# Benefits from development projects in forestry: Does the available evidence paint a true picture?

*J.G. Laarman and A. Contreras H.*

*Continued development assistance for forestry requires that forestry projects be attractive in terms of their financial, economic, social and environmental benefits. This article reviews the project completion reports of 28 externally funded forestry projects and concludes that, in many cases, the methodologies used in evaluating them resulted in an underestimation of their benefits, particularly those outside direct financial returns.*

***Jan G. Laarman*** is Professor of Forestry, North Carolina State University, USA.
***Arnoldo Contreras H.*** is Senior Forestry Specialist, the World Bank.

Development assistance to forestry has been expanding rapidly. External funding for tropical forestry increased by almost 80 percent in just the four years from 1984 to 1988 (see Table 1). Total current funding exceeds US$ 1000 million annually. The recent public awakening to the threat of tropical deforestation is surely a major determinant of funding increases. However, even the relatively large increases in international assistance for forestry are far from adequate. Financial resources needed to foster forestry development under reasonable conditions of absorptive capacity are $13000 million to $17000 million annually between now and the end of this century, according to recent FAO estimates (FAO, 1987).

While most developing economies require substantial financial investments in forestry, continued investment depends on evidence that forestry projects are attractive in terms of financial, economic, social and environmental benefits. Despite assertions and implicit assumptions that forestry projects are "good" in these dimensions, systematic information is scanty.

Financial and economic returns of a large number of projects in the forestry sector are estimated at the time of project appraisal. However, these estimates are highly uncertain, because they are forecasts of prices, costs and technological and administrative performance before projects begin. Furthermore, conventional project appraisal is rarely able accurately to account for environmental and social benefits, even though forestry advocates often assume that both are abundantly generated by forestry projects. In fact, environmental and social contributions of forestry are often assumed to be of such importance as to provide the primary argument for allocating investment resources to the sector (e.g. Fearnside, 1989).

This article examines rates of return and social and environmental impacts for forestry projects financed by multilateral donors. The review concentrates on post-disbursement results. Typical disbursement periods for forestry projects are 5-8 years, and project completion reports nominally are written I -2 years later, e.g. at 6-10 years into the project cycle. The perspective after 6-10 years usually permits a comprehensive evaluation of

apparent successes and failures. The revised financial and economic rates of return in project completion reports are still only forecasts (owing to the considerable length of forestry production cycles), yet they are considerably more accurate than estimates developed at project appraisal.

## The sample of projects

This article considers post-disbursement evaluations of forestry projects financed with both grants and loans, for which project completion reports were available as of the first quarter of 1989. The multilateral donors contacted for project completion reports were the World Bank, the Asian Development Bank, the Inter-American Development Bank, the United Nations Development Programme and FAO. A total of 28 completion reports were obtained and examined. All were included in this study.

The separation of "forestry projects" from other projects is a definitional matter determined by the lenders, and is somewhat subjective when projects have multiple objectives. The present analysis excludes forestry subcomponents in agricultural and rural development projects, given that these subcomponents nominally are too small to be individually evaluated.

Table 2 summarizes the reviewed projects according to region and purpose. Projects range in size from US$4 million to $378 million, in terms of actual accumulated project costs after the termination of loan or credit disbursement. The total portfolio represented by these 28 projects is just over $1500 million, significant in absolute amount but modest as a share of sectoral spending when considering the vastly expanded expenditure since the mid-1980s. Four loans to three European countries account for over half of the financing ($870 million), even though Africa and Asia clearly dominate in numbers of projects. Ten projects are purely grants; the 18 others are either loans or loans in combination with grants.

The earliest projects date from the late 1960s and the most recent completed projects for which reports are available were initiated in 1980. Hence the project set focuses mainly on the "first generation" of forestry projects, most of which fall into the category of forest-based industries. Additionally, a few projects, mainly in Africa, focus on fuelwood and energy. Virtually none of the projects is directed to conservation of tropical ecosystems as a primary objective. Institutional strengthening is a supporting subcomponent in most projects, but rates of return are not reported on institutional subcomponents alone.

It will be several more years before the current generation of social forestry projects can be evaluated in meaningful terms (World Bank, 1986). However, careful assessment of the first generation of projects provides a unique baseline against which results of future forestry projects can be judged. The current analysis lays out the record of past performance and implicitly sets standards for future improvement.

**TABLE 1. International aid and investment for tropical forestry, 1984 and 1988**

| | **1984 actual level** | **1988 estimated level** |
|---|---|---|
| | (millions of dollars) | |
| **National agencies** | | |
| Australia | 3 | 5.3 [a] |
| Austria | 1 | 0.1 |
| Belgium | 3 | 0.9 |
| Canada | 45 | 75.1 [b] |
| Denmark | 10 | 29.3 |
| | | |

| | | |
|---|---|---|
| Finland | 12 | 22.0 |
| France | 15 | 42.9 |
| Germany, Fed. Rep | 25 | 147.3 [c] |
| Ireland | 1 | 0.2 |
| Italy | | 11.2 [d] |
| Japan | 13 | 26.0 [e] |
| Netherlands | 10 | 32.1 |
| New Zealand | 3 | 4.1 |
| Norway | 5 | 12.6 |
| Portugal | | 0.1 |
| Spain | | 0.9 |
| Sweden | 35 | 57.9 |
| Switzerland | 11 | 22.9 |
| United Kingdom | 5 | 23.1 |
| United States | 70 | 82.7 [f] |
| East European Communities | | 35.0 |
| **Subtotal** | **267** | **631.7** |
| **Development banks** | | |
| World Bank | 106 | 129.8 |
| Asian Development Bank | 30 | 75.0 |
| African Development Bank | 5 | 1.0 [g] |
| Inter-American Dev. Bank | 32 | 6.8 [h] |
| **Subtotal** | **173** | **212.6** |
| **International agencies** | | |
| WFP | 110 | 131.4 |
| UNDP (FAO-executed projects, etc.) | 28 | 24.9 [i] |
| ILO | | 2.0 |
| FAO | 8 | 11.4 |
| UNEP | 2 | 1.5 [j] |
| Unesco | | 1.8 |
| UNIDO | | 2.8 |
| UN Sudano-Sahelian Office | | 12.2 [k] |
| **Subtotal** | **148** | **188.0** |
| **Grand total** | **588** | **1032.3** |

*Source*: Secretariat note *Review of international cooperation in tropical forestry*, prepared in July 1989 for ninth session of Committee on Forest Development in the Tropics.

[a] Figures refer to budget year 1987/88, US$1 = $A1.33. [b] Includes both CIDA and IDRC. [c] Total amount includes US$85.4 million still undetermined. [d] Rough estimate based on value of portfolio of forestry projects. [e] Rough estimate assuming 12.5% annual increase from 1986. [f] Estimate based on Forestry activities supported by the US Agency for International Development (May 1988),

ODA. [g] Rough estimate. [h] Figures by TFAP field of action are rough estimates. [i] Distribution proportionally same as FAO's. [j] Estimation based on UNEP's project list. [k] Estimation based on forestry project portfolio of UNSO, assuming average length of a project is three Years.

## Rates of return

The current study considers both financial and economic rates of return reported by the projects. In financial analysis, benefits are defined in terms of actual monetary returns resulting from the sale or rental of goods and services in a market. Costs are represented by outflows of money, mainly paid out for goods and services. In economic analysis, on the other hand, the concern is with what society gives up and gains from a project. Costs are thus defined in terms of value of opportunities foregone because resources are used in the project rather than in an alternative manner. Project benefits are defined in terms of increases in goods and services available to society as a whole owing to the project.

Both economic and financial analyses are needed. The economic analysis is needed to provide information on whether or not the project would provide an economically efficient use of the resources available to society. The financial analysis is needed to provide information on actual amounts and timing of inflows and outflows of funds.

Table 3 summarizes financial and economic rates of return (FRR and ERR, respectively) at project appraisal and completion. In several instances, FRR is not available, particularly for small projects. Project evaluation teams acknowledge that small pilot projects are often too experimental to be subjected to tests of commercial viability.

At project completion, economic returns exceed financial returns in 17 cases, and are equal in two cases. In no projects is the financial return higher than the economic return. The margin between economic and financial returns may be double or more (e.g. projects AF5, AS2, AS4 and AS6).

The large difference between economic and financial returns cannot be attributed to off-site and non-market outputs, such as external environmental benefits. These benefits may have existed, but evaluation teams did not estimate them in project completion reports. Rather, the higher economic returns are explained almost entirely by the divergence of shadow prices from market prices for direct inputs and outputs. Two of the most important shadow prices are those of labour (input) and stumpage (output). Plantation projects are labour-intensive, and they frequently estimate a shadow price of labour well below the actual wage rate in rural regions of seasonally surplus labour.

**The highest economic rate of return was reported for two logging and road-building efforts in Southeast Asia**

Regarding stumpage, financial flows from government sales of standing timber (both natural forests and plantations) often depend on administered stumpage prices well below costs of production or replacement, and well below prevailing market prices or prices in neighbouring countries. This subsidizes timber concessionaires and buyers, but reduces financial cash flow to the public landowner. Several forestry projects in this present set have struggled with reforms to increase stumpage rates, but the extent of success is dubious or still unclear. For many projects, the matter of stumpage prices continues to lie in the future as timber at present immature becomes merchantable in the 1990s and beyond.

Because the distribution of rates of return may be skewed, the median sometimes more usefully measures central tendency than the mean. At project completion, median ERR is considerably below mean ERR (Table 4) and is perhaps the more informative indicator. The

ERRs of over 100 percent for projects AS2 and AS6 are conspicuously high, inviting critical questions on assumptions, methodology and other analytical aspects. Both were successive time-slice projects to build roads and install logging and milling equipment in a low-income country of Southeast Asia. An important issue is the economic pricing of timber and land, since failure to correctly include opportunity costs for both and replacement costs for the timber can exaggerate economic returns.

**TABLE 2. Evaluated forestry projects classified by region, objective, commencement and funding level**

| Project | Main objective | Commencement | Funding | |
|---|---|---|---|---|
| | | (year) | (millions of US$) | |
| **Africa** | | | | |
| AF1 | Industrial plantations | 1968 | 23 | (L) |
| AF2 | Industrial plantations | 1969 | 4 | (L) |
| AF3 | Industrial plantations | 1974 | 20 | (L,G) |
| AF4 | Industrial plantations | 1975 | 62 | (L,G) |
| AF5 | Industrial plantations | 1976 | 8 | (L) |
| AF6 | Industrial plantations | 1977 | 41 | (L) |
| AF7 | Fuelwood plantations | 1978 | 5 | (G) |
| AF8 | Trial plantations and forest revenue collections | 1978 | 18 | (G) |
| AF9 | Fuelwood plantations | 1979 | 9 | (G) |
| AF10 | Fuelwood plantations and natural forest management | 1979 | 9 | (G) |
| AF11 | Industrial plantations | 1979 | 47 | (L) |
| AF12 | Fuelwood plantations | 1980 | 16 | (G) |
| AF13 | Industrial plantations | 1980 | 77 | (L) |
| **Subtotal** | | | **399** | |
| **Asia** | | | | |
| AS1 | Integrated wood-processing complex | 1970 | 12 | (L) |
| AS2 | Logging, roading and milling | 1974 | 43 | (G) |
| AS3 | Logging, roading and milling | 1977 | 43 | (L) |
| AS4 | Fuelwood plantations | 1978 | 6 | (L) |
| AS5 | Industrial plantations and smallholder tree farming | 1978 | 11 | (L) |
| AS6 | Logging, roading and milling | 1979 | 62 | (G) |
| AS7 | Rehabilitation of forest industries | 1979 | 26 | (L) |
| AS8 | Mangrove plantations and land accretion | 1980 | 11 | (G) |
| AS9 | Farm forestry and community woodlots | 1980 | 48 | (G) |
| AS10 | Farm forestry and community woodlots | 1980 | 76 | (G) |
| **Subtotal** | | | **338** | |
| **Europe, Near East and North Africa** | | | | |
| EMENA1 | Silvicultural investments | 1972 | 173 | |
| EMENA2 | Newsprint mill | 1976 | 198 | |
| EMENA3 | Integrated pulp/paper complex | 1976 | 378 | |
| EMENA4 | Industrial plantations | 1979 | 121 | |
| **Subtotal** | | | **870** | |
| **Latin America and Caribbean** | | | | |

| | | | | |
|---|---|---|---|---|
| LAC1 | Industrial plantations, logging roading and milling | 1979 | 36 | (L) |
| **Total, all regions** | | | **1683** | |

*Note*: L = Loan; G = Grant.

**Evaluation estimates versus appraisal estimates**

Table 3 also evidences the difference between rates of return estimated at time of appraisal (before project implementation) and those re-estimated upon project evaluation at completion (after disbursement). Only three projects indicated higher rates of return at evaluation than at appraisal. This is explained by meeting plantation targets ahead of schedule together with rising timber prices (AF1); by lower than projected planting costs in combination with rising lumber prices (LAC1); and by underestimation of area planted and wood selling prices in farm forestry (AS9).

Most estimates at appraisal have been too high, sometimes by substantial margins. The unweighted mean FRR for forestry projects at appraisal was 24.4 percent. This compares with 7.9 percent re-estimated at evaluation. The comparable figures for ERR are 32.6 percent and 20.1 percent respectively. Thus, performance has fallen substantially short of expectations, especially on the financial side.

Forestry is not the only sector affected by excessive optimism. The 1988 World Bank report on project performance, referring to the 949 projects which had been both appraised at the time of project approval and evaluated at project completion, states that "the degree of uncertainty - and optimism surrounding economic rate of return estimates which is revealed in the experience of the past 12 years is sufficient to warrant a systematic inquiry into the reasons why economic rates of return at completion differ so much from expectations at appraisal" (World Bank, 1988). An additional set of 187 projects was analysed the following year and the Bank concluded that "the gap between appraised and re-estimated ERRs was slightly wider this year- 10.8 percent on average" (World Bank, 1989).

**TABLE 3. Financial and economic rates of return at appraisal vs. completion**

| Project | Internal rates of return | | | | | |
|---|---|---|---|---|---|---|
| | Financial | | | Economic | | |
| | Appraisal | | Completion | Appraisal | | Completion |
| | (%) | | (%) | (%) | | (%) |
| AF1 | 10 | (U) | >10 | 13 | (U) | >13 |
| AF2 | NA | (C) | NA | 11-12 | (S) | 11-12 |
| AF3 | 10 | (O) | 6 | 13 | (O) | 7 |
| AF4 | NA | (C) | 6-11 | 18-25 | (O) | 9-13 |
| AF5 | 10 | (O) | 7 | 14 | (S) | 14 |
| AF6 | 11 | (O) | 9 | 20 | (O) | 15 |
| AF7 | NA | (C) | NA | 12 | (O) | 6 |
| AF8 | 18 | (O) | <1 | NA | (C) | NA |
| AF9 | NA | (C) | NA | 20 | (O) | 15 |
| AF10 | NA | (C) | NA | 9-11 | (S) | 7-10 |
| AF11 | NA | (C) | NA | 12 | (O) | 10 |
| AF12 | NA | (C) | 7 | N | (C) | 9-16 |
| AF13 | NA | (C) | 5-10 | 12-13 | (S) | 10-14 |
| AS1 | NA | (C) | NA | 29 | (O) | Negative |

| | | | | | | |
|---|---|---|---|---|---|---|
| AS2 | 33 | (O) | 16 | >100 | (S) | >100 |
| AS3 | NA | (C) | <1 | >100 | (O) | 41 |
| AS4 | 18 | (O) | 11 | 41 | (O) | 22 |
| AS5 | 25-105 | (O) | 4-5 | 2-103 | (O) | 4-5 |
| AS6 | 14 | (O) | 9 | >100 | (S) | >100 |
| AS7 | 100 | (C) | NA | >100 | (C) | NA |
| AS8 | NA | (C) | NA | 18 | (S) | 18 |
| AS9 | NA | (C) | 13 | 12 | (U) | 19 |
| AS10 | 13 | (O) | 11 | 17 | (O) | 16 |
| EMENA1 | 33 | (O) | 6 | NA | (C) | 6 |
| EMENA2 | 8 | (O) | 5 | 16 | (O) | 15 |
| EMENA3 | 10 | (O) | 5 | 14 | (O) | 8 |
| EMENA4 | NA | (C) | 7 | 21 | (O) | 12 |
| LAC1 | 13 | (U) | 14 | 15 | (U) | 17 |

Rate of return at appraisal compared with at completion:

| | | | |
|---|---|---|---|
| Overestimated | (O) | 12 | 14 |
| About the same | (S) | 0 | 7 |
| Underestimated | (U) | 2 | 3 |
| Cannot compare | (C) | 14 | 4 |

*Note*: NA = Not available

**Project size**

As indicated in Table 4, weighted means of rate of return do not differ to any marked degree from unweighted means. This implies that project size has no direct association with project success or failure. A larger number of projects would have to be analysed before size comparisons could be made meaningful in a statistical sense.

Rates of return for four large EMENA projects appear no higher than rates of return for the project set as a whole. Furthermore, the data for 23 forestry projects in Africa and Asia show little association between project size and complexity, and rates of return.

**Comparison with non-forestry projects**

A rate of return of 10 percent marks a conventional cut-off between successful and unsuccessful projects among multilateral agencies. By this criterion, 19 of 26 forestry projects pass the economic test, but only 6 of 20 pass the financial test. The application of a single cut-off rate across a variety of economies and project types can be criticized as simplistic. Nevertheless, the use of a uniform rate may be sensible from the viewpoint of setting minimum expectations in the allocation of limited funding.

Table 5 indicates that the mean ERR of the present set of forestry projects lies near the mean ERR of all World Bank projects evaluated to date. Moreover, the success rate for forestry on the basis of ERR (19 of 26 projects) is roughly comparable with the success rate for all World Bank projects (552 of 708 projects). Hence forestry appears neither more attractive nor less attractive than other sectors on the basis of this limited comparison.

**TABLE 4. Financial and economic rates of return d project completion, unweighted and weighted by project size**

| | Internal rates of return | | | |
|---|---|---|---|---|
| | Financial | | Economic | |
| | (%) | | (%) | |
| **Unweighted mean** | **7.9** | **(20)** | **19.8** | **(26)** |
| **Weighted mean** | **6.9** | **(20)** | **18.0** | **(26)** |
| Africa | 7.6 | (8) | 11.6 | (12) |
| Ash | 9.8 | (7) | 47.3 | (9) |
| EMENA | 5.5 | (4) | 9.8 | (4) |
| Latin America | 14.0 | (1) | 17.0 | (1) |
| **Median** | **7.5** | **(20)** | **12.5** | **(26)** |

*Note*: Means and medians computed using mid-points of ranges when point estimates not given; estimates exceeding 100 percent regarded as 100 percent for computations; number of projects given in parentheses.

**TABLE 5. Distributions and means of projects by economic rates of return (ERR) at project completion**

| Estimated ERR | Forestry projects | | All World Bank projects | |
|---|---|---|---|---|
| (%) | No. | % of total | No. | % of total |
| Negative | 1 | 3.8 | 60 | 8.5 |
| 0.0 - 9.9 | 6 | 23.0 | 96 | 13.5 |
| 10.0 - 14.9 | 8 | 30.8 | 161 | 22.7 |
| 15.0 - 19.9 | 7 | 26.9 | 147 | 20.8 |
| 20.0 - 29.9 | 1 | 3.9 | 147 | 20.8 |
| 30.0+ | 3 | 11.6 | 97 | 13.7 |
| **Totals** | **26** | **100.0** | **708** | **100.0** |
| Weighted mean ERR | 17.9% | | 17.8% | |

*Sources*: Table 3 and World Bank, 1987, *Twelfth annual review of project performance results*, Appendix Table 1.11, Washington, D.C., Operations Evaluation Department.

## Social impacts

Attention to the social nature of development projects has been growing. However, the project completion reports considered in our analysis provide only fragmentary information about social impacts. At the time these projects were designed and implemented, concern about the effects, either positive or negative, was significantly less than it is today; in many cases, the social dimension was explored only superficially, if at all, during project design. As a consequence, procedures for identifying and measuring social impacts were not as developed as methodologies for financial and economic analysis, leading to a severe lack of data available at project completion. However, some information is available.

### Employment and income distribution

Eleven of the 28 reports examined employment effects. However, the information is not standardized and full-time employment equivalents are impossible to compute from the given data. Moreover, the data are too sparse and incomplete to permit estimates of project

investment cost per job created. None of the 28 projects appears to have been supported with sociological analysis of employment and earnings either before or after project implementation.

### Social conflicts

In a number of projects, it appears as if land scarcities for food cross were not fully appreciated at project appraisal. This led to the technical problem of obtaining adequate amounts and site qualities of land for forest plantations, and the social problem of interacting with the people already present in the area. In one plantation project in West Africa (AF11), an ambitious planting target was achieved only to have 2400 families encroach on the newly planted area. In East Africa (AF4), a project evicted squatters who had started cultivating land intended for forestry.

Evaluation reports on two early social forestry projects in South Asia (AS9, AS10) raise questions about a number of social issues. First, they maintain that arrangements for distribution of benefits in community plantations were vaguely defined if defined at all. Participation by small and marginal farmers was much less than expected at appraisal. Government forestry officials were accused of promoting private planting by the larger landowners to supply large wood-processing industries. Another complaint was that good agricultural land was diverted to tree planting, and that these operations used less labour than agricultural production.

## Environmental impacts

Documentation of environmental impacts has been sparse and superficial. Projects reviewed here were conceived during a period when environmental protection received far less attention in development assistance than it does today. Appraisal reports and evaluation reports tended to focus on environmental aspects only when recognized problems were in the forefront of project decision-making (World Bank, 1987). Despite the lack of systematic analysis, the evaluation reports on forestry projects permit a few informal observations.

**Environmental aspects tended to be analysed only when recognized problems were In the forefront, for example In pulp and paper manufacturing plants**

### Positive impacts

Industrial projects related to pulp and paper (i.e. EMENA 2, EMENA 3) appear to have made special efforts to control effluent and otherwise manage environmental risks. The project reports go into detail on how plant siting and technology were adjusted for matters of river flow, population distribution and surrounding economy. One plant was originally conceived as a chemical pulp mill, but the technology was changed to mechanical pulp because of low river flow. In the other case, perceived threats to tourism and the environment led planners to change the location of a pulp and paper project from one province to another. This caused a two-year delay, reappraisal, and considerable cost overrun.

A number of forestry projects have had a positive impact through helping develop land-use planning guidelines, formulating or strengthening government policies for protecting forests and wildlands, or demonstrating new protection techniques. An example is EMENA 4, a project that largely failed to achieve the desired development of industrial plantations but made considerable progress in demonstrating techniques for reforesting eroded slopes, controlling fire losses, improving grazing practices and installing civil works for torrent control. Significantly, almost none of this was factored into the project's financial and economic analysis.

Projects in arid zones of West Africa (AF7, AF10) were intended to produce fuelwood and building poles. According to the completion reports, the first of these projects played a "significant catalytic role" and has led to "increased awareness on the subject of forestry". The second achieved a "major accomplishment" by helping decrease the rate at which fuelwood was extracted from two forest reserves under depletion pressure. This second project is also thought to have produced a favourable microclimate for agricultural production in areas adjacent to the two forest reserves.

A few plantation projects established nature reserves in critical zones of the regions in which they contemplated tree planting. A project in humid West Africa (AF8) fostered a national parks and wildlife section within the government's forestry department. This led to the creation of the country's first national park shortly thereafter. A plantation project in East Africa (AF4) helped establish a nature reserve, although the national government ultimately reduced its size from 10000 ha to 4000 ha in view of concerns about taking too much land from agricultural users.

A central objective of a mangrove afforestation project in South Asia (AS8) was to protect the coastline from cyclones and tidal surges, and to accrete new land which later might be useful for agriculture. The project attained most of its planting objective, and hence perhaps most of its environmental objective. Yet the appraisal report stated that "the absence of data on sedimentation, accretion and stabilization... implies that the project should be justified on the basis of forest products alone". Consequently, the central protection benefits were not even factored into financial and economic analysis.

**Unresolved impacts**

Of the 28 projects reviewed here, only one (EMENA 1) encountered formal opposition from organized environmental constituencies. An association for nature protection, together with an organization for water conservation, addressed the national government about peatland drainage, wildlife effects of road construction and effects on lakes and ponds of forest fertilization. In response, the multilateral lender and national government agreed to set aside certain peatlands for protection and to take into consideration the other concerns. In the end, "this apparently satisfied the two organizations which had raised the issues".

Technology choice in logging has raised a number of questions about appropriateness. For example, a project in Southeast Asia (AS2, AS6) expanded logging by substituting road transport for river transport, and by increasing the number of logging operations. Project evaluators maintain that elephant logging does less damage to forest stands than mechanized logging, but also express alarm about the capture of wild elephants from a declining population. The use of trucks rather than log rafts for log transport allows a greater number of non-floating species to be logged, but expansion into non-teak logging presents its own risks of forest damage. Also, the harvesting method favoured by the project fells teak trees when they are green, and is thought to cause more damage to the residual stand than the traditional felling of girdled trees. Hence the arguments for or against negative impact are complex, multidimensional and not easily answered.

**The environmental impacts of forest road construction were rarely considered In project assessment**

Technology has also been an issue in land clearing for forest plantations. Mechanical clearing was applied in humid West Africa (AF8, AF11, AF13), with mixed performance. In two of these projects, soil compaction and leaching resulted in slow plantation growth, and weed competition became a serious problem. These projects later shifted toward manual clearing methods to the extent that mechanical methods were found unsuitable.

For the most part, the industrial plantation projects have treated environmental issues incompletely and superficially, though assuming that beneficial impact has been generated. For example, the evaluation report for AF1 asserts that "it can be safely said that the project fulfilled the usual protective and amenity roles of large-scale afforestation schemes". Another report for a plantation project in Africa (AF3) limits itself to "tree cover reduces erosion and improves soil fertility and water retention".

However, a number of other reports, written a few years later, indicate (again without substantiation) that tree planting may have been more harmful than beneficial. Evaluation reports on community forestry projects in East Africa and South Asia (AF9, AS9, AS10) express doubts about the wisdom of planting eucalyptus. Another report (AS6) comments on teak plantations as vulnerable to problems of insects, disease and soil erosion. Still another for a project in humid West Africa (AF13) sums up with the ambiguity "It is not clear if plantations are an ecological benefit or ecological cost".

Apparently, plantation development has occurred on a wide range of sites and preexisting vegetative conditions. Competition with agriculture has been intense in a number of projects (AF2, AF3, AF4, AF7, AF9, AF11, AS4, AS5, AS9, AS10). Land-use mapping to delineate areas for tree planting versus other uses was not always adequate. For example, project AF4 provided for land capability classification but, owing to a number of constraints, this activity was never implemented. As a result, a great deal of land with agricultural potential was put under forest plantations.

A few projects (AF8, AF13, AS4) removed natural forest as a starting point for industrial plantations. Importantly, the evaluation reports suggest that these forests had already been logged or otherwise disturbed to varying degrees. One of these projects attempted to substitute pine for natural forest in a humid region of West Africa, but was unable to get the pine to grow satisfactorily (AF8). In another case, clearing apparently extended into some unsuitable areas and destroyed a certain amount of wildlife habitat (AF13).

## Lessons learned and implications for the future

Review of the first generation of multilaterally funded forestry projects points out the incompleteness and superficiality of assessments of social and environmental impacts of the early projects. Its major contribution is systematic quantification of financial and economic rates of return.

Results show that the distribution and central tendency of ERR on the early forestry projects roughly conform to patterns of ERR on other projects in other sectors. The data presented here make it difficult to argue that forestry has done either better or worse than this larger portfolio of projects.

This may disappoint critics of the early forestry efforts, who level sharp charges at the development banks for improperly conceived and badly implemented projects. The result similarly may perplex the forestry enthusiasts who cling to doctrines that forestry is inherently more attractive for development than alternative sectors.

With respect to financial returns, the means and median of FRR are below the standard hurdle rate of 10 percent. Project evaluators tend more and more to emphasize social costs and benefits ahead of financial costs and benefits; thus, high financial profitability is not often all objective per se. Yet projects which experience substandard financial cash flow perpetually require outside subsidy. In the current era of worldwide debt crises and austerity policies, subsidies are difficult to justify except under exceptional circumstances.

**Integration of social and environmental analyses with economic analysis**

Environmental and social impact analyses must be designed better and integrated into economic analysis of forestry projects to give a true picture of their benefits. The first step would be to apply more widely cost-benefit calculations where ecological values are at stake. However, problems of valuation and methodology remain substantial. Many frontiers of conceptualization and theoretical work have yet to be crossed. Moreover, quantitative evidence in natural resources economics is not and never will be precise. Nonetheless, these are not sufficient grounds to refrain from applying approximate tools and estimates derived from present knowledge.

In retrospect, the completion reports of the forestry projects reviewed here indicate gaping holes in valuing opportunity costs of land, in evaluating non-market outputs, in considering watershed links with agricultural productivity, in identifying and valuing amenity benefits, in quantifying depletion costs, in identifying impacts on different socio-economic groups and in numerous related questions. The absence of such analysis greatly understates what might be achieved, produces misleading perspectives on desirable versus undesirable projects, and helps to explain why forestry projects appear to generate no more than average ERR in a total portfolio of projects. Many of the forest's goods and services are not marketed, implying obvious understatement in parochial examination of just the marketed products.

Recently, economists and natural resources specialists have made a start toward developing analytical concepts and valuation methods of direct relevance for the kinds of projects typically arising in the forestry sector (Spears, 1985; Anderson, 1987; Gregersen *et al*., 1987; Grut, 1987 and 1988). Increasingly when these methods of analysis are applied, even to first-generation projects, it becomes apparent that the largest and earliest benefits are often not the wood but, rather, indirect and jointly produced outputs (Anderson, 1987).

The challenge now is to regularly apply that thinking in on-the-ground project identification, preparation, appraisal and evaluation. The main obstacle is one not of knowing but of doing.

**Policies to elevate financial cash flow**

On the other hand, if the true failing of past forestry projects has been inadequate generation of direct net revenues, then no amount of environmental economics will remove that constraint. In that case, forestry projects must generate stronger financial cashflow through policy changes and other means. This point seems to be well understood by the development banks (World Bank, 1986). Main issues are seedling prices and distribution costs in community forestry, subsidies and stumpage prices in industrial forestry, credit availability and terms for all forms of forestry, and costs of publicly funded extension and technical assistance across the whole sector. On the one hand, most traditional forestry agencies have not nurtured an investment orientation (McGaughey and Gregersen, 1983). On the other, current conditions make it difficult to raise prices, reduce subsidies and in other ways upset forceful leaders in private business. Additionally, ideas such as rent capture may go beyond a forestry agency's usual purview of sectoral issues. Recent work on timber pricing policy (Repetto and Gillis, 1988) directs attention to the considerable financial magnitudes at stake and suggests that genuine reform could make a large difference in favourably shifting cash flow toward resource owners. This is an encouraging finding, as the evidence suggests that forestry development projects, and particularly those supported by external loans, must generate and capture higher net revenues or lose favour in the highly competitive arena of development assistance.

**Investment in human capital**

Institutional weaknesses are a prominent feature of failed development projects. Institution-building components have been incorporated in most of the projects examined here. However, project completion reports normally pay far more attention to physical attainments than to

particular strengths and weaknesses of personnel. Given the sensitivity of personnel issues, this is understandable. Nevertheless, future forestry projects must find a way to take advantage of special strengths of capable individuals, while filling gaps where such individuals are sparse.

## Bibliography

**Anderson, D.** 1987. *The economics of afforestation: a case study in Africa*. World Bank Occasional Paper No. 1, new series. Baltimore, Md, Johns Hopkins University Press.

**FAO.** 1987. *Mobilizing funds for world forestry development*. Rome.

**Fearnside, P.M.** 1989. Extractive reserves in Brazilian Amazonia. *Bioscience*. 39: 387-393.

**Gregersen, H.M. *et al.*** 1987. *Guidelines for economic appraisal of watershed management projects*. FAO Conservation Guide No. 16. Rome, FAO.

**Grut, M.** 1987. Cost-benefit analysis of fuelwood and forest protection projects in developing countries. *Commonwealth For. Rev*., 66: 25-29.

**Grut, M.** 1988. *Issues arising in economic analysis of bank financed forestry projects*. Washington, D.C., AFTAG Division, World Bank.

**McGaughey, S.E. & Gregersen, H.M.** 1983. *Forest-based development in Latin America*. Washington, D.C., Inter-American Development Bank.

**Pasca, T.M.** 1988. The politics of tropical deforestation. *American Forests*, 94(11/12): 21-24.

**Repetto, R. & Gillis, M.,** eds. 1988. *Public policies and the misuse of forest resources*. New York, Cambridge University Press.

**Spears, J.** 1985. Deforestation issues in developing countries: the case for an accelerated investment programme. *Commonwealth For. Rev*., 64: 313-343.

**World Bank.** 1986. *World Bank financed forestry activity in the decade 1977-86: a review of key policy issues and implications of past experience to future project design*. Washington, D.C., Agriculture and Rural Development Department.

**World Bank.** 1987. *The twelfth annual review of project performance results*. Washington, D.C., Operations Evaluation Department.

**World Bank.** 1988. *Project performance results for 1986*. Washington, D.C., Operations Evaluation Department.

**World Bank.** 1989. *Project performance results for 1987*. Washington, D.C., Operations Evaluation Department.