges are added for special purposes, or to fund certain activities.

On the other hand there can be advantages and economies of scale to using a common base for more than one charge. In such cases, the several charges should be coordinated by a single government department to ensure the combined charges reflect stumpage values adequately.

Avoid Charges Based on Difficult to Define Criteria: Charges based on criteria that are difficult to define, measure, or verify, or on criteria that can be subject to interpretation, or manipulation, can encourage firms to adjust their activities to avoid charges, and can encourage evasion, increase administration costs and result in a loss of revenue. The larger the difference in charges between the categories, the greater the incentive for misclassification. For example, log grades that are not precisely specified may encourage mis-grading to reduce charges. Species groupings that are not clearly distinguished will encourage mis-classification of logs to groups carrying lower charges.

Avoid Charges Established by Statute: Charges that are established by statute and require legislative action to change them, or to raise their level, are time consuming and difficult to update. The delays in making changes leave the charges always behind prices and stumpage values.

Avoid Administratively Set, Fixed-Rate Charges That Do Not Incorporate a Mechanism for Adjustment and Review: The problems of adjusting the level of administratively set charges have been emphasized. Where they are utilized, a process for their periodic review is suggested, and an escalation formula to

adjust their level, along the lines discussed above, is recommended. Avoid

Value Related (Ad Valorem) Charges Based on Prices Under the Control of the Individual Firms: Charges such as ad valorem export charges based on the declared value of individual shipments encourage under-reporting of prices, so as to reduce payments, as seen in Chapters 8 and 9 (Sections 8.11, 9.11). In such cases, the firm itself benefits directly from underreporting. The benefit from, and incentive for, under-reporting is considerably reduced if charges are, instead, based on industry wide declared values. The use of posted prices eliminates the incentive, and is usually the preferred solution.

Avoid Using Export Charges on Logs to Both Reflect Stumpage Values and Encourage Domestic Processing: Separate volume based charges to reflect stumpage values, combined with an export charge on logs, were recommended above. A single charge can not achieve both objectives.

Avoid the Use of Export Quotas or Domestic Processing Requirements to Encourage Domestic Processing: Export quotas on logs are effective in restricting log exports, but higher export charges could do as well, and will generate additional revenue on log exports. Domestic processing requirements that require the domestic processing of a certain proportion of the cut can lead to unusual results. Again, higher export charges could do as well and would also generate additional revenue on log exports.

Avoid the Use of the Corporate Income Tax to Replace Forest Charges: The corporate income tax is not an appropriate substitute for forest charges, as was argued forcefully in Chapter 9 (Section 9.14), and above.

Avoid Creating Uncertainty About the Forest Revenue Systems: The government should avoid creating uncertainty about the structure of the forest revenue system, expected changes in that structure, the charges applied, the level of charges, or the amounts payable. Where there is uncertainty about the forest revenue system, the forest industry will look for a greater profit before making investments or other decisions, in order to cover the increased uncertainty. A higher required profit allowance will leave less as stumpage values, and so forest charges cannot be as high. Some investments will not be undertaken. Some stands or species will not be cut. If uncertainty can be reduced, higher forest charges are possible, and increased investment and utilization may be possible.

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## GLOSSARY OF FREQUENTLY USED TERMS

AD VALOREM In proportion to value, literally "by value". In the case of ad valorem charges or taxes, the amount to be paid is proportionate to the value of the timber or forest product.

ALLOWABLE CUT, ANNUAL ALLOWABLE CUT, YIELD DETERMINATION The calculation, more directly by volume regulation, less directly by area regulation, of the amount of forest produce that may be harvested annually or periodically from a specified area over a stated period, in accordance with the objects of management. NOTE: (1) The amount actually prescribed, generally specified in a working plan or working scheme, is termed the prescribed yield (or permissible yield) which may be an intermediate yield or a final yield or both. (2) For major produce it is prescribed by volume, number of stems of certain size categories, or area cut over -- either annually or periodically.

APPRAISAL The determination by a competent authority of value, or the value so determined, of property or goods, e.g., forest land or timber.

BONUS BID At an auction the price (or forest charge) bid over and above the upset price, or minimum price, set by the seller.

COMPLIANCE COSTS The costs incurred by the forest industry or timber buyer in paying the charge.

CONCESSION, FOREST CONCESSION, TIMBER CONCESSION (1) timber lease, licence, or permit granted to a firm or person to extract and market timber or other produce commercially from a defined area of forest within a given period. NOTE: For timber a certain number and size of tree may be specified.

CONVERSION COSTS The economic outlay to manufacture a unit of wood product. Manufacturing in this sense relates to all costs of processing once the raw wood is entered into the converting process.

CONVERSION RETURN In stumpage appraised, the amount available for profit and stumpage value. It is defined as the selling price of the logs or processed products, minus the operating costs including depreciation.

CORPORATION TAX, CORPORATION INCOME TAX, CORPORATION PROFITS TAX A tax levied on the profits of incorporated companies, usually annually and at flat rate.

DEMAND The quantity of a commodity that will be bought at a particular price and within a given period of time. Generally at a high price less will be bought than at a low price, yielding a demand curve explaining the relationship between the price and quantity which would be bought.
Demand does not refer to merely the desire for a commodity, and is distinguished from need.

DERIVED DEMAND Where the demand for a commodity (e.g., logs) is the direct result of the demand for another (e.g., sawnwood or plywood). The term is particularly applicable to the demand for factors of production, land, labour capital, raw materials and other inputs. The price and quantity of the factor is determined by the demand for the finished product in which it is used. Thus the greater the demand for the finished product, the greater the demand for the factor of production.

DISCOUNTING The process of estimating the present worth of an anticipated item of income or expenditure by determining the amount of money which, if present by invested and allowed to accumulate at compound interest will exactly equal the expected item of income or expenditure at the time when it becomes due.

ECONOMIC EFFICIENCY The efficiency with which resources and factors of production are used to produce goods and services of value to society. Economic efficiency is achieved when it is not possible to increase the production of some goods or services without reducing the quantities of some other goods or services that are equally valuable to society.

ECONOMIC RENT The excess of total payments to a factor of production (land, labour capital or raw materials such as timber supplies) over and above the earnings necessary to keep it in its present use.

EXTERNALITIES The costs or benefits that do not enter into the financial accounting system of the firm, organization, or industry (e.g., pollution, scenic beauty).

MARGINAL COST The additional cost of increasing output by a small amount (i.e., one unit).

OPPORTUNITY COST The value of the next best alternative foregone by devoting resources to a particular project. The value of the alternatives or other opportunities which have to be foregone in order to achieve a particular thing. The real cost of satisfying an objective, expressed in terms of the cost of the sacrifice of alternative activities given up.

OPEN-BID AUCTION, ORAL AUCTION A sale in which interested parties bid openly for timber.

OVERHEAD COSTS Overheads, fixed costs. Costs that are not directly attributable to specific units of production, mainly fixed costs and common costs.

PRESENT VALUE, PRESENT WORTH. The value at one point of time, generally the present, of a series of benefits or costs arising at subsequent points of time. NOTE: Present values are often calculated for time-streams of values measured at shadow prices rather than market prices.

ROYALTY Payment (to be) made to the owner or lessor of a forest for the right of exploiting it, generally based on a rate per unit of produce removed.

SCALE, SCALING To measure timber (individually or collectively) and fuelwood (stacked). NOTE: The person who measures is termed a scaler.

SEALED-BID AUCTION A sale in which interested parties submit written bids at the time and place specified.

SEVERANCE TAX A tax on a fixed (i.e., in situ) natural resource, (e.g., on timber), following its removal from its natural site and therefore severance from its natural stake.

SHADOW PRICE Value measured by opportunity cost principles instead of market prices, related to determining costs (or values) of goods or services not normally quantifiable by costing (valuing) according to other the opportunities foregone.

SOCIAL COST, SOCIAL OPPORTUNITY COST The non-monetary and rarely calculable toll on society arising from any form of economic activity. e.g., from smoke pollution over and above the cost of goods and services causing the smoke.

SOCIAL VALUE, SOCIAL BENEFIT The non-monetary and rarely calculable returns to society arising from any form of economic activity, e.g., those from creating a town recreation park.

SPECIFIC TAX A tax based on a physical rather than a value unit, (e.g., a timber severance tax per $m^3$)

STACKED VOLUME STACKED CONTENT, SUPERFICIAL VOLUME The total space occupied by a stack of wood, as determined by its external dimensions. NOTE: (1) is expressed in stacked cubic units (e.g., stacked cubic feet, steres) (2) stacked volume equals solid volume plus void volume.

STUMPAGE APPRAISAL The estimation of the financial value, to the concession holder of standing timber to be logged, and marketed as logs or as processed products.

STUMPAGE VALUE The value of timber as it stands uncut, in terms of an amount per cubic unit.

UPSET PRICE Reserve price. A predetermined minimum price, generally with reference to auction sales.

## ACKNOWLEDGEMENTS

From the acknowledgements below it will be clear that I owe much to the numerous individuals who contributed to the study. Positions and titles given are those at the time. Undoubtedly a number of individuals have changed positions since.

In Liberia: Mr. Joshua S. Sawyerr, Chairman of the Forest Development Authority Management Council and Acting Managing Director, Mr. Emmanue Emeh, Manager of The Forest Management Division, Mr. Samuel Dorko, Forest Management Division, Mr. Tommy Gorgla, Manager of the Utilization Division, Mr. Emmantony Constance, Chief Accountant and Acting Comptroller, Mr. Sammokai Richards, Senior Research Officer, all of the Forest Development Authority; Mrs. Henrietta Koening, Assistant Minister, Ministry of Finance; Mr. Clemenceau B. Urey, Commissioner of Customs and Excise; Mr. Harold Miller-Eckhardt, Team Leader, Documentation and Marketing Center Project; Mr. Ekkehard Nolte, Acting Head, German Forestry Mission; Mr. L. Ernest Dow, Senior Forestry Advisor, Mr. Gerold W. Schmidt, Forestry Legal Financial and Administrative Advisor, both of the FAO/World Bank Forestry Development Project.

In the Ivory Coast: S.E. Koffi Attobra, Ministre des Eaux et Forêts; M. Konan Soundele, Directeur de la Production Forestière, M. Lobourignon Zagote Christian, Directeur de Conservation du Domain Forestier, M. Anon Atsé, Directeur des Industries du Bois, M. Atron, Directeur du Contrôle Forestier et Contentieux, M. Assa Yapi, Directeur du Service Autonome des Statistiques, M.N'. Guessan Michel, Directeur de la Conservation de la Nature et l'Environnement, M. Loba, Directeur des Parcs Nationaux, all of the Ministère des Eaux et Forêts; M. Seydou Koné, Director Général and M. Gaoussou Touré, Chief de la Division des Reboisements, Société pour le Développement des Plantations Forestières (SODEFOR); M. Diarra, Director Général de l'Activité Industrielle (DGAI), M. Pierre Albet, Division des Industries du Bois, M. Séry Galé Albert, Division des Industries du Bois, all of the Ministère de l'Economie des Finances et du Plan; M.I. Bianche, Président and Mme. N. Joly, Secretariat of the Syndicat des Producteurs Industriels du Bois; Mr. K. Robert Ellinger, Deputy Mission Chief Regional Mission in West Africa, The World Bank; Mlle. Genèvieve Walravens, Chargée du Programme PNUD; M. Jean-Djigui Keita, Regional Forestry Officer, FAO Regional Office for Africa.

In Ghana: Mr. John Francois, Chief Conservator of Forests, Mr. Keso Kese, Deputy Chief Conservator, and Mr. Emanual Djokotoe, all of The Department of Forestry; Mr. Peter E.K. Boateng, Chief Executive of The Ghana Timber Marketing Board, Mrs. Alberta E. Otoo, Senior Legal Officer, Mr. J. Darko, Head of Export Sales and Mr. A.C. Stevens, Senior Accountant, all of The Ghana Timber Marketing Board; Mr. Jean-Djigui Keita, Regional Forestry Officer, FAO; Mr. R. Burnley, FAO Representative, Mr. Fred Amin-Offei, FAO.

In Nigeria: Mr. A.M. Oseni, Director of Forestry, Federal Department of Forestry, Mr. K. Aladejana, Assistant Director of Forestry, Mr. L.I. Umeh, Head of the Forest Monitoring and Evaluation Unit, Mr. R.O. Aruofor and Mr. K. Bostrom of The Forestry Monitoring and Evaluation Unit, Mr. G. Igugu, Assistant Director of Forestry, Southwestern Zone, and Mr. P.O. Enemouh, Assistant Director of Forestry, Southeastern Zone, all of the Federal Department of Forestry; Professor P.R.O. Kio and Dr. E.E. Enabor of The Department of Forest

Resources, University of Ibadan; Mr. S.A. Adetogun, Assistant Chief Conservator of Forests and Mr. I.A. Adeoye, Conservator of Forests of Oyo State; Mr. S.A. Karimu, Chief Conservator of Forests, Ogun State; Mr. R.F. Esan, Chief Conservator of Forests, Ondo State; Mr. S.O. Oruma, Deputy Chief Conservator of Forests, Bendel State; Mr. C. Bryant, Project Manager, Ogun State Forestry Plantation Project; Mr. J. Phillips, Project Manager, Ondo State Afforestation Project.

In Indonesia: Dr. Soedjarwo, Director-General of Forestry, Mr. Soemarsono, Director of Forest Production, Mr. Sisoyo Sarodjo, Director of Forest Product Marketing, Mr. Harsono, Assistant Director of Forest Planning, Mr. Salmon, Assistant Director of Forest Products and Industry, Mr. Armin Zuldin of the Directorate of Forest Products Marketing, all of the Directorate General of Forestry; Mr. Firmansjah and Mr. Sutara Matadistra of Masyarakat Perkayuan Indonesia (MPI) (Indonesian Timber Society); Mr. Karsujono and Mr. Tedjokusumo of Asosiasi Produsen Kayulapis Indonesia (Indonesian Plywood Producer's Association); Dr. Achmad Sumitro, Dean, College of Forestry, University of Gadjah Mada; Mr. R.G. Dixon, Project Manager, FAO/UNDP Forestry and Forest Products Development Project, Mr. J.G. Rumeau, FAO Representative.

In Sabah, Malaysia: Mr. William Shim, Principal Assistant Secretary, Ministry of Natural Resources; Mr. Wilfred Pereira, Assistant Conservator, Mr. Sam Mannan, Forest Economist, Mr. Awang Tengah, Scaling and Export Officer, and Mr. Chan Hing Hon, Utilization Officer, all of the Forestry Department; Mr. Hassan Ibrahim, Deputy Permanent Secretary, and Ms. Noni Said, Principal Assistant Secretary, Ministry of Finance; Mr. Mariano Munoz, Operations Manager, and Mr. Lawrence Ryan, Sabah Foundation; Ms. Monica Chia, Assistant Director, and Mr. Peter S. Gudgeon, Economic Advisor, State Economic Planning Unit; Mr. Weston D. Walch, Managing Director and Mr. Rudy Mathews, Logging Manager, Pacific Hardwoods Sdn. Bhd.; Mr. Roger J.N. Busby, Project Manager and Mr. Emil Jones, Forest Economist, FAO/UNDP, Sabah Timber Industry Royalty Appraisal and Market Study.

In the Philippines: Mr. J.B. Alvarez Jr., Director, Bureau of Forest Development, Mr. Cirilo B. Serna, Division Chief, Parks (formerly with Planning and Evaluation Division), Mr. Rogesco Bagayan, Chief Planning and Evaluation Division, Mr. Rogesco de La Rosa, Chief Utilization Division, Mrs. Eufresina Boado, Executive Officer, Project Management Staff, and Mr. Benedicto Reprado, Chief of Section, Timber Management Division, all of the Bureau of Forest Development; Mr. Jose C. Tirona , Director, Export Department, and Mr. Yuico, Department of Economic Research, Central Bank of the Philippines; Mr. B.G. Sanvictores, Mr. G.R. Fonuoso and Mr. Joselito C. Baltazar of the Philippines Wood Products Association; Mr. Edmundo Cortes, Director, Presidential Committee on Wood Industries Development; Mr. Enrique C. Amio, Forest Products Research and Industries Development Commission; Mr. Jesus N. Natonto, Field Manager, and Mr. Arsenio A. Pineda, General Logging Superintendent, Nasipit Lumber Co. Inc.; Mr. A.J. Browning, Project Manager, FAO/UNDP Forestry Development Project; Mr. Hans A.H. Dall, FAO Representative.

In Thailand: Mr. Thanon Premrasmi, Director-General, Royal Forestry Department; Dr. Sathi Chaiyapechara, Director Planning Division and Mr. Pong Sono, Director, Control Division, all of the Royal Forest Department; Dr. Amnuay Corvanich, Managing Director, Forest Industries Organization; Dr. D.B.

Reddy, Deputy Regional Representative and Dr. Y.S. Rao Regional Forestry Economist, FAO; Mr. J.K. Robert England, Assistant Regional Representative and Mr. Ratana, UNDP.

Individuals in other organizations who provided stimulus, ideas, suggestions and comments included: Professor Hans M. Gregersen, College of Forestry, University of Minnesota; Mr. John Spears, Forestry Advisor to The President, Mr. Noel R. Brouard, Forester, Eastern Africa Region, and Mr. Kenji Takeuchi, Commodities and Export Projections Division, all of the World Bank; Mr. Tore Rose, U.N. Centre on Transnational Corporations; Mr. Marion Clawson and Roger A. Sedjo of Resources for The Future, Washington, D.C., U.S.A.; Mr. George Leonard and Mr. Jim Thorne of the Timber Management Staff, U.S. Forest Service, Washington, D.C., U.S.A.; Mr. Al Hall of International Forestry Staff, U.S. Forest Service, Washington, D.C., U.S.A.; Mr. Joseph Dose, Chief Division of Forestry, and Mr. Frank Schiller, Division of Forestry, Bureau of Land Management, U.S. Department of the Interior, Washington, D.C., U.S.A.; Mr. Hans Waelti and Mr. Lehl J. Porpaczy, Valuation Division, B.C. Forest Service, Victoria, B.C., Canada; Mr. Malcolm Gillis, Harvard Institute for International Development, Cambridge, Mass., U.S.A.; Mr. Vince Matt, Forest Industries Consultant, Sumner, Washington, U.S.A.; Mr. Paul A. Ryan, Forestal International Ltd., Vancouver, B.C., Canada; Mr. Franz Schmithüsen, Forestry Department, Federal Republic of Germany (and formerly of FAO); M. Louis Huguet, Directeur Général, Centre Technique Forestier Tropical Nogent Sur Marne, France (and formerly of FAO); Mr. F. Zurbrügg and Mr. Nick Cooling of the FAO/World Bank Investment Centre, Rome, Italy.

A number of FAO field personnel in other countries took the time to comment on earlier drafts and offer suggestions and ideas that contributed to improvements. These included: Mr. S. Kolade Adeyoju, Addis Ababa, Ethiopia; Mr. William D. Beattie, Brasilia, Brazil; Mr. James J. Douglas, Dacca, Bangladesh; Mr. B. Husch, Santiago, Chile; Mr. Martin L.S.B. Rukuba, Addis Ababa, Ethiopia.

At FAO Headquarters in Rome those who provided comments on the initial outline, and several drafts as well as suggestions ideas and advice included: Dr. M.A. Flores Rodas, Assistant Director General, Forestry Department, Mr. J. Prats-Llauradó, Mr. Alf Leslie, Dr. Stan L. Pringle, Mr. J.E.M. Arnold, Mr. M.K. Muthoo, Mr. H.A. Hilmi, Mr. Arnoldo H. Contreras, Mr. C. Chandrasekharan, Mr. P.A. Wardle, Mr. M. Palmieri, Mr. M. Paveri-Anziani, Mr. Leo R. Letourneau, Mr. T.A. Erfurth, Mr. M.S. Kim, M.P.J. Lanly, and Mr. R. Levingston.

Finally I should like to especially acknowledge the advice and encouragement of the informal committee that oversaw the project, Mr. J. Prats-Llauradó, Mr. Alf Leslie, Dr. Stan L. Pringle, Mr. H.A. Hilmi, Mr. Arnoldo H. Contreras and Mr. Thomas M. Catterson who patiently piloted the project along. In addition to their advice and comments, the thoroughful and detailed comments of Mr. Philip Wardle and Dr. Hans M. Gregersen were especially helpful.

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