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VALUATION OF TROPICAL FORESTS AS NATURAL RESOURCE SYSTEMS

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VALUATION OF TROPICAL FORESTS AS COMPLEX NATURAL RESOURCE SYSTEMS

Over the last decade, and particularly over the last several years, it has become clear that tropical rainforests (TRF) are truly one of the world's last frontiers. Their value as complex natural resource systems is clearly larger than the timber and fuelwood they contain. Yet when development projects intended to manage the tropical rainforests are evaluated by conventional benefit-cost or rate of return measures, they are often found to be uneconomic by international lending institutions, such as the World Bank. Thus, use of rate of return criteria for complex resource development projects and programs can often pose an investment strategy problem for multilateral lending institutions and governments trying to increase the level and pace of economic activity, while being simultaneously sensitive to environmental concerns.

Determination of appropriate investment decision criteria for development projects and programs involving natural resource management is a critical problem for multilateral lending institutions and governments used to working with rate of return criteria. This problem is compounded if an institutional decision is made to "reshape or adapt" the rate of return approach, rather than trying alternative and supplemental analytical approaches. The result, in the case of tropical rainforest development, is that the lending institution's and government's perspective continues to reflect a belief that a more complete valuation of tropical rainforest timber and non-timber forest products and environmental services is needed to improve estimated rates of return. Of course, more complete valuation of such goods and services would logically permit benefit-cost and rate of return estimates to be performed with greater precision. As the rate of return changed, the number of projects meeting investment criteria would also be expected to change, and perhaps even increase. However, consideration should be given towards use of a broader analytical perspectives that add decision information, rather than trying to compress even more information into one number. Broader analytical perspectives, such as those used for multipurpose planning including multiple objective criteria techniques, could provide additional information that would more fully address the dynamic and interlocking linkages and complexity of resource development, socio-economic, and environmental issues.

The objectives of the initial terms of reference for my research program at the World Bank were twofold. The initial objective was to evaluate currently used approaches for economic evaluation of tropical rainforest development. The second objective was to suggest alternative, and perhaps more comprehensive evaluation methodologies. Alternative approaches and methodologies should not only be operationally oriented for Bank staff, but there is a need to also incorporate state-of-the-art analytical procedures to more adequately address sustainable development and environmental quality goals. These objectives closely correspond to concerns voiced by Bank operations staff as a result of experiences and difficulties encountered developing and implementing investment and development strategies for tropical rainforests.

EVALUATING THE "REALITY" OF VALUING TROPICAL RAINFORESTS

Multilateral lending institutions and many governments in developing countries rely on conventional rate of return measures to analyze forestry and other natural resource projects. However, the use of narrowly interpreted rate of return criteria may prove to be unintentionally discriminatory because of development difficulties caused by the interaction of dynamic economic and equally complex bio-technical relationships which are not well understood. Second, the complex dynamics of forest sector development may very well hinder efficient forestry project preparation and appraisal. These complex ecological dynamics may also cause project appraisals to understate either economic costs or benefits, and lead to under- or overstatements of estimated economic returns.

The nature of multilateral lending for forestry projects has changed over time paralleling changes in economic development paradigms over the last several decades, partially because hard evidence was increasingly difficult to find that supported commonly held views that industrial forestry projects were economically profitable, and socially and environmentally beneficial. Subsequent lending has been focused towards agro-social forestry in order to capture and recognize benefits and costs not previously quantified or monetized.

Recent internal World Bank documents indicate that ex post financial and economic returns to industrial and fuelwood projects are usually lower than ex ante appraisal analyses. On average, these projects exhibit a lower or about the same rate of return as other Bank projects, thus precluding arguments that a higher level of funding is warranted for forestry projects. However, arguments are being made that a higher level of forestry funding is justified due to social and environmental impacts for which benefits are difficult to measure. It should be noted that social and environmental impacts have often been incompletely assessed in forestry and related natural resource related development project appraisals.

Nevertheless, discussions with Bank staff suggest strongly that the economic returns for many ongoing (and in pipeline) tropical forestry projects would show significantly lower rates of return given associated social and environmental impacts. Lower returns could also be expected for other reasons, namely: optimistic product prices and unrealistic yields, unanticipated financial and cash flow problems, inefficient government fee schedules and revenue collection, poor project design or activity scheduling, cultural and institutional conflicts, bio-technical bottlenecks, and insufficient knowledge of secondary economic impacts. One conclusion that can be drawn, then, is that either or both project design and preparation procedures may be flawed. If so, new forestry (and perhaps natural resource) operational directives and additional staff training to implement the new operational directives may need to be enacted.

One area that revised operational directives will need to address is how to resolve conflicting forestry development policy objectives, while at the same time recognizing the difficulty of monetizing or quantifying direct and indirect impacts related to changes in tropical forest resource use. Many, if not most, of these impacts are not even well understood scientifically, much less available in a data format which would allow economic analysis. Further,

socio-economic and environmental goods and services resulting from tropical forest areas are difficult to quantify and even more difficult to monetize due to the complexity of the ecosystem involved. Quantifying and valuing each of the thousands of goods and services (and their interactions) supplied by tropical rainforest ecosystems is just not a realistic endeavor. This is particularly true for biodiversity concerns.

Additional valuation activities, if undertaken, would involve estimating dynamic supply, demand, and price relationships for each commodity and service to be able to add up all the socio-economic benefits. Such studies are likely to be controversial, lack public and professional support, and commandeer a far greater number of resources than will ever be likely available. Thus, it is not clear that continuing to prepare project appraisals by primarily relying on rate of return analysis will justify enhanced multilateral lending for the sustainable development of tropical forests, greatly reduce the rate of deforestation, or lead to more appropriate forestry resource development strategies.

Valuation of tropical rainforest products and services should be regarded as an empirically difficult, if not impossible task, particularly in the context of project appraisal preparation. Further efforts in this direction in order to provide additional information directed towards rate of return analyses are not likely to be practical for several reasons. These include: a) biological and ecological complexities; b) incomplete scientific knowledge; and c) inadequate economic evaluation procedures. Rather, information relating to the valuation and quantification benefits and costs related to the development of tropical forestry resources should be viewed within the context of multipurpose planning paradigms. These decisionmaking paradigms should be able to incorporate conflicting political, social, and economic objectives and tradeoffs, particularly when difficult to quantify and value environmental impacts are anticipated.

SYNTHESIZING A MULTIPURPOSE/MULTIOBJECTIVE PLANNING APPROACH FOR TROPICAL FORESTRY DEVELOPMENT

Investments in many types of projects, other than forestry and natural resources associated with fragile ecosystems, are fairly straightforward and can be evaluated in terms of estimating direct costs and benefits. In such cases benefit-cost and rate of return analyses are appropriate measuring tools for project decision making. However, forestry and natural resource projects affecting the ability of ecosystems to provide non-market goods and environmental services call for different evaluation procedures. Moreover, development of (secondary) forested and natural resource areas may be better served by taking into account their "forward and backward linkages" (e.g., their indirect secondary and tertiary social, economic, and environmental effects) which are difficult to both observe and measure using available techniques and procedures.

Development paradigms involving tropical forestry and natural resource development projects should reflect at least five stages of planning and

information development to cope with complex environmental, economic and social impacts, data chasms, and conflicting development objectives. They are as follows:

- (a) Resource inventories detailing natural resource (land, water, and forestry) characteristics, agro-ecological capacity, and other technical constraints,
- (b) Reasonably comprehensive quantitative and qualitative data on bio-technical and ecological relationships,
- (c) A bio-technical/socio-economic simulation capability for projecting critical and important relationships relating to development objectives and tradeoffs over time,
- (d) A sector development plan for providing a framework to prioritize projects, and for demonstrating forward and backward linkages within the forestry sector and with other sectors,
- (e) An analytical framework incorporating information from (a), (b), (c), and (d) above for resolving, evaluating, and identifying socio-economic and bio-technical interrelationships for making policy tradeoff decisions among alternative, and sometimes conflicting, development objectives and strategies.

The opportunity now exists for the World Bank and other international lending/donor institutions to more fully evaluate economic, ecological, and environmental benefits associated with sustainable management of tropical rainforests. This opportunity can be partially grasped by incorporating multi-purpose planning techniques and multi-objective tradeoff concepts developed over the last decade to deal with resource development problems within the commonly used benefit-cost and rate of return criteria now used by many lending and donor institutions.

In addition, because of the interacting roles that societal (non-traded) goods and services, ecological complexity, and environmental quality goals play, it is clear that the preparation and development of policy (objective) tradeoff matrixes with the assistance of client countries will need to contain ... quantitative (both monetized and non-monetized) and qualitative measurements. Some items are measurable using accepted empirical techniques, such as the value of fuelwood and the gross revenue potential of stumpage under alternative management scenarios. However, some items in the tradeoff matrix may only be valued in a qualitative manner, either due to lack of scientific knowledge (ex., biodiversity -- the value of plant tissue for future medical drugs) or the inherent difficulty of valuing public preferences for public goods (ex., valuing a diversified landscape for an urban population).

Over the last several decades, decision sciences have increasingly made use of economic paradigms and analytical approaches, particularly those relating to tradeoff concepts. In many respects, the essence of economic decisions -- the allocation of scarce resources to competing wants -- is similar to political decisions balancing competing interests. It should not be surprising,

therefore, that the interplay between economic, social, political, and environmental decisions have been increasingly well characterized by multiple criteria decision making (MCDM) techniques in recently published resource planning literature. This literature strongly suggests through empirical examples and elegant mathematical equations that MCDM concepts and operational techniques have the dual capacity to provide information to construct policy tradeoff matrixes while implicitly providing an internal rate of return for investment alternatives even though not all objectives or activities may be completely quantified or monetized.

Increased use of MCDM techniques to supplement commonly used rate of return criteria can provide additional information and criteria to evaluate alternative resource investment strategies for multilateral institutions and governments when conflicting environmental, social, and economic objectives are apparent. For example, a decision may simultaneously cause certain events with negative consequences, such as siltation or soil erosion, and those with positive consequences, such as temporary increased food or fuel production. Use of rate of return analysis alone, in this type of situation where conflicting objectives occur, may in many instances be too cumbersome, controversial, or incomplete to provide a comprehensive set of benefits and costs to decisionmakers (both clients and lenders).

SOME SUGGESTIONS FOR A RESEARCH PROGRAM TO SUPPORT A MULTIPURPOSE FORESTRY RESOURCE PLANNING PROGRAM

LAND MANAGEMENT AND POLICY ACTIVITIES: Forest authorities are responsible for forest inventories, timber production, land use, conservation, disease control, forest protection, and other activities. Land use inventories provide basic information for planning forest development programs. Inventory activities in a region can vary from general resource surveys to very detailed stand (i.e., quantity, quality, size, condition, etc), soil mapping, topography, conservation, and biodiversity studies. Such land information systems are a necessary component for any comprehensive master plans for long-term development and management of forests and natural resources--particularly if these plans incorporate economic, social, and environmental components. For example, World Bank lending for such activities reached some \$800 million in FY'87 and has been steadily increasing since then. As a consequence, the World Bank, as the lead multilateral lending institution, should begin to undertake a coordinated policy development effort to assure quality technical assistance to insure that information can be systematically incorporated into forestry and natural resource development programs.

SUPPLY AND DEMAND ISSUES FOR FOREST PRODUCTS: The policy implications of supply and demand for forest products (including minor forest products), internal marketing and distribution mechanisms, and tourism and trade potential for alternative forest development strategies are significant. For example, supply and demand studies for fuelwood in many countries could easily dominate policy and funding debate concerning the highest priority projects for multilateral lending efforts.

DEVELOPMENT OF FOREST EXTENSION AND SERVICE DEPARTMENTS: Although it is clear that better linkages are necessary between forestry research and extension, and that both extension and forestry service departments need to be strengthened, it is not clear what the most effective set of multilateral policy or project based lending policies should include. It is clear that extension and forestry services will always need better trained manpower and budgetary support for more effective management of natural forests, plantations, reforestation, watershed planning, and monitoring activities. However, much more attention needs to be placed on developing integrated and effective lending policies with measurable objectives which can be tailored on a country by country basis to justify expected changes to within country benefits and government revenue.

INCENTIVES FOR SUSTAINABLE FORESTRY DEVELOPMENT: Incentives and appropriate policies for sustainable forestry development are only now beginning to be discussed by resource and forestry economists. Increased incentives, alternative economic evaluation procedures, and policies incorporating environmental constraints and goals need to be developed for sector planning efforts and to provide a basis for project appraisals. An integrated forestry sector development policy incorporating forward and backward linkages to other sectors to increase income, employment, infrastructure, education, and other objectives could quickly refocus Bank lending efforts supporting alternative and competing land use activities (such as agricultural production and livestock), or provide the basis for a larger proportion of overall multilateral funding. Prior public investment and development policies relating to forests have been influenced by short and medium-term financial, revenue, and export economic considerations. The recent adoption of the Tropical Forestry Action Program (TFAP) by the Bank, FAO, the Regional Banks, and other multilateral institutions in 1987 indicates increasing concern about social forestry, conservation, protected forest areas, climate change concerns, and irreversible ecological damage. The increasing awareness of forests as a renewable resource with multiple uses and outputs (timber, minor forest products, environmental services, and other amenities such as recreation) has changed the forest sector's primary economic importance from an exploitable resource to an increasingly valuable asset necessary for long term economic development.

TIMBER HARVESTING AND CONCESSIONARY POLICY: An integrated policy for multilateral lending relating to government or public control of timber harvesting by private or multinational firms needs to be explored and developed. This is particularly true for concession holders located in different countries than final markets where transfer pricing problems can occur. Transfer pricing problems in addition to inappropriate harvesting fees, royalty levels, logging regulations, timber concession procedures, tax laws, trade regulations, government incentives, grading systems, marketing procedures, and various other policies (together with lax supervision and enforcement) have often encouraged deforestation, reduced government revenue, and increased environmental degradation (sometimes irreversible). Policies, implemented through sector adjustment credit loans or specific projects need to be developed to provide private firms and individuals incentives to use techniques and technology to reduce deforestation and damage, harvest timber on a sustainable yield basis, and encourage reforestation in degraded areas.

FOREST DEVELOPMENT STRATEGIES: Policies relating to strategic development of forest sectors need to be developed that reflect the enormous diversity of forest types, land resources, cultural traditions, and level of socio-economic development. Different development strategies and priorities will be needed for different countries or groups of countries with similar conditions and constraints, but should reflect each country's own set of priorities and national objectives relating to how its forests should be maintained and utilized. Most, if not all, of these policy decisions will necessarily be made on the basis of economic, cultural, and environmental criteria, and may be influenced or reinforced by multilateral lending policies at critical decision making junctures. In order to take a pro-active role in such discussions, it is vital that the immediate development of a generalized analytical framework will allow rapid and comprehensive discussions of efficient policy tradeoffs among different environmental and developmental objectives, regardless of whether they can be monetized.

SUMMARY AND CONCLUSIONS

The central tenet of development has always been "one thing leads to another, but the critical unanswered question has always been "how to make one thing lead to another." Tropical forestry and other resource development projects, are presently faced with the difficulty of learning how to "make one thing lead to another, or prevent one thing from happening to another" by incorporating socio-economic and environmental "sustainability" criteria. For tropical forestry projects, as with other resource development projects, finding operational answers to respond to these additional concerns is complicated by incomplete knowledge of critical bio-technical relationships involved and their interaction with cultural and economic systems.

The critical economic question for multilateral lending institution and government resource development specialists is "Under what circumstances, using what criteria, and for what objectives, is investment in a country's forestry sector a strategic and efficient allocation of public funds?" At least two corollary questions can be suggested. First, are the procedures currently being used to develop strategic plans and appraisals for tropical forestry projects comprehensive and well-articulated to capture important socio-economic and environmental linkages? Second, are the markets, quantities, prices, and values placed on forest related goods and services soundly developed to provide decision makers an opportunity to evaluate alternative development strategies and quantify social, economic, and environmental tradeoffs?

It is likely that the answers to these questions will involve a great deal of additional economic research and quantitative analysis examining alternative scenarios. This work will evolve slowly over time, and involve studies which lay one brick at a time. Nevertheless, this research program will need to commence soon, and acceptable interim procedures will need to be developed to design and manage tropical forestry projects that optimize economic returns, while maximizing social and environmental benefits.