

Forestry Commission
ARCHIVE

Evaluation of the Contribution of Forestry to Economic Development

A J Grayson



COVER PICTURES:

Top left. Log piles at paper mill, Groveton, New Hampshire, U.S.A. HERBERT L. EDLIN.

Centre left. Assembling panels of sawn hardwood (Eucalyptus), Zambia. ARNOLD J. GRAYSON.

Bottom left. Oak logs at sawmill, Stafford, England. HERBERT L. EDLIN.

Top right. Forest nursery and pine plantations, Zambia. ARNOLD J. GRAYSON.

Centre right. Spruce forest near Oslo, Norway. HERBERT L. EDLIN.

Bottom right. Nine-year old Eucalyptus plantations at Mulungu, Zaire. PETER J. WOOD.

Evaluation of the Contribution of Forestry to Economic Development

**PROCEEDINGS OF A MEETING OF A WORKING PARTY OF THE INTERNATIONAL
UNION OF FOREST RESEARCH ORGANISATIONS HELD AT THE HEADQUARTERS
OF THE FORESTRY COMMISSION, EDINBURGH, 30 SEPTEMBER-3 OCTOBER, 1975**

Edited by
A. J. GRAYSON, M.A., B.Litt.
Forestry Commission

FOREWORD

At the Fifteenth Congress of the International Union of Forest Research Organisations (I.U.F.R.O.) held at Gainesville, Florida in March 1970, a Working Party was set up in Division 4 (Planning, Economics, Management and Policy) to consider methods of evaluating the contribution of Forestry to economic development.

This Bulletin contains the papers presented at the meeting of this Working Party together with a report of the discussions held in the Headquarters' Office of the Forestry Commission of Great Britain, Edinburgh in the autumn of 1975.

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EDITOR'S PREFACE

The study of economic growth is and will remain a central theme of economics. It has however only been during the past 30 years or so that economists have focused attention on the factors governing growth in less developed countries.

For anyone who has witnessed the conditions of life in such countries, it is hardly necessary to argue the case for promotion of higher living standards when one reflects on the conditions, in some places worsening, of life and all that these mean for the health, well-being and dignity of the peoples concerned. In any event the question is to a large extent made academic by the fact that Governments and peoples show by their action their support of economic growth. In the face of this pervasive ethos, it is simply not relevant, because politically impracticable, to favour any other objective than one which promises a greater command over material resources.

It follows that a fundamental aim of development policies, whether autonomous or aided by various external measures, is the growth of purchasing power. But the consequences of higher aggregate incomes are by no means equally beneficial for all classes or groups in a developing country. While the distribution of income has long been a subject of study in the more developed economies, the necessity for recognising inequalities of income distribution has only been recognised fairly recently in less developed economies and more attempts made to assess such inequalities. This matter of income distribution, with, in many places, growing inequality of incomes, can be pursued at a variety of levels. One concerns the rural-urban division. The writer recalls the occasion of a talk to FAO personnel over a decade ago when Gunnar Myrdal pointed out that the provision of employment in secondary and tertiary industry was decades away in most developing countries: the need was to develop job opportunities in a wide variety of rural activities and the services that these in turn demanded. The change of emphasis in development strategy towards the rural sector is at last being given recognition by politicians.¹

In the more technical business of evaluation techniques used in the economic appraisal of alternative courses of action, economists have at last begun to tackle the problem of assessing how well a wide variety of objectives are likely to be served by a given project. Within the broad spectrum of methods now advanced one may note the goals-achievement matrix approach and increasingly refined developments of cost-benefit analysis.

The papers which follow—and the discussions in the meeting at which they were presented show the same point—reflect the more realistic, comprehensive attitude to project appraisal and evaluation that has only recently become part of economists' stock-in-trade but has a familiar ring to many forest managers concerned with planning ways of satisfying competing objectives.

The papers presented range from the descriptive through the methodological to the prescriptive. Although their coverage is so wide it is hoped that they may stimulate those working on problems of development, especially those concerned with aid programmes of developed countries and international agencies, to consider more fully the implications of their proposals in conjunction with those whose lives they influence.

In organising this meeting of the Working Party, which was the first following discussions at the XV IUFRO Congress, I have been greatly helped by the interest and attention of those who prepared papers and contributed to the discussions. Owing to the desire to publish materials speedily, it has not been practicable to carry out the fullest editing which might have been desirable. In a few cases where the length of the original paper suggested it, authors kindly agreed to my editing of their work without reference back. I am especially indebted to Dr. von Maydell for undertaking the translation into German of all the summaries of papers as well as to authors for providing French versions of their summaries.

I am also indebted to the Director General of the Forestry Commission, Mr. J. A. Dickson, who welcomed participants to the meeting and who allowed the Working Party to enjoy the services of the new Headquarters building of the Forestry Commission and to Mr. G. D. Holmes, Commissioner for Harvesting and Marketing and a member of the Executive Board of IUFRO, for a stimulating opening address to members. Thanks are also due to Mr. E. J. M. Davies, Conservator of Forests, South Scotland Conservancy who arranged and to Mr. R. Chard who led a tour of Glentworth forest in the course of the meeting.

A. J. GRAYSON

Chairman of Working Party S4, OS. 01.

FORESTRY COMMISSION, EDINBURGH

¹ See, for example, Hart, Judith (1975). The priority for rural development overseas, *Overseas Development Paper* No. 4, 13 pp, H.M.S.O.

LIST OF AUTHORS AND PARTICIPANTS

AUTHORS

- *Dr. S. K. Adeyoju, Department of Forest Resources Management, University of Ibadan, NIGERIA
Mr. T. R. Blackford, Ministry of Overseas Development, UNITED KINGDOM
Dr. I. S. Ferguson, Australia National University, Canberra, AUSTRALIA
- *Dr. D. Haley, Faculty of Forestry, The University of British Columbia, Vancouver, CANADA
Prof. F. Helles, Department of Forestry, Royal Veterinary and Agricultural University, Copenhagen, DENMARK
- *Dean J. W. Ker, Faculty of Forestry, The University of New Brunswick, Fredericton, CANADA
Mr. J. J. MacGregor, Commonwealth Forestry Institute, Oxford, UNITED KINGDOM
Prof. G. von Malmberg, Royal College of Forestry, Stockholm, SWEDEN
Dr. H-J. von Maydell, Forest Research Institute, Reinbek, WEST GERMANY
Dr. O. O. Olawoye, Department of Forest Resources Management, Ibadan, NIGERIA
Mr. M. S. Philip, Department of Forestry, University of Aberdeen, UNITED KINGDOM
Mr. J. J. Reilly, Department of Forestry, Australia National University, Canberra, AUSTRALIA
- *Prof. J. H. G. Smith, Faculty of Forestry, The University of British Columbia, Vancouver, CANADA
Mr. A. A. Strain, Department of Forestry and Wood Science, University College of North Wales, Bangor, UNITED KINGDOM
Mr. P. A. Wardle, Forest Economics and Statistics Branch, Forestry Department, F.A.O., Rome, ITALY
- *Prof. M. Wayman, Faculty of Chemical Engineering and Applied Chemistry, University of Toronto, CANADA

OTHER PARTICIPANTS

- Mr. D. Alder, Commonwealth Forestry Institute, Oxford, UNITED KINGDOM
Mr. R. J. N. Busby, Planning and Economics Division, Forestry Commission, Edinburgh, UNITED KINGDOM
Mr. J. Dewar, Planning and Economics Division, Forestry Commission, Edinburgh, UNITED KINGDOM
Mr. A. J. Grayson, Planning and Economics Division, Forestry Commission, Edinburgh, UNITED KINGDOM
Mr. C. Kelly, Planning and Economics Division, Forestry Commission, Edinburgh, UNITED KINGDOM
Prof. F. Jørgensen, Department of Forestry, Agricultural College of Norway, Vollebakk, NORWAY
Dr. W. E. S. Mutch, Department of Forestry and Natural Resources, University of Edinburgh, UNITED KINGDOM
Mr. E. D. Parkes, Australia National University, Canberra, AUSTRALIA

*did not attend

SUMMARIES OF PAPERS

1. THE EXISTING AND POTENTIAL ROLES OF FORESTRY IN THE ECONOMIES OF DEVELOPING COUNTRIES

By J. J. MacGREGOR

United Kingdom

Views on economic development in general and a summary of claims made for forestry in making approaches to Government are presented along with qualifications about earlier attempts to initiate development. According to some development economists many of the impediments which have been examined from time to time have often proved to be less than expected. Problems of measuring the potential role of sectors of the economy are brought up while the need to be clear about the ultimate aim of rural development, social reform, and the recognition of the limitations of industrial strength is emphasised.

The nature and quality of data are frequently inadequate for basic planning which implies the need for public intervention, financial and social evaluation by cost-benefit analysis, and also for data for investment decisions e.g. on technology, costs, demand and supply. Studies of the world situation by FAO and others have assisted individual countries to put their own plans into perspective.

An analysis is given of criteria sometimes used in judging forestry's role. A fourfold classification—used to describe limitations affecting forest expansion—and the implications of a dynamic forest policy are explored. Special features and potential contributions of the forest industries are also stressed in relation to the developing countries.

The limitations and advantages of generalising on such a large subject are put forward and a plea is made for more evaluation of what has actually been achieved in individual or national development projects.

2. EFFECTIVE POLICIES FOR STIMULATING INVESTMENT IN FORESTRY AND FOREST INDUSTRIES IN COUNTRIES WITH TROPICAL FORESTS

By H-J. von MAYDELL

West Germany

Moist tropical forests have proved to be an enormous potential renewable resource. To activate this potential for present and future supplies to meet human needs requires investment in lands, labour and technical development and allocation of financial funds.

The present worldwide change in tropical forest policies calls for reconsideration of the objectives aimed at and the trends expected by tropical countries on one side and timber importers of the temperate zone on the other. There are solutions to many problems which lie in the best interest of both parties. It is the responsibility of professional foresters, scientists and industrialists to provide correct and convincing information to the decision makers on the needs and on the benefits of tropical forestry.

The tropical moist forest, properly managed, is not the "big green nothing" it had been characterised a long time ago. It is one of the promising potentials of our limited globe. Other sectors of the economy are far less useful to human society. Although they offer lower returns on land, human labour and capital invested they have, so far, succeeded in attracting money by cleverly lobbying for their cases. It is therefore clear that we need an efficient policy to stimulate investment in forestry and forest industries in countries with tropical moist forest.

One of the first steps in this direction is to reduce investment risks. In the background, however, for every investor is the question "Does it pay?" This, of course, means much more than could be expressed in terms of money. It means a fairly positive balance between input and output, reaching as far as reputation and personal satisfaction, political motivation and cultural life. This may mean, e.g., access to markets and/or resources, research facilities, licences, etc., decentralisation, diversification, distribution of risks and, naturally, fair returns on the money invested.

However effective an investment policy may be, experience has proved that it is not the only and very often not the decisive factor for investment in forestry and forest industries. Even in the almost total absence of stimulating policies we have had investment and, on the other side, very attractive policies have failed in mobilising funds. The initiative and activity of the investor is still and will remain the ruling factor for forest and forest industries development in the tropics.

3. THE ROLE OF FORESTRY IN ALLEVIATING POVERTY IN NIGERIAN RURAL AREAS

By O. O. OLAWOYE

Nigeria

Nigeria is a low income per capita country characterised by a great degree of income and wealth inequality and by widespread poverty.

Rural poverty in Nigeria is reflected in unemployment, low income, poor housing, low level of education, inadequate or complete absence of medical facilities, inadequate diet and lack of social facilities.

The role of forestry in Nigerian rural development has been significant. In the industrial sector, forestry has played a great role in employment of rural people. Also plantation establishment can, and will, absorb a lot of rural labour.

Income generated from export duties on logs has helped the government towards achieving its fiscal policy objectives. Forestry has played a valuable role in alleviating poverty through the provision of food in various ways. In addition, provision of roads, modern forest villages, social infrastructure and prevention of natural hazards have been some of forestry's contribution to alleviation of poverty in Nigeria.

4. THE ROLE OF FORESTRY FOR INCOME AND EMPLOYMENT

By G. von MALMBORG

Sweden

The purpose of the paper is to present a research project going on in Sweden. But the background to Swedish forestry is presented to emphasise ownership characteristics and structural features.

Large-scale forestry, primarily state and company owned, is most common in northern Sweden, but even there private forests make up about one third of the total acreage. And in southern Sweden they are quite dominating (Table 3).

About half of the privately owned forests acreage is combined with agriculture. The real figure, however, is higher because some "de facto combinations" are listed as not combined.

The private forests are mainly small.

The management objective of state and company owned forests is primarily production of raw material for the forest industry. That is, of course, the final end use of the privately produced timber, but the private owners may have—and usually have—other goals, which are more directly tied to their prime interest. Example of such goals may be job opportunities, transfers of capital, saving. Also private owners differ considerably with respect to age, interest in different types of production etc. The age distribution among farmers affects their ability to carry out forestry work.

Despite the combination of agriculture and forestry only between 40 and 60% of all farmers are fully occupied on their farms. And that proportion has declined between 1961 and 1971.

Owner characteristics and structural conditions affect forestry work and employment. Thus more than 90% of the labour force in large-scale forestry is employed on a permanent basis or work more than 1,200 hours per year. In small scale forestry only 2% work more than 1,200 hours.

Various developments have resulted in depopulation in the sparsely populated forestry regions and we may have reached a turning point. One indicator of this is a growing interest in these areas and in agriculture and forestry. Of course, there are other reasons for this interest, too, but they all work in the same direction.

The main purpose of the research project, in which the University of Umeå and the Schools of Agriculture and Forestry are involved, is to study consequences in a region of alternatives in forestry and agricultural production with respect primarily to biological and technical means. The interest is focused on employment and income. One important aspect is how to balance decreasing employment and/or income against increases in other branches.

SUMMARIES

5. FORESTRY'S CONTRIBUTION TO ECONOMIC AND SOCIAL DEVELOPMENT IN MALAYSIA

By J. W. KER

Canada

This paper has been prepared to provide an introduction to economic and social developments in Malaysia and their implications for forestry.

The historical perspective and forest resource base are reviewed, followed by an outline of Malaysia's economic planning and achievements to date, its national objectives, distribution of income and ownership and its aim to restructure the racial composition of employment.

Education, academic, technical and vocational, being a federal responsibility, is given high priority in Malaysia, receiving between 8 and 10% of public development expenditures. A single educational system for the 13 states and the capital district that comprise Malaysia, a common language (*Bahasa Malaysia*), and a national emphasis on rapid economic and social development are the principal factors tending to bind together this new nation that sprawls 2,100 kilometres (1,300 miles) from Penang and Perlis in the west to the Sulu Sea in the east.

In the first ten years of its existence, Malaysia has rapidly expanded its production and export of forest products, achieving an unsustainable rate of exploitation. A relatively small proportion of the resultant revenues has been re-invested in forestry. Even more serious, however, have been lack of planning and control over extraction, especially on state-owned lands and areas being converted to agricultural use, and the extensive export of logs in the round, especially from Sabah and Sarawak.

The federal government, through the Ministry of Primary Industries, aided by the numerous studies of the FAO Forest Industries Development Project, has taken steps to prohibit the export of roundwood and to encourage the integration and rationalisation of forest-based industries. Meanwhile state governments, in both East and West Malaysia, with the help of forest and forest industry surveys undertaken with overseas assistance, including the Canadian International Development Agency, are beginning to develop more adequate forest policies and administrations.

A serious handicap to all such endeavours, however, is the extreme scarcity of qualified and experienced foresters, forest engineers and administrators in both government (federal and state) and industry. Malaysia's emphasis on education is therefore logical. But achieving the target composition by racial group, though an understandable national objective, is creating voids in many essential categories of employment. For example, only about 15% of administrative and research positions within the Forestry Department in 1973-74 were occupied by qualified staff members.

Whether or not Malaysia is successful in replacing its timber growing stock and roundwood supplies, now being depleted so rapidly, and in rationalising management of the forest resource will depend, to a large extent, upon the extent and success of corrective measures taken by federal, state and industrial agencies during the next decade.

6. FORESTRY DEVELOPMENT IN THE NEW ECONOMIC COMMUNITY OF WEST AFRICA (ECOWAS)

By S. K. ADEYOJU

Nigeria

"Economic integration" is a fashionable slogan the meaning of which can be stretched very far. The most usual formal instruments of economic integration are concerned with the free movement of goods, services, and factors of production. They include the free-trade area, the customs union, and the common market. The fulfilment of these economic conditions underlies the protracted consultations and negotiations (over a period of more than twelve years) culminating in the Treaty of Lagos.

On 27-29 May 1975, the Presidents and Heads of government of fifteen severally contiguous West African countries initiated the Economic Community of West African States, ECOWAS, or CEDEAO, Communauté Économique et Douanière de l'Afrique de l'Ouest, to the Francophones. In the communique issued after the treaty establishing the union, the heads of state affirmed as their basic aim the promotion of co-operation and development in all fields of economic activity. They were convinced that such a co-operation is essential for raising the standard of living of their peoples, of increasing and maintaining economic stability, of fostering closer relations among their countries and of contributing to the progress and development of Africa. They also affirmed their determination to make the community a "pragmatic, dynamic and effective institution which will take into account the realities prevailing in member states".

This paper therefore seeks to outline the possibilities for forestry development within the economic community. There are, however, severe limitations to a full discussion of the forestry potentials in the sub-continent. First, the information available is most inadequate. There are no reliable data on major aspects such as the size of forests, area of forest types, forest production, industrial output, employment potential, wood export and imports, forest service capability, finance, and so on. Second, ECOWAS has just been launched, and as at present (early July 1975) only two countries (Liberia and Nigeria) are reported to have ratified the treaty, in real terms, ECOWAS is still a proposal. In spite of the newness of ECOWAS and the unsatisfactory state of information, an attempt is made in this paper (a) to summarise the general economic setting of the union; (b) to review the forest resources; and (c) to assess the major areas of forestry development.

Because of the inequalities of forest resources endowment, planned commitments to major forest industrial projects, the apparent advantages of economies of scale, and the similarity of important forestry problems, there is no doubt that the benefits of international actions overwhelm those of the small resources of most member states each of which is concerned with pressing economic problems on all fronts. Because of the narrow and unstable economic base of most member states, the national allocations of resources to forestry are generally inadequate. However, the integrated economic policy foreseen for ECOWAS indicates that the resources of the more endowed and developed partners will be available for the improvement of the less industrialised members. Thus the surplus products of the high forests should be more easily accessible to the land-locked savanna and semi-desert countries, while forest industrial promotion, management practices, research, education, training and wildlife development can be rationalised.

The forestry objectives of ECOWAS can be attained only if the forest services will endeavour to recognise the new obligations and challenge of the Treaty of Lagos, and institute an appropriate programme of action without delay. In this respect, the need for establishing task forces and consultations on various technical problems cannot be overstressed.

7. FOOD FROM WOOD

By M. WAYMAN

Canada

Present practices in using wood for food and fodder are reviewed. The largest scale uses are via wood hydrolysis to prepare wood sugars, and their fermentation to single cell protein; single cell protein grown on spent pulping liquors; and leaf meal. Under commercial development is a process for manufacture of a feed energy source directly from hardwoods which promises to provide a significant proportion of the winter maintenance requirements of cattle. To this date, the economic impact of all wood conversion processes on food and fodder supply is negligible, except in the U.S.S.R., where it is believed to supply about 3% of the protein required for high protein feed concentrates. The potential is, however, great. It is estimated that the wood presently wasted in normal harvesting practices throughout the world is more than ample, upon conversion to wood sugars and then to single cell protein, to supply the full amount of the recommended dietary requirement of protein for all of the world's children. The economics would be tolerable compared to other priorities.

8. QUANTITIES, EVALUATION AND THE FORESTRY SECTOR CONTRIBUTION TO DEVELOPMENT

By P. A. WARDLE

Food and Agriculture Organisation of the United Nations

A number of the ways in which the activities of FAO in the fields of economic analysis and statistics assist in planning the contribution of the forestry and forest industries sector to economic development are described. These include (i) the assembly of international statistics on resources, production and trade, industry capacity and costs and prices; (ii) analysis of regional and world trends in the use of forest products and the formulation of estimates for the future, and (iii) at the national level, support in the assembly of information, evaluation of alternative projects and courses of action, and the formulation of sector plans.

The importance of basic information services for rational planning of the sector and the best allocation of resources for development is stressed. In two major areas it is noted that information is particularly

SUMMARIES

deficient, namely—that of (i) destruction and alienation of forest and forest land and (ii) the use of wood and its economic role in rural communities of developing countries. A clearer understanding in these two areas is vital to the assessment of resource potential and for identifying the optimum allocation of resources for community benefit in developing countries.

9. FORESTRY IN REGIONAL ECONOMIC DEVELOPMENT IN DENMARK

By F. HELLES

Denmark

This paper reports an ongoing research work, the aim of which is to throw light on the role of plantation forestry in the economic development of the Jutland heath region.

The research work is based upon the following hypothesis: in the most backward parts of the heath region plantation forestry played a considerable role in the economic development, a role which mainly had the character of a catalyst effect, i.e. plantation forestry made income and materials available to the local population which accordingly became able to undertake decisive investments in agriculture. There also were growth effects upon commerce and services, crafts and small-scale industries.

Two economic models are used, both of which are based upon three concepts: (i) “elementary circle”, i.e. the plantation in question, (ii) “economy circle”, i.e. the local community to which the plantation belongs, and (iii) “the outside world”, i.e. the territories outside the economy circle.

In the paper the main stress is laid on explaining the research method, but a few results from the analysis of a pilot area are presented in order to illustrate how the models work.

10. PROJECT DATA HANDBOOK FOR FORESTRY

By T. R. BLACKFORD

Ministry of Overseas Development, United Kingdom

Project Data Handbooks are conceived of not so much as comprehensive guides to what are usually highly technical subjects, but rather as a means for alerting the policy-maker to the fundamental problems and conditions which he is likely to face in dealing with the areas under consideration. Indeed, in the sense that handbooks are something akin to “check-lists” by which projects can be assessed and evaluated, no specialised knowledge is demanded in order to understand and profit by the use of the information given.

However, the handbook on forestry does take its analysis a little deeper than is usually the case. Indeed this is to a certain extent unavoidable simply because an economic analysis cannot ignore the technicalities of forestry. Moreover, as the role and position of the forestry sector is unique in every economy, a broad outlook reflecting an “average” situation had to be adopted. In this sense the handbook makes no claim to being infallible.

With this in mind, a glance at the contents reveals something of the nature of study. Dealing with it section by section we have the following arrangement.

Section A is an analysis of present and future global market trends for forestry in general terms of supply and demand. The latter part of this section is an interpretation of the price-demand and income-demand relationships which are of obvious and direct relevance to any economic analysis of a commodity like wood.

Section B juxtaposes trends in world wood prices with the aforementioned relationships as a reminder of their economic interrelations. It is also made plain that although forestry involves a long time scale, often up to 50 years and beyond, which militates against accurate forecasting, useful results may be gained by examining past trends and extrapolating them into the future to produce a not unrealistic economic forecast which is of immense use when assessing likely costs/benefits in forestry planning.

Section C provides a succinct appraisal of the potential contributions to be made by the forestry sector to economic development. Written as a summary of powerful economic arguments to be found in sources listed in the text, it focuses on nine major reasons why forestry is an important asset to a developing economy.

Section D deals with the technicalities of forestry. The text therefore ranges over subjects as diverse as production yields, growth rates and the influence of markets, and correlates them under the heading “Production Forestry”. This section provides a valuable and concise insight into the physical side of forestry together with the associated economic factors.

Section E deals with the financial aspects of forestry, which are obviously germane to any discussion of the forestry sector. It concerns itself primarily with the determination of royalty rates which are the basis of forest-derived finance.

Section F is a short section concerned with the evaluation of non-marketable costs and benefits which accrue to forest areas. Clearly, in areas of controversial or complicated decision, these factors, which are often very difficult to quantify, can play a decisive role in policy planning.

Section G deals with logging and returns to the rather more physical techniques of forestry. This subject is dealt with fairly comprehensively, again with an economic view in addition to a description of physical processes.

Sections H and I are devoted to an analysis of the secondary stages of the forest industry i.e. the attendant industries using forest products and the role they have to play in an economy. Once again the text offers a valuable introduction to the subject, especially pulping, and includes a summary of the technical nature, scale and energy requirements of industries ranging from sawmills and pulp production to fibreboard and hardboard mills.

Finally the appendix is comprised of a table designed to illustrate the annual increments to tree growth and the minimum level of forest area necessary for the economic viability of a typical factory.

Clearly the handbook makes no attempt to answer all of the questions on forestry. Its basic aim is to convey the idea of forestry in an economic context using the simple criteria contained in the text. The importance of alerting policy-makers to the economics of a subject is obvious and must help to formulate rational planning decisions for both developing and developed countries alike. To be ignorant of the economics is to ignore a crucial area, the understanding of which is a prerequisite for logical, rational decisions. Ultimately, therefore, the intention with the handbook is to broaden the outlook of policy makers and to enable them to gain a fuller picture of the subject.

11. PROBLEMS INVOLVED IN HARMONIZATION OF ECONOMIC OBJECTIVES WITH TECHNICAL, ENVIRONMENTAL AND SOCIAL CONCERNS ABOUT FOREST DEVELOPMENT

By J. H. G. SMITH

Canada

Experience in Taiwan and other developing countries is compared with recent trends in attitudes toward use of forest resources in Canada and the United States. It appears as if both traditional and modern environmentally aware feelings toward creation and use of forest resources are in conflict with the commonly accepted goal of rapid economic growth in developing nations.

For many years forest land managers have stressed preservation and conservation of land, timber, and associated resources. Their ideas about sustained yield and multiple use have often conflicted with the desires of development planners and forest economists to treat forest capital as a stock resource. Nevertheless many developing countries are rapidly converting forest capital to social capital. Reservations of forest land to protect watersheds, grow timber, provide recreation, and to shelter and sustain fish and wildlife are being invaded by hordes of "landless ones" who have no other place to go. Shifting cultivators clear cut, burn, plant and move on as part of their way of life. Roads scar mountain sides, offend and assist tourists, accelerate erosion and increase sedimentation. Mills provide jobs but pollute water and air. It is evident that new goals and new ethics are needed if forest development is to be undertaken without severe impacts on the environment. Whether or not current North American attitudes can be applied to developing countries remains to be seen. It is much easier to state the problems than to propose solutions but some attempts are being made to provide a viable conceptual framework for harmonisation of conflicting objectives and attitudes.

12. JUSTIFICATION AND SOURCES FOR FUNDING OF FORESTRY OPERATIONS IN DEVELOPING ECONOMIES

By D. HALEY and J. H. G. SMITH

Canada

The role of investments in forest resources and forest based industries in the economic development process is reviewed. It is suggested that while such investments can provide many highly desirable goals

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and services, plus a reasonable return to capital, much of the justification for funding forestry projects is found in the indirect role forestry is expected to play in the development process. The dangers of justifying any investment programme on the basis of indirect and intangible returns without carefully analysing the nature and true impact of such returns are emphasised. Sources of funding for forestry operations are described, and the advantages and disadvantages of several alternatives are discussed.

13. DYNAMIC SYSTEMS ANALYSIS AND FOREST DEVELOPMENT PLANNING

By A. A. STRAIN

United Kingdom

After a discussion of the informational advantages of systems analysis in the context of development planning, an illustration is given of one of the ways in which Forrester's industrial dynamics model can be applied to the forest economy, using a set of difference equations elaborated for the log export sector.

14. THE IMPACT OF POLICIES AND FISCAL MEASURES ON FOREST INVESTMENT

By M. S. PHILIP

United Kingdom

The rate of United Kingdom forest investment is traced from 1947 to 1974 using the area planted as the measure. The parts played by forest, agricultural and social policies and strategies of taxation and direct subsidy in forestry and hill farming in determining the level of investment are analysed. It is concluded that in the light of the predicted trends in politics and society in the United Kingdom and under current tax legislation, the outlook for all sectors of forestry—including the State-owned Forest Enterprise, the privately owned sector and industry based on home grown wood—is daunting. At present there are no plans to expand the State investment in forestry if, as the author predicts, the private sector withdraws. The contrast between this situation and that in the rest of the European Economic Community is noted.

15. THE SOCIAL DISCOUNT RATE AND OPPORTUNITY COST OF CAPITAL IN FORESTRY DEVELOPMENT PROJECTS

By I. S. FERGUSON and J. J. REILLY

Australia

Use of the same rate of interest for public and private investment is not feasible because of market imperfections. Use of a synthetic discount rate which takes account of the opportunity cost of capital would result in an inefficient allocation of public resources over time. On the other hand, use of the social rate of time preference as a discount rate and of a separate shadow price for scarce capital is most likely to enable the public sector to approach an optimal allocation of resources, both over time and otherwise. The social rate of time preference was estimated to lie in the range 4 to 6% and a value of 5% was selected for use in cost-benefit analyses. The shadow price for loan funds, the major source of scarce capital, was estimated to be \$2.73 per dollar of loan fund used.

RÉSUMÉS DES COMMUNICATIONS

1. LES RÔLES EXISTANTS ET POTENTIELS DES FORÊTS DANS LES ÉCONOMIES DES PAYS DÉVELOPPANTS

Par J. J. MacGREGOR

Royaume Uni

L'auteur envisage, au cours de cette étude, certains aspects du développement économique en général, ainsi qu'un résumé des arguments avancés pour justifier les prétentions forestières, auprès du Gouvernement. Selon certains économistes spécialisés en matière de développement, bien des objections sporadiquement soulevées, se sont en fait souvent révélées plus discutables qu'elles ne le semblaient de prime abord. Les problèmes concernant l'évaluation du rôle potentiel de certaines sections de l'économie sont soulevés, cependant que l'emphase est mise sur le besoin de clarifier la nécessité de cerner le but ultime du développement rural, de la réforme sociale, et de la prise de conscience des limites du pouvoir de l'industrie.

La nature et la qualité des données sont souvent inadaptées à la planification de base, qui implique le besoin d'une intervention publique, d'une évaluation financière et sociale par l'analyse de rentabilité, de même que le besoin de données concernant les décisions d'investir, par exemple dans la technologie, les prix, l'offre et la demande. La FAO et d'autres organisations ont, par leurs études sur la situation mondiale, aidé certains pays à planifier de façon plus large.

Une analyse est faite des critères quelquefois utilisés pour évaluer le rôle des forêts ainsi que la relation entre revenu et demande de bois. L'auteur entreprend l'examen d'une classification en quatre rubriques, qui servent à définir les limites affectant l'expansion forestière, et ce qu'implique une politique forestière dynamique. Il souligne en particulier certains aspects des industries forestières, ainsi que leur participation potentielle, dans le contexte des pays en voie de développement.

Une mise en garde sur les avantages et limites de la généralisation sur un sujet aussi vaste est faite par l'auteur qui en même temps formule le souhait que soit mieux considéré ce qui a été en réalité obtenu dans les projets de développement nationaux ou locaux.

2. MESURES DE LA POLITIQUE FORESTIÈRE POUR L'ENCOURAGEMENT DES INVESTISSEMENTS DANS LE SECTEUR FORESTIER ET L'ÉCONOMIE DU BOIS DANS LES PAYS DISPOSANTS DES FORÊTS TROPICALES

Par H. J. von MAYDELL

Allemagne de l'Ouest

Les forêts humides tropicales représentent un potentiel immense de matières premières renouvelables. Pour la mise en valeur de ce potentiel dans le but de couvrir des besoins actuels et futurs de l'homme, des investissements soit en forme de terre, de main d'oeuvre, de développement technique ainsi que des moyens financiers seront nécessaires.

Les changements actuels globaux des objectifs de la politique forestière poursuivis par des pays tropicaux donnent occasion à des réflexions nouvelles. Celles-ci ont rapport d'une part aux buts et aux développements attendus dans les régions tropicales et d'autre part aux perceptions qu'ont les pays des zones tempérées importateurs du bois tropical. Une multiplicité des solutions de problèmes communs s'offrent dans l'intérêt mutuel.

C'est la fonction des forestiers, chercheurs et entrepreneurs de l'économie du bois de fournir ceux qui doivent prendre des décisions avec des informations correctes et convaincantes sur la demande d'investissements et la capacité de l'économie forestière et du bois des tropiques.

Une forêt humide tropicale correctement aménagée n'est pas du tout "le grand rien vert", comme on l'appelait autrefois. La forêt représente plutôt un des potentiels qui promet le plus dans notre monde limité. D'autres secteurs de l'économie sont bien moins utiles pour l'homme. Bien qu'ils fournissent des résultats moindres en ce qui concerne la terre soumise à la production, la main d'oeuvre et le capital investi

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ils réussissaient de mobiliser plus de moyens d'investissement à cause d'une argumentation adroite. Pour cette raison il est nécessaire de développer des programmes de la politique forestière d'assistance effectives dans les pays tropicaux.

Un premier pas en poursuivant cet objectif sera la réduction du risque. Malgré ceci la question décisive pour l'investisseur sera: "Est-ce que cela vaut la peine?" Cela exprime plus que la valeur monétaire. Y compris sont des points de vue comme une relation équilibrée entre les dépenses et les recettes, l'autorité, le prestige et la satisfaction personnelle, des motifs politiques ainsi que des domaines culturels. De l'importance sont entre autre l'accès aux marchés et/ou aux ressources de matières premières et aux autres ressources, les possibilités de recherche, les licences, la décentralisation, la diversification, la distribution du risque—et naturellement un paiement d'intérêts convenable sur les moyens investis.

Des programmes effectifs de développement sont d'une importance considérable. Mais assez souvent il a été constaté que ces programmes n'ont pas été le facteur décisif pour une décision d'investissement sur le secteur de l'économie forestière et du bois. Des investissements ont été effectués même en manque presque total d'une politique soutenant l'encouragement des investissements, tandis que d'autre part des lois très attractifs restent inefficaces, quand il était question de verser des investissements. Dernièrement ce sont et resteront l'initiative et l'activité de l'entrepreneur qui décident sur le développement de l'économie forestière et du bois dans les tropiques.

3. LE RÔLE DES FORÊTS POUR SOULAGER LA PAUVRETÉ EN REGIONS RURALES NIGÉRIENNES

Par Dr. O. O. OLAWOYE

Nigéria

Le Nigéria est un pays de bas revenu par tête, caractérisé par un haut degré d'inégalité de la richesse du revenu et par une pauvreté largement répandue.

La pauvreté rurale au Nigéria se reflète dans le chômage, les bas revenus, un logement pauvre, un niveau bas d'éducation, l'insuffisance ou l'absence totale des facilités médicales, une alimentation insuffisante et l'absence des services sociales.

Le rôle de la sylviculture dans le développement rural Nigérian a été d'importance. Dans le domaine industriel, la sylviculture a joué un grand rôle dans la création d'emploi pour les gens ruraux. L'établissement de plantations continuera à absorber un grand nombre de travailleurs ruraux.

Les revenus issus des droits sur l'exportation du bois ont aidé le gouvernement à atteindre ses buts quant à sa politique fiscale. La sylviculture a joué un rôle noble quant à la diminution de la pauvreté en fournissant de la nourriture de trois manières principales.

La fourniture de routes, de villages forestiers modernes, d'infrastructure sociale, et de protection contre les hazards naturels ont été des contributions de la sylviculture à la diminution de la pauvreté.

4. LE RÔLE DES FORÊTS POUR LE REVENU ET L'EMPLOI

Par PROFESSEUR G. von MALMBORG

Suède

Ce document a pour but de présenter un projet de recherche sur lequel on travaille en Suède. Comme arrière-plan, on présente l'exploitation de la sylviculture suédoise telle sort que l'on en fasse ressortir les caractéristiques de la propriété et les traits structuraux.

La sylviculture à grande échelle, possédée en premier lieu par l'état et par les sociétés, est la plus fréquente au nord de la Suède, mais même là, les forêts privées atteignent un tiers de la superficie totale et au sud de la Suède elles sont tout à fait prédominantes (Tableau 3).

La moitié environ de la superficie forestière possédée par des particuliers est combinée avec l'agriculture. Le pourcentage exact en est néanmoins plus élevé parce que quelques "de facto combinaisons" sont portées sur la liste comme n'étant pas combinées (Tableau 4).

La superficie des forêts privées est principalement réduite (Tableau 5).

L'objet des gestions de l'état et des forêts possédées par les sociétés est essentiellement la production de matières premières pour l'industrie forestière. Cela est bien entendu le mode définitif d'emploi du bois produit par des particuliers, mais il se peut que les propriétaires privés aient—et c'est ce qu'ils ont ordinaire-

ment—d'autres buts, qui sont plus directement liés à leur intérêt principal. Comme exemple de tels buts, on peut citer des possibilités de travail, des transmissions de capitaux, des épargnes. Les propriétaires privés diffèrent aussi, quant à leur âge, leur intérêt de types différents de production etc. La répartition de l'âge parmi les fermiers est présentée au Tableau 6.

Malgré la combinaison de l'agriculture et du travail forestier, il n'y a que 40 à 60% de tous les fermiers qui soient entièrement occupés sur leurs fermes et cette proportion abaissée entre 1961 et 1971 (Tableaux 7a, 7b).

Les caractéristiques des propriétaires et les conditions structurales affectent le travail forestier et l'emploi. Ainsi plus de 90% de la main-d'oeuvre à grand échelle est employée à titre permanent ou travaille plus de 1,200 heures. En ce qui concerne la sylviculture à petite échelle, il n'y a que 2% qui travaille plus de 1,200 heures (Tableau 8).

Cet état de choses a abouti à une dépopulation dans les régions forestières à population clairsemée et il se peut que l'on ait atteint un moment critique. Ce qui l'indique est un intérêt croissant pour ces surfaces et par l'agriculture et la sylviculture. Bien sûr, il y a aussi d'autres raisons qui expirent cet intérêt, mais elles sont toutes dans la même direction.

L'intention principale de ce projet de recherche dans lequel l'Université d'Umeå et les Ecoles Royales Supérieures de l'Agriculture et des Forêts sont engagées, est d'étudier les conséquences que l'on peut trouver dans une région qui présentait des alternatives à sylviculture et en produits agricoles quant aux moyens biologiques et techniques en premier lieu. L'intérêt est centralisé sur l'emploi et les revenus. Un aspect important est de savoir comment équilibrer l'emploi décroissant et/ou revenus et les augmentations dans les autres domaines.

5. LA CONTRIBUTION DES FORÊTS POUR LE DÉVELOPPEMENT ÉCONOMIQUE ET SOCIAL EN LA MALAISIE

Par J. W. KER

Canada

Le présent document cherche à fournir une introduction aux développements économiques et sociaux en la Malaisie et leurs implications pour la gestion forestière.

Un seul système d'éducation pour les treize états et la région capitale, une langue commune (bahasa Malaisie) et une emphase nationale sur un rapide développement économique et social sont les facteurs principaux tendant à resserrer cette nation nouvelle.

Pendant les premières dix années de son existence, la Malaisie a augmenté rapidement la production et l'export des produits forestiers, accomplissant une rapidité d'exploitation pas soutenable. Seulement une petite proportion du revenu résultant a été replacé à la sylviculture.

L'administration fédérale, par le Ministère des Industries Primaires, et aidée par les études nombreuses du projet de la FAO "Développement des Industries Forestières" a pris des mesures pour encourager l'intégration et la rationalisation des industries basées sur les forêts. Un désavantage sérieux pour tous ces efforts, pourtant, est la rareté extrême des forestiers avec des qualifications et de l'expérience dans le gouvernement (fédéral et provincial) aussi bien que dans l'industrie. L'emphase Malaisienne sur l'éducation est donc logique.

6. LE DÉVELOPPEMENT FORESTIER DANS LA NOUVELLE COMMUNAUTÉ ÉCONOMIQUE DE L'AFRIQUE DE L'OUEST (ECOWAS)

Par Dr. S. K. ADEYOJU

Nigéria

Les instruments officiels les plus courants de l'intégration économique intéressent le libre mouvement des biens, des services et des facteurs de production. Elle peut prendre la forme de zones de libre échange, d'unions douanières ou de marchés communs. C'est vers ces objectifs économiques qu'étaient orientées les consultations et négociations prolongées, qui se sont étendues sur plus de douze ans, et qui ont abouti au traité de Lagos.

Du 27 au 29 mai, 1975 les présidents et chefs des gouvernements de 15 pays d'Afrique occidentale qui ont des frontières communes ont lancé la Communauté Économique et Douanière de l'Afrique de l'Ouest (CEDEAO; ECOWAS, Economic Community of West African States). Dans le communiqué publié à la suite du traité, les chefs d'états ont affirmé que leur objectif fondamental était de promouvoir la coopération et le développement dans tous les secteurs de l'activité économique. Ils étaient convaincus qu'une telle coopération est essentielle pour relever le niveau de vie de leur peuple, améliorer et maintenir la stabilité économique, stimuler un resserrement des relations entre leurs pays et contribuer au progrès et au développement de l'Afrique.

On a cherché dans le présent document à définir les possibilités qui s'ouvrent au développement forestier dans la communauté économique. Cependant, une étude complète du potentiel forestier du sous-continent se heurte à des limites sérieuses. Premièrement, les informations disponibles sont très insuffisantes.

On n'a pas de données fiables sur des questions très importantes telles que la dimension des forêts, la surface des divers types de forêts, la production forestière, la production industrielle, le potentiel d'emploi les importations et exportations de bois, le potentiel des services forestiers, le financement, etc. Deuxièmement, la CEDEAO ne fait que démarrer et à l'heure actuelle, au début juillet 1975, deux pays seulement sont signalés comme ayant ratifiés le traité (Libérien et Nigérien), en pratique l'CEDEAO n'est encore qu'un projet.

Comme les ressources forestières ne sont pas réparties également, non plus que les places d'investissements dans de grands projets d'industrie forestière, ni les avantages qui à attendre des économies d'échelle et comme en revanche d'importants problèmes forestiers sont semblables, il est certain que les avantages des initiatives internationales dépassent de loin ce que la plupart des États Membres peuvent faire avec leurs simples ressources d'autant plus que chacun doit résoudre sur tous les fronts des problèmes économiques très urgents. Etant donné la base économique limitée et instable dans la plupart des États Membres, les crédits affectés dans chaque pays au secteur forestier sont généralement insuffisants. Cependant, la politique économique intégrée prévue pour la CEDEAO indique que les ressources des pays les mieux pourvus et les plus développés seront mises à disposition pour permettre des progrès chez les membres les moins industrialisés. Ainsi la production excédentaire des forêts denses devrait devenir plus facilement accessible aux pays semi-désertiques et sans littoral de savane, tandis que d'autre part il sera possible de rationaliser la promotion des industries forestières, les pratiques d'aménagement, la recherche, l'enseignement, la formation et la mise en valeur de la faune.

7. ALIMENTS TIRÉS DU BOIS

Par M. WAYMAN

Canada

Les modes actuels de préparation d'aliments et de fourrage à partir du bois sont passés en revue. A grand échelle, on distingue—l'hydrolise du bois, puis la fermentation des sucres de bois obtenus, qui donne des cellules protéiques simples, le développement de cellules protéiques simples sur les produits d'utilisation des liquers de réduction en pâte—la préparation de mets de feuillages. Est en cours d'introduction commerciale un procédé de préparation directe d'une source énergétique alimentaire à partir du bois d'arbre feuillu, qui promet de pourvoir à une part importante des besoins de subsistance du bétail en hiver. Jusqu'à maintenant, l'impact économique de l'ensemble des procédés de conversion du bois en aliments et en fourrage est négligeable, sauf en U.R.S.S., où semblent-ils, ils fournissent 3% des protéines nécessaires dans les aliments à haut taux protéique. Le potentiel d'utilisation est cependant considérable. On estime que le bois actuellement perdu à travers le monde, dans les pratiques courantes de récolte, est plus qu'amplement suffisant pour, après conversion en sucres de bois puis en cellules protéiques simples, fournir à tous les enfants du monde la quantité diététique requise de protéines. La rentabilité d'une telle utilisation serait acceptable si on la compare à celle d'autres objectifs prioritaires.

8. APPORT DU SECTEUR FORESTIER AU DÉVELOPPEMENT, QUANTITÉS ET ÉVALUATION

Par P. A. WARDLE

Organisation des Nations Unies pour l'Alimentation et l'Agriculture

L'auteur décrit comment le travail de l'analyse économique et statistique de la FAO aide à planifier l'apport du secteur forestier et des industries forestières au développement économique. Ce travail consiste

à (i) rassembler de statistiques internationales sur les ressources, la production et le commerce, le potentiel industriel et les coûts et les prix; (ii) analyser les tendances régionales et mondiales de l'utilisation des produits forestiers et faire des prévisions, (iii) au niveau national, soutenir le rassemblement des informations, évaluer les options possibles (projets, méthodes d'action), et élaborer des plans sectoriels.

L'auteur souligne le rôle des services d'information de base dans la planification rationnelle du secteur et dans la répartition optimale des ressources pour le développement. Il note que les informations sont particulièrement insuffisantes dans deux principaux secteurs (i) destruction et aliénation de forêts et terres forestières, et (ii) utilisation du bois et son rôle économique dans les communautés rurales des pays en développement. Une meilleure connaissance de ces deux facteurs est indispensable pour évaluer le potentiel et pour déterminer une répartition optimale des ressources dans l'intérêt des communautés des pays en développement.

9. LA FORÊT DANS LE DÉVELOPPEMENT REGIONAL ÉCONOMIQUE EN DANEMARK

Par F. HELLES

Danemark

Ce papier présente une recherche en cours, visant d'élucider le rôle des travaux de reboisement dans le développement économique de la région des landes Jutlandaises (Danemark).

La recherche se base sur l'hypothèse suivante: pour les régions les plus déshéritées des landes Jutlandaises les travaux de reboisement jouaient un rôle considérable dans le développement économique régionale surtout par son effet multiplicateur, c'est à dire les reboisements forestiers distribuant des salaires et plus tard des produits forestiers permettant par la suite à la population locale agraire de faire des investissements déterminants dans l'agriculture. Un effet d'accroissement de l'activité dans le commerce, le secteur de services, le menuiserie et chez les artisans se constatait également.

Deux modèles économiques sont utilisés, les deux se basant sur trois niveaux de conception: (i) "cercle élémentaire", c'est à dire les reboisements en question, (ii) "le cercle économique", c'est à dire la communauté locale dans laquelle sont situées les reboisements, et (iii) "le monde environnant", c'est à dire l'ensemble des secteurs en dehors du cercle économique.

Le papier se concentre surtout sur l'explication de la méthode de recherche, mais donne également quelques résultats provisoires provenant d'une analyse pilote, à fin de l'opération des modèles économiques.

10. MANUELLE DE DATA POUR PLANIFICATION DES PROJETS FORESTIERS

Par T. R. BLACKFORD

Ministère pour Développement d'Outre-Mer, Royaume Uni

Les manuels de données concernant des projets sont conçus moins comme guides d'ensemble pour ce qui constitue habituellement des sujets hautement techniques que comme moyens d'attirer l'attention des personnes élaborant de politiques sur les conditions et problèmes fondamentaux qu'elles sont susceptibles de rencontrer en s'occupant des régions en cours d'examen. En fait, dans le sens que les manuels ont quelque chose en commun avec les "listes de contrôle" au moyen desquelles les projets sont appréciés et évalués, aucune connaissance spécialisée n'est requise pour pouvoir comprendre et tirer parti de l'utilisation des informations données.

Le manuel se rapportant à la sylviculture approfondit toutefois son analyse un peu plus que de coutume. A vrai dire, cela est inévitable dans une certaine mesure simplement parce qu'une analyse économique ne peut se désintéresser des détails techniques de la sylviculture. En outre, comme le rôle et la situation du secteur de la sylviculture sont uniques dans le cadre de chaque économie, il a fallu adopter un aperçu reflétant une situation "moyenne". A ce point de vue, le manuel ne prétend nullement être infaillible.

En tenant compte de ces points, un coup d'oeil jeté sur le contenu révèle quelque peu la nature de l'étude:

La Section A—est une analyse des tendances globales présentes et future du marché pour la sylviculture en fonction de l'offre et de la demande en général.

La Section B—juxtapose les tendances en matière de prix mondiaux du bois aux rapports susmentionnés comme rappel de leurs inter-relations économiques.

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La Section C—fournit une appréciation succincte des contributions éventuelles à apporter au développement économique par le secteur forestier.

La Section D—traite des détails techniques de la sylviculture: elle englobe des sujets aussi divers que le rapport de production, les taux de croissance et l'influence des marchés, et les met en corrélation sous le titre "Sylviculture de production".

La Section E—traite des aspects financiers de la sylviculture, en particulier la détermination des taux de redevance.

La Section F—est une courte section consacrée à l'évaluation des coûts et des profits non négociables provenant des régions forestières.

La Section G—concerne l'abattage et le débit des arbres et reprend les techniques plutôt plus physiques de la sylviculture.

Les Sections H et I—sont consacrées à une analyse des stades secondaires de l'industrie forestière, c'est-à-dire les industries dérivées utilisant les produits forestiers et le rôle qu'elles ont à jouer dans une économie.

Finalement, l'annexe comprend un tableau visant à illustrer les accroissements annuels de la croissance des arbres et le niveau minimum des zones forestières nécessaires à la viabilité économique d'une usine typique.

De toute évidence, le manuel ne cherche pas à répondre à toutes les questions concernant la sylviculture. Son objectif fondamental est de transmettre la notion de la sylviculture dans un contexte économique utilisant le simple critère contenu dans le texte. L'importance qu'il y a à attirer l'attention des personnes élaborant des politiques sur les aspects économiques d'un sujet est manifeste et doit contribuer à la formulation de décisions rationnelles relatives à la planification tant pour les pays développés que pour ceux en voie de développement. Ignorer les aspects économiques revient à ignorer la zone cruciale, dont la compréhension est une précondition en vue de la prise de décisions logiques et rationnelles. Finalement, le manuel vise pour cette raison à élargir la conception de ceux élaborant les politiques et à leur permettre de se faire une idée plus complète du sujet.

11. DES PROBLÈMES À PROPOS L'HARMONIZATION DES OBJECTIVES ÉCONOMIQUES AVEC DES BUTS TECHNIQUES, ENVIRONNEMENTALES ET SOCIAUX

Par J. H. G. SMITH

Canada

On compare l'expérience de Taiwan et celle d'autres pays en voie de développement avec l'évolution récente des attitudes vis-à-vis l'utilisation des ressources forestières au Canada et aux États-Unis. Il semble que les mouvements d'environnementalistes, traditionnels et modernes vis-à-vis la création et l'utilisation des ressources forestières sont en conflit avec le but, généralement reconnu, de la rapide croissance économique dans les pays en voie de développement.

Depuis plusieurs années, les aménagistes forestiers ont mis l'accent sur la préservation et la conservation des terres, des arbres et des ressources connexes. Leurs idées au sujet du rendement soutenu et l'aménagement polyvalent se sont souvent heurtées au désir des planificateurs du développement et des économistes forestiers, de traiter le capital forestier comme une ressource en inventaire. Néanmoins, plusieurs pays en voie de développement ont rapidement transformé leur capital forestier en capital social. Les réserves forestières, créées pour la protection des bassins hydrographiques, la culture des arbres, la promotion des activités de récréation et pour abriter et perpétuer la faune terrestre et aquatique, sont envahis par des armées de sans-logis qui n'ont pas d'autres endroits où se loger. La population mobile des cultivateurs coupe à blanc, brûle, plante et se déplace, reflétant leur style de vie. Les routes marquent profondément le flanc des montagnes, offensent et assistent les touristes, accélèrent l'érosion et augmentent le processus de sédimentation. Les moulins procurent des emplois d'une part, mais polluent les eaux et l'air d'autre part. Il est clair que de nouveaux objectifs et une nouvelle éthique sont nécessaires si le développement forestier doit être entrepris sans pour autant provoquer d'impacts sérieux sur l'environnement. Il reste à vérifier si les attitudes actuelles en Amérique du Nord peuvent s'appliquer ou non aux pays en voie de développement. Il est beaucoup plus facile d'énoncer les problèmes que de proposer des solutions; cependant on fait quelques efforts pour procurer un cadre conceptuel viable pour l'harmonisation des attitudes et des objectifs conflictuels.

12. LA JUSTIFICATION ET LES RESSOURCES POUR LE FINANCEMENT DES OPERATIONS
FORESTIÈRES DANS LES ÉCONOMIES DÉVELOPPANTES

Par D. HALEY et J. H. G. SMITH

Canada

Le rôle des investissements forestiers, soit au niveau de la ressource ou de l'industrie, dans le processus du développement économique est passé en revue. On suggère que, bien que ces investissements fournissent des biens et services très souhaitables en plus d'un retour raisonnable sur le capital investi, la justification première pour financer les projets forestiers est la rôle espéré indirect que la foresterie va jouer dans le processus de développement économique. L'accent est mis sur les dangers de justifier n'importe lequel programme d'investissement sur la base des bénéfices indirects et intangibles, sans au préalable analyser soigneusement la nature et l'impact exact de tels bénéfices. On décrit les sources de financement pour les opérations forestiers, et on discute les avantages et désavantages de plusieurs alternatives.

13. ANALYSE DES SYSTÈMES DYNAMIQUES ET LA PLANIFICATION FORESTIER

Par A. A. STRAIN

Royaume Uni

Après un tour d'horizon des avantages de la méthode système pour avoir des renseignements de planification dans les pays sous-développés, la modèle de la dynamique industrielle du Forrester est appliquée au secteur forestier, utilisant des équations différences élaborées pour l'export des grumes.

14. L'EFFET DES POLITIQUES ET MESURES FISCALES SUR L'INVESTISSEMENT FORESTIER

Par M. S. PHILIP

Royaume Uni

Le taux d'investissement dans l'exploitation forestière de 1947 à 1974 est fixé en utilisant comme base de calcul la surface plantée. Les politiques forestières, agricoles et sociales, ainsi que les systèmes d'imposition et de subvention directe des exploitations forestières et du "hill-farming" (élevage extensif) sont analysés pour préciser le rôle qu'ils ont joué dans la détermination du degré d'investissement. On en conclut, à la lumière des tendances escomptées dans les domaines politique et social et sous la législation fiscale actuelle, que les perspectives sont décourageantes pour tous les secteurs de l'exploitation forestière—y compris le secteur public, le secteur privé et les industries qui utilisent le bois indigène. Actuellement il n'y a pas de projet pour augmenter les investissements de l'état dans l'exploitation forestière au cas où, comme l'auteur le prévoit, le secteur privé se retire. Le contraste entre la situation au Royaume-Uni et celle des autres membres de la CEE est à souligner.

15. LE TAUX D'ESCOMPTE SOCIAL ET LE COÛT DU CAPITAL EN PROJETS FORESTIERS

Par I. S. FERGUSON et J. J. REILLY

Australie

L'emploi du même taux d'intérêt pour l'investissement public et privé n'est pas praticable à cause des marchés imperfections. Si on emploie un taux d'escompte synthétique qui tient compte de le coût opportunité de capital il s'ensuit une allocation temporelle inefficace des ressources du secteur publique. De l'autre côté, si on emploie le taux social de temps préférence (STP) au lieu d'un taux d'escompte et un "shadow" prix séparé pour le capital rare, le secteur publique rendra capable d'approcher d'une allocation optimale des ressources. Le taux social de temps préférence a été estimé entre quatre et six pour cent et on a choisi le valeur de cinq pour cent pour les analyses coût-avantage. Le "shadow" prix pour les fonds prêts, la source majeure du capital rare, a été estimé à \$2.73 par le dollar de fond prêt qu'on utilise.

ZUSAMMENFASSUNGEN DER STUDIEN

1. DIE TATSÄCHLICHE UND DIE POTENTIELLE BEDEUTUNG DES FORSTSEKTORS FÜR DIE WIRTSCHAFT VON ENTWICKLUNGSLÄNDERN

von J. J. MacGREGOR

Vereinigtes Königreich

Ansichten über die allgemeine wirtschaftliche Entwicklung und Argumente zugunsten der Forstwirtschaft bei Forderungen an die Regierung werden vor dem Hintergrund von Erfahrungen aus früheren Entwicklungsversuchen dargelegt. Nach Meinung einiger Wirtschaftsexperten hat sich herausgestellt, daß viele der anfänglichen Hindernisse leichter zu überwinden waren als ursprünglich angenommen. Probleme der Quantifizierung der potentiellen Bedeutung von Wirtschaftssektoren werden aufgezeigt und die Notwendigkeit, die Ziele der Entwicklung im ländlichen Raum, der gesellschaftlichen Reformen und die Grenzen der industriellen Macht zu beschreiben, betont.

Natur und Qualität von Daten sind vielfach unzureichend als Planungsgrundlage. Dies führt zum Bedarf an öffentlicher Intervention, finanzieller und sozialer Evaluierung in Form von Cost-Benefit-Analysen, sowie an Daten für Investitionsentscheidungen, z.B. über Technologien, Kosten, Nachfrage und Angebot. Studien über die Weltsituation, durchgeführt von der F.A.O. und anderen, haben einzelnen Ländern geholfen, ihre eigenen Pläne zu konkretisieren.

Kriterien, die für die Beurteilung der Bedeutung der Forstwirtschaft und der Relation zwischen Einkommen und Nachfrage nach Holz zu verwenden sind, werden analysiert. Ein vierfaches Klassifizierungssystem zur Beschreibung der begrenzenden Faktoren für die Ausdehnung der Waldfläche und die Implikationen einer dynamischen Forstpolitik werden untersucht. Besonderheiten und mögliche Leistungen der Holzindustrien werden im Zusammenhang mit Entwicklungsländern hervorgehoben.

Grenzen und Vorteile der Verallgemeinerung eines so breiten Themenbereiches werden aufgezeigt und die Notwendigkeit vermehrter Evaluierungen von Ergebnissen individueller oder nationaler Entwicklungsprojekte betont.

2. FORSTPOLITISCHE MAßNAHMEN ZUR FÖRDERUNG FORST- UND HOLZWIRTSCHAFTLICHER INVESTITIONEN IN LÄNDERN MIT TROPISCHEN WÄLDERN

von H. J. von MAYDELL

Bundesrepublik Deutschland

Tropische Feuchtwälder stellen ein gewaltiges Potential als regenerierbare Rohstoffquelle dar. Um dieses Potential so zu erschließen, daß es der Befriedigung gegenwärtiger und zukünftiger Bedürfnisse der Menschen dient, bedarf es Investitionen in Form von Land, Arbeitskräften und technischer Entwicklung und finanziellen Mitteln.

Die gegenwärtig weltweiten Veränderungen der forstpolitischen Zielsetzungen tropischer Länder geben Anlaß zu neuen Überlegungen. Diese beziehen sich einerseits auf die Ziele und die erwarteten Entwicklungen in den tropischen Gebieten und andererseits auf die Vorstellungen der Tropenholz importierenden Länder der gemäßigten Zonen. Viele Lösungen gemeinsamer Probleme bieten sich im beiderseitigen Interesse an.

Es ist Aufgabe der Forstleute, Wissenschaftler und Unternehmer der Holzwirtschaft, die Entscheidungsträger mit zutreffenden und überzeugenden Informationen über den Investitionsbedarf und über die Leistungen die tropische Forst- und Holzwirtschaft zu versorgen.

Ein richtig bewirtschafteter tropischer Feuchtwald ist keineswegs das "große grüne Nichts", als das er früher einmal bezeichnet wurde. Er stellt vielmehr eines der vielversprechendsten Potentiale in unserer begrenzten Welt dar. Andere Bereiche der Wirtschaft sind für die menschliche Gesellschaft weit weniger von Nutzen. Obgleich sie geringere Ergebnisse vom eingesetzten Land, der Arbeitskraft und dem investierten Kapital erbringen, konnten sie bisher aufgrund geschickter Argumentation mehr Investitionsmittel mobilisieren. Deshalb ist es nötig, wirksame forstpolitische Förderungsprogramme in den tropischen Ländern zu entwickeln.

Ein erster Schritt in dieser Richtung ist die Verminderung des Risikos. Ungeachtet dessen lautet die für einen Investor entscheidende Frage: "Lohnt es sich?" Darin kommt mehr zum Ausdruck als sich in Geldwert ausdrücken läßt. Einbezogen sind Gesichtspunkte wie ein ausgewogenes Verhältnis zwischen Aufwand und Ertrag, Ansehen, Prestige und persönlicher Befriedigung, politische Motive und kulturelle Bereiche. Wichtig sind u.a. der Zugang zu Märkten und/oder Rohstoffquellen und anderen Ressourcen, Forschungsmöglichkeiten, Lizenzen, Dezentralisierung, Diversifizierung, Risikoverteilung—und natürlich eine angemessene Verzinsung der investierten Gelder.

Wirksame Entwicklungsförderungsprogramme sind von großer Bedeutung. Es hat sich jedoch oft genug herausgestellt, daß sie nicht der einzige und häufig nicht der entscheidende Faktor für Investitionsentscheidungen auf dem Gebiet der Forst- und Holzwirtschaft sind. Selbst bei nahezu völligem Fehlen einer Investitionsförderungs politik haben Investitionen stattgefunden, während auf der anderen Seite sehr attraktive Gesetze wirkungslos blieben, wenn es galt, Investitionen durchzuführen. Die Initiative und Aktivität des Unternehmers ist und bleibt letzten Endes der entscheidende Faktor für die Entwicklung der Forst- und Holzwirtschaft in den Tropen.

3. DIE ROLLE DER FORSTWIRTSCHAFT BEI DER VERMINDERUNG DER ARMUT IN LÄNDLICHEN GEBIETEN NIGERIAS

von Dr. O. O. OLAWOYE

Nigeria

Nigeria ist ein Land mit niedrigem Pro-Kopf-Einkommen. Große Unterschiede in der Einkommensverteilung und weit verbreitete Armut sind charakteristisch.

Die Armut auf dem Lande findet ihren Ausdruck in Arbeitslosigkeit, geringem Einkommen, unzureichenden Wohnbedingungen, niedrigem Ausbildungsniveau, völligem oder teilweisem Fehlen medizinischer Versorgung, ungenügender Ernährung und Mangel an sozialen Einrichtungen.

Die Bedeutung der Forstwirtschaft für die ländliche Entwicklung ist stets groß gewesen. Im industriellen Bereich hat die Forstwirtschaft vor allem Arbeitsplätze für die Landbevölkerung geschaffen. Auch für die Aufforstungen werden nach wie vor zahlreiche Arbeitskräfte benötigt. Einkommen aus Exportabgaben für Rohholz haben es der Regierung ermöglicht, ihre finanziellen Aufgaben zu erfüllen. Ferner hat die Forstwirtschaft in bedeutendem Umfange die Not gelindert, indem sie auf verschiedene Art und Weise die Ernährungssituation verbesserte.

Darüberhinaus sind der Straßenbau, die modernen Arbeitersiedlungen im Walde, soziale Einrichtungen und Schutzfunktionen des Waldes Beispiele für den Beitrag der Forstwirtschaft zur Verbesserung der Lebensbedingungen in Nigeria.

4. DIE BEDEUTUNG DER FORSTWIRTSCHAFT FÜR EINKOMMEN UND BESCHÄFTIGUNG

von G. von MALMBORG

Schweden

Mit dem vorliegenden Beitrag soll ein in Schweden laufendes Forschungsvorhaben vorgestellt werden. Die schwedische Forstwirtschaft unter besonderer Berücksichtigung der Besitzverhältnisse und strukturellen Merkmale dient als Hintergrund.

Große Forstbetriebe, vor allem im Besitz des Staates oder privater Holzindustriekonzerne, sind die Regel im nördlichen Schweden. Doch selbst hier entfällt etwa ein Drittel der Fläche auf Privatwälder. Im südlichen Schweden herrschen diese Privatbetriebe vor.

Etwa die Hälfte der Privatwaldfläche ist mit der Landwirtschaft gekoppelt. Die tatsächliche Zahl ist jedoch noch höher, weil eine Reihe von "de facto" Betriebseinheiten nicht statistisch ausgewiesen sind.

Die privaten Wälder sind überwiegend klein.

Primäres Wirtschaftsziel der Staats- und Industriekonzerne ist die Erzeugung von Holz für die Holzindustrie. Das entspricht natürlich auch der letztlichen Verwendung des Holzes von den Privatwaldflächen. Deren Besitzer haben jedoch vielfach noch andere Ziele, die direkt mit ihren vorrangigen Interessen verbunden sind. Beispiele dafür sind Beschäftigungsmöglichkeiten, Kapitaltransfer, Sparmaßnahmen. Ferner bestehen bei den privaten Waldbesitzern erhebliche Unterschiede hinsichtlich ihres

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Alters, ihres Interesses an verschiedenen Arten der Produktion usw. Die Altersgruppenverteilung bei den Landwirten wird in Tab. 6 dargestellt.

Trotz der Kombination von Land- und Forstwirtschaft sind nur 40 bis 60% aller Landwirte auf ihrem Besitz voll beschäftigt. Dieser Anteil hat zwischen 1961 und 1971 abgenommen.

Besitzart und strukturelle Bedingungen wirken sich auf die Waldarbeit und Beschäftigung aus. So sind über 90% der Beschäftigten in den großen Forstbetrieben ganzjährig beschäftigt oder arbeiten über 1,200 Stunden im Jahr. Im kleinen Waldbesitz arbeiten nur 2% der Beschäftigten über 1,200 Stunden.

Die Entwicklung führte zur Entvölkerung wenig besiedelter Waldgebiete. Möglicherweise ist inzwischen eine Wende eingetreten. Ein Hinweis darauf ist das zunehmende Interesse an diesen Gebieten sowie an Land- und Forstwirtschaft. Zwar gibt es verschiedene Gründe für dieses Interesse, doch wirken sie sich in gleicher Weise aus.

5. DER BEITRAG DER FORSTWIRTSCHAFT ZUR WIRTSCHAFTLICHEN UND SOZIALEN ENTWICKLUNG IN MALAYSIA

von J. W. KER

Canada

Im vorliegenden Beitrag soll eine Einführung in die wirtschaftliche und soziale Entwicklung Malaysias und ihre Auswirkungen auf die Forstwirtschaft gegeben werden.

Behandelt werden ein historischer Rückblick, die Waldressourcen, ein Überblick über Malaysias wirtschaftliche Planung und deren bisherige Ergebnisse, ihre nationalen Ziele, die Einkommens- und Besitzstruktur und die Ziele der Neuordnung der Beschäftigungsstruktur in Abhängigkeit von der rassischen Zugehörigkeit.

Der Ausbildung auf allen Ebenen wird große Bedeutung beigemessen. Sie untersteht den Bundesbehörden und erhält 8 bis 10% der öffentlichen Ausgaben für Entwicklung. Das einheitliche Ausbildungssystem für die 13 Länder und den Bezirk der Hauptstadt, die Malaysia bilden, eine einheitliche Sprache (Bahasa Malaysia) und die nationale Forcierung der wirtschaftlichen und sozialen Entwicklung sind die wichtigsten Faktoren, um diesen jungen Staat zu einigen, der sich über 2,100 km von Penang und Perlis im Westen bis zur Sulu-See im Osten erstreckt.

In den ersten 18 Jahren seines Entstehens hat Malaysia die Produktion und den Export von Holz schnell entwickelt, wodurch eine Exploitationsrate bedingt war, die sich nicht dauernd aufrecht erhalten läßt. Nur ein relativ geringer Teil der daraus resultierenden Einnahmen wurde in die Forstwirtschaft reinvestiert. Noch nachteiliger wirkten sich die fehlende Planung und Kontrolle der Holzgewinnung aus (besonders auf Flächen im Besitz des Staates und auf Flächen, die in landwirtschaftliche Nutzung überführt wurden) sowie der extensive Export von Rohholz, vor allem aus Sabah und Sarawak.

Die malayische Bundesregierung hat durch den Minister für Primärindustrien und unterstützt durch zahlreiche Studien des F.A.O.-Projektes für die Entwicklung der Holzindustrie Schritte unternommen, um den Export von Rohholz zu verbieten und die Integration und Rationalisierung der Holzindustrie zu fördern. Inzwischen haben die Regierungen der Bundesländer sowohl in Ost- als auch in Westmalaysia mit Hilfe von forst- und forstwirtschaftlichen Studien, die mit ausländischer Hilfe (einschl. derjenigen der Canadian International Development Agency) durchgeführt wurden, begonnen, bessere forstpolitische Programme und Verwaltungen zu entwickeln.

Eine große Schwierigkeit bei allen diesen Bemühungen ist jedoch der große Mangel an qualifizierten und erfahrenen Forstleuten und Verwaltungsbeamten im Dienst der Regierung (Bund und Länder) und der Industrien. Es ist deshalb verständlich, daß Malaysia der Ausbildung großes Gewicht beimißt. Die Zielvorstellungen hinsichtlich der rassischen Zusammensetzung führen dabei zu beträchtlichen Problemen, obgleich die zugrunde liegenden nationalen Interessen verständlich sind. Beispielsweise waren im Jahre 1973/74 nur etwa 15% der Verwaltungs- und Forschungsstellen der Forstverwaltung mit qualifizierten Beamten besetzt.

Ob Malaysia bei der Wiederherstellung seines Holzvorrats und seiner Rohholzerzeugung, die gegenwärtig stark abgebaut werden, sowie bei der Rationalisierung der Bewirtschaftung seiner Wälder Erfolg haben wird, hängt weitgehend vom Ausmaß und der Wirksamkeit von Maßnahmen ab, die die Bundes- und Länderregierungen sowie die industriellen Unternehmen im kommenden Jahrzehnt durchführen werden.

6. DIE ENTWICKLUNG DER FORSTWIRTSCHAFT IN DER NEUEN WIRTSCHAFTSGEMEINSCHAFT
WESTAFRIKANISCHER STAATEN (ECOWAS)

von S. KOLADE ADEYOJU

Nigeria

“Wirtschaftliche Integration” ist ein sehr dehnbarer Modebegriff. Die häufigsten Mittel der wirtschaftlichen Integration sind auf einen freien Austausch von Gütern, Dienstleistungen und Produktionsfaktoren ausgerichtet. Sie schließen die Freihandelszone, die Zollunion und den gemeinsamen Markt ein. Um diese Voraussetzungen zu schaffen, waren mehr als zwölfjährige Verhandlungen erforderlich, die schließlich zum Abkommen von Lagos führten.

Am 27. bis 29. Mai 1975 gründeten die Präsidenten und Staatsoberhäupter von 15 benachbarten westafrikanischen Staaten die Economic Community of West African States, ECOWAS oder CEDEAO, Communauté Économique et Douanière de l'Afrique de l'Ouest, wie sie in den frankophonen Ländern genannt wird. Im abschließenden Kommuniqué bekräftigten die Staatsoberhäupter ihr Ziel einer Förderung von Zusammenarbeit und Entwicklung in allen Bereichen der Wirtschaft. Sie gaben ihrer Überzeugung Ausdruck, daß eine derartige Zusammenarbeit entscheidend für die Verbesserung des Lebensstandards ihrer Völker sei, für die Verbesserung und Erhaltung wirtschaftlicher Stabilität, die Förderung engerer Beziehungen zwischen ihren Ländern und den Fortschritt und die Entwicklung Afrikas. Sie bekräftigten ferner ihre Entschlossenheit, die Gemeinschaft zu einer “pragmatischen, dynamischen und effektiven Institution zu machen, die von den Realitäten der Mitgliedsstaaten ausgehen wird”.

Ausgehend vom Enthusiasmus und der zu erwartenden Unterstützung durch die Mitgliedsstaaten sowie von den zweckmäßigen Regelungen des Abkommens von Lagos, versucht dieser Beitrag Möglichkeiten der forstlichen Entwicklung in der Gemeinschaft herauszuarbeiten. Bei einer Diskussion des forstlichen Potentials des Großraumes ergeben sich jedoch enge Grenzen. Erstens sind die vorhandenen Informationen höchst unzureichend. Es gibt keine verlässlichen Angaben über wichtige Daten wie die Größe der Waldflächen, die Ausdehnung bestimmter Waldtypen und die forstliche Produktion, die industrielle Erzeugung, die mögliche Beschäftigung von Arbeitskräften, über den Holzaußenhandel, die Kapazität der Forstverwaltungen, Finanzen etc. Ferner ist die ECOWAS gerade erst gegründet worden, und bisher (Anfang Juli 1975) haben erst 2 Staaten (Liberia und Nigeria) den Vertrag ratifiziert. Mit anderen Worten: ECOWAS ist noch ein Vorhaben. Trotz allem wird im vorliegenden Beitrag versucht,

- (a) die allgemeine wirtschaftliche Situation,
- (b) die Waldressourcen und
- (c) die wichtigsten Bereiche der forstlichen Entwicklung zusammenfassend darzustellen.

Angesichts der ungleichen Verteilung der Waldressourcen, der geplanten großen Holzindustrievorhaben, der Vorteile von Großprojekten und der Ähnlichkeit wichtiger forstlicher Probleme besteht kein Zweifel, daß internationale Maßnahmen Vorzüge haben im Vergleich zu Problemlösungen in den einzelnen Staaten, die mit zahlreichen Schwierigkeiten auf allen möglichen Ebenen konfrontiert sind. Aufgrund der schwierigen und instabilen Wirtschaftslage der meisten Mitgliedsstaaten sind darum forstliche Investitionen unzureichend. In der Gemeinschaft sollen jedoch die Ressourcen der waldreicheren Länder auch den weniger industrialisierten Staaten zur Verfügung stehen. So sollen die Überschüsse der Zone der geschlossenen Wälder für die binnenländischen Savannen- und Halbwüsten-Staaten zugänglich werden. Die Entwicklung der Holzindustrie, der Forstbewirtschaftung, Forschung, Ausbildung, Fortbildung und Wildbewirtschaftung kann so rationalisiert werden.

Die forstlichen Ziele der E.C.O.W.A.S. können nur verwirklicht werden, wenn die Forstverwaltungen die neuen Aufgaben und Möglichkeiten im Gefolge des Abkommens von Lagos erkennen und unmittelbar darauf reagieren. In dieser Hinsicht ist die Notwendigkeit zur Einrichtung von Aktionsgruppen und Beratungsgremien für die verschiedenen technischen Bereiche von großer Bedeutung.

7. NÄHRUNG AUS HOLZ

von MORRIS WAYMAN

Canada

Die gegenwärtigen Verfahren der Verwendung von Holz für die Herstellung von Nahrungsmitteln und Viehfutter werden dargestellt. Am wichtigsten sind die Hydrolyse zur Erzeugung von Holzzuckern und

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deren Fermentation zu single cell Protein, die Gewinnung von single cell Protein aus Abfällen der Zellstoffindustrie und die Erzeugung von Vitaminkonzentraten aus dem Baumgrün. Ein Prozeß zur Herstellung eines Futtermittels aus Laubhölzern befindet sich in der industriellen Entwicklungsphase. Damit könnte ein bedeutender Teil des Futterbedarfes von Rindern während der Wintermonate gedeckt werden. Bisher ist die wirtschaftliche Bedeutung aller Verfahren zur Erzeugung von Nahrungs- und Futtermitteln aus Holz äußerst gering. Eine Ausnahme macht die Sowjetunion, in der vermutlich 3% des Bedarfs an Futtermitteln in dieser Weise gedeckt werden können. Das Potential ist jedoch groß. Es wird geschätzt, daß aus den Holzabfällen, die gegenwärtig auf der ganzen Welt bei den normalen Einschlägen anfallen, bei Verarbeitung zu Holzzuckern und nachfolgend zu single cell Protein genügend Eiweißnahrung gewonnen werden könnte, um den Bedarf aller Kinder der Erde zu decken. Die Kosten dafür erscheinen als vertretbar im Vergleich zu anderen Ausgaben.

8. UMFANG UND BEWERTUNG DES BEITRAGES DER FORSTWIRTSCHAFT ZUR ENTWICKLUNG

von P. A. WARDLE

Organisation der Vereinten Nationen für Ernährung und Landwirtschaft

Die verschiedenen Aktivitäten der F.A.O. auf dem Gebiet wirtschaftlicher Analysen und Statistiken, durch die Planungen im Bereich des Beitrages der Forst- und Holzwirtschaft zur wirtschaftlichen Entwicklung unterstützt werden, werden beschrieben. Diese Aktivitäten schließen ein (1) die Zusammenstellung internationaler Statistiken über Ressourcen, Produktion und Handel, Industriekapazitäten, Kosten und Preise; (2) Analysen regionaler und internationaler Trends in der Verwendung von Forstprodukten und Ausarbeitung von Prognosen; (3) Hilfen bei der Zusammenstellung von Informationsdaten, der Bewertung alternativer Projekte und Maßnahmen und Formulierung von Sektor-Planungen auf nationaler Ebene.

Die Bedeutung von Informationsdiensten für die rationelle Sektor-Planung und die beste Zuordnung von Ressourcen für die Entwicklung wird herausgestellt. Es wird darauf hingewiesen, daß in zwei Bereichen ein besonderer Mangel an Informationen besteht: (1) bezüglich der Zerstörung und Veränderung von Wäldern und forstlichen Ländereien und (2) bezüglich der Holzverwendung und ihrer wirtschaftlichen Bedeutung in ländlichen Gebieten der Entwicklungsländer. Ein besseres Verständnis ist gerade hier notwendig, um das Potential zu bestimmen und eine optimale Zuordnung der Ressourcen zum Wohle der Gesellschaft in Entwicklungsländern zu gewährleisten.

9. FORSTWIRTSCHAFT IN DER REGIONALENTWICKLUNG IN DÄNEMARK

von FINN HELLES

Dänemark

Es wird über eine laufende Forschungsarbeit berichtet, deren Ziel es ist, die Bedeutung von Aufforstungen für die wirtschaftliche Entwicklung der jütländischen Heidegebiete zu durchleuchten.

Bei dieser Forschungsarbeit wird von folgenden Hypothesen ausgegangen: In den am weitesten zurückgebliebenen Teilen des Heidegebiets spielte die Aufforstung eine beachtliche Rolle für die wirtschaftliche Entwicklung, eine Rolle, die vor allem den Charakter eines Katalysator-Effektes hatte, d.h. die Aufforstungen brachten Geld und Material für die lokale Bevölkerung mit sich. Dies ermöglichte der Bevölkerung, entscheidende Investitionen in der Landwirtschaft vorzunehmen. Die Aufforstungsmaßnahmen wirkten sich außerdem fördernd auf das Wachstum von Handel und Dienstleistungen, Handwerk und Kleinindustrie aus.

Zwei ökonomische Modelle werden benutzt, die beide von drei Bezugsbereichen ausgehen:

- (1) dem "Elementarbereich", d.h. der Aufforstungsfläche,
- (2) dem "Wirtschaftsbereich", d.h. der örtlichen Gemeinde, zu der die Aufforstungsfläche gehört, und
- (3) dem "Außenbereich", d.h. dem Gebiet außerhalb des "Wirtschaftsbereichs".

Im vorliegenden Beitrag wird das Hauptgewicht auf die Forschungsmethodik gelegt. Es werden lediglich einige Ergebnisse aus den Analysen einer Musterfläche angeführt, um zu erläutern, wie mit den Modellen gearbeitet wird.

10. PROJEKT-DATENSAMMLUNG: FORSTWIRTSCHAFT

von T. R. BLACKFORD

Ministerium für Entwicklung in Übersee, Vereinigtes Königreich

Projekt-Datensammlungen sollen weniger umfassende Wegweiser für in der Regel hochtechnische Fragen sein als vielmehr Hilfsmittel für den Entscheidungsträger für das Verständnis der Grundfragen und Voraussetzungen, mit denen er sich voraussichtlich auf dem betreffenden Gebiet auseinandersetzen muß. Damit ähneln die Projekt-Datensammlungen in gewisser Weise Kontroll-Listen, mit deren Hilfe Projekte beurteilt und bewertet werden können. Deshalb sind keine Spezialkenntnisse erforderlich, um die darin enthaltenen Informationen zu verstehen und nutzbringend anwenden zu können.

Die Projekt-Datensammlung Forstwirtschaft geht in ihren Angaben jedoch etwas weiter als allgemein üblich. Das ist zum Teil unvermeidbar, weil eine wirtschaftliche Analyse die technischen Grundtatsachen der Forst- und Holzwirtschaft nicht ausklammern kann. Da überdies die Bedeutung und Stellung des forstlichen Sektors in jeder Wirtschaft spezifisch ist, mußte ein großer Überblick, der die "durchschnittlichen" Verhältnisse kennzeichnet, gegeben werden. Diesbezüglich erhebt die Projekt-Datensammlung jedoch keineswegs den Anspruch, fehlerlos zu sein.

Davon ausgehend, vermittelt die nachstehende Inhaltsübersicht einen Eindruck von der Art der Studie. Sie enthält folgende Abschnitte:

Abschnitt A: Eine Analyse gegenwärtiger und künftiger Weltmarkt-Entwicklungen für die Forstwirtschaft in allgemeinen Begriffen des Angebots und der Nachfrage.

Abschnitt B: Stellt Trends der internationalen Holzpreise den vorgenannten Beziehungen gegenüber und weist damit auf ihre wirtschaftliche Wechselwirkung hin.

Abschnitt C: Vermittelt einen kurzen Überblick über den möglichen Beitrag der Forstwirtschaft zur wirtschaftlichen Entwicklung.

Abschnitt D: Befaßt sich mit technischen Fragen. Der Text schließt deshalb so unterschiedliche Themen wie Produktion, Zuwachsraten und Markteinflüsse ein und faßt sie unter dem Begriff "Produktionsforstwirtschaft" zusammen.

Abschnitt E: Befaßt sich mit den finanziellen Aspekten der Forst- und Holzwirtschaft, die notwendigerweise zur Diskussion gehören.

Abschnitt F: Behandelt kurz die Bewertung nicht vermarktbaren Aufwendungen und Erträge der Forstwirtschaft.

Abschnitt G: Bezieht sich auf die Holzgewinnung und kehrt damit wieder mehr zu technischen Fragen zurück.

Abschnitt H und I: Sie behandeln die Holzindustrien, d.h. insbesondere die holzverarbeitende Industrie und deren Rolle bei der wirtschaftlichen Entwicklung.

Im Anhang wird schließlich eine Tabelle gebracht, die ausgehend vom jährlichen Holzzuwachs die Mindestwaldfläche ausweist, die für eine typische Holzindustrie zur Rohholzversorgung benötigt wird.

Die Projekt-Datensammlung ist kein Versuch, alle Fragen der Forst- und Holzwirtschaft zu beantworten. Ihr Ziel ist es, die forstlichen Gedanken in einem wirtschaftlichen Zusammenhang durch einfache Kriterien darzustellen. Die Bedeutung einer derartigen Information für Entscheidungsträger in Industrie- und Entwicklungsländern liegt auf der Hand. Unkenntnis der wirtschaftlichen Zusammenhänge bedeutet, daß die entscheidenden Bereiche für logische und rationale Entscheidungen übersehen werden. Deshalb ist es das Ziel dieser Datensammlung, den Gesichtskreis der Entscheidungsträger zu erweitern und sie in die Lage zu versetzen, sich ein besseres Bild von der Materie zu machen.

11. PROBLEME DER ABSTIMMUNG WIRTSCHAFTLICHER ZIELE MIT TECHNISCHEN, UMWELTBEOZUGENEN UND SOZIALEN ANFORDERUNGEN BEI DER ENTWICKLUNG DER FORSTWIRTSCHAFT

von J. H. G. SMITH

Canada

Erfahrungen aus Taiwan und anderen Entwicklungsländern werden mit gegenwärtigen Bestrebungen im Hinblick auf die Waldressourcen Kanadas und der Vereinigten Staaten verglichen. Es scheint als ob tradi-

ZUSAMMENFASSUNGEN DER STUDIEN

tionelle und moderne Umweltvorstellungen bezüglich der Begründung und Nutzung von Wäldern mit dem allgemein akzeptierten Ziel eines schnellen wirtschaftlichen Wachstums in Entwicklungsländern kollidieren.

Jahrelang haben Forstleute die Erhaltung und den Schutz von Grund und Boden, Holz und damit verbundenen Ressourcen betont. Ihre Ideen bezüglich Nachhaltigkeit und vielseitiger Nutzung standen oft im Widerspruch zu den Vorstellungen der Entwicklungsplaner, das forstliche Kapital als eine Art Lagerbestand zu behandeln. Trotzdem wandeln viele Entwicklungsländer forstliches Kapital in soziales Kapital um. Die Ressourcen an Waldland in Wasserschutzgebieten, Holzproduktionszonen, Erholungslandschaften und Schutzbezirke für Fischerei und Wildbestände werden von ganzen "Horden Landloser" überfallen, die nirgends anders hingehen können. Die Brandhackbau-Betreibenden roden, brennen, pflanzen und ziehen weiter, wie es ihre Lebensart ist. Straßen zerschneiden Berghänge, stören und helfen Touristen, beschleunigen die Erosion und steigern die Sedimentation. Holzwirtschaftliche Betriebe schaffen Arbeitsplätze und verunreinigen Wasser und Luft. Es wird deutlich, daß neue Ziele und neue Wertmaßstäbe gesetzt werden müssen, wenn die Entwicklung der Forstwirtschaft ohne schwere Folgen für die Umwelt bleiben soll. Ob die gegenwärtigen nordamerikanischen Maßnahmen auf Entwicklungsländer übertragen werden können, bleibt abzuwarten. Es ist viel einfacher, auf die Probleme hinzuweisen als Vorschläge für ihre Lösung zu machen. Trotzdem werden einige Versuche unternommen, um ein gewisses Konzept für die Harmonisierung konkurrierender Ziele und Ansichten zu entwickeln.

12. BEGRÜNDUNG FORSTLICHER MAßNAHMEN UND DEREN FINANZIERUNG IN ENTWICKLUNGSLÄNDERN

von D. HALEY und J. H. G. SMITH

Canada

Die Bedeutung von Investitionen auf dem Gebiet der Forst- und Holzwirtschaft in Entwicklungsländern wird untersucht. Es wird angenommen, daß derartige Investitionen viele erstrebenswerte Güter und Dienstleistungen und zusätzlich einen angemessenen Rückfluß des eingesetzten Kapitals zur Folge haben. Trotzdem wird die Begründung für die Finanzierung forstlicher Maßnahmen häufig durch die indirekte Bedeutung der Forstwirtschaft für den Entwicklungsprozeß gegeben. Die Gefahr solcher Begründungen von Investitionsprogrammen durch indirekte und unantastbare Ergebnisse ohne eine sorgfältige Analyse der Art und tatsächlichen Auswirkung solcher Ergebnisse wird herausgestellt. Quellen für die Finanzierung forstlicher Programme werden beschrieben und die Vor- und Nachteile verschiedener Alternativen diskutiert.

13. DYNAMISCHE SYSTEMSANALYSE UND FORSTWIRTSCHAFTLICHE ENTWICKLUNGSPLANUNG

von A. A. STRAIN

Vereinigtes Königreich

Nach einer Diskussion der Vorteile von Systemanalysen für die Information im Zusammenhang mit der Entwicklungsplanung, werden Wege aufgezeigt, mit denen Forresters Modell einer dynamischen Systemanalyse für die Industrie in der Forstwirtschaft angewendet werden kann, indem ein Satz von Gleichungen verwendet wird, der für den Bereich des Stammholzexports ausgearbeitet wurde.

14. DIE AUSWIRKUNG POLITISCHER UND FISKALER MAßNAHMEN AUF FORSTLICHE INVESTITIONEN

von M. S. PHILIP

Vereinigtes Königreich

Die forstliche Investitionsrate von 1947 bis 1974 wird von der Aufforstungsfläche ausgehend verfolgt. Die Rolle forstlicher, landwirtschaftlicher und sozialer politischer Maßnahmen und von Strategien der Besteuerung und direkten Subvention von Forstwirtschaft und Landwirtschaft im Hügelland bei der

Bestimmung des Umfanges von Investitionen wird untersucht. Es wird gefolgert, daß angesichts der vorhergesagten politischen und gesellschaftlichen Entwicklung im Vereinigten Königreich sowie angesichts der gegenwärtigen Steuergesetzgebung, die Aussichten für alle Sektoren der Forstwirtschaft einschließlich Staatsforsten, Privatforsten und von inländischem Holz abhängigen Holzindustrien entmutigend sind. Gegenwärtig bestehen keine Pläne, die staatlichen forstlichen Investitionen zu erweitern wenn, wie der Verfasser voraussagt, sich der private Sektor zurückzieht. Auf den Gegensatz zwischen dieser Situation und den Verhältnissen in den übrigen Ländern der Europäischen Gemeinschaft wird hingewiesen.

15. DISKONTIERUNG UND OPPORTUNITÄTSKOSTEN BEI ÖFFENTLICHEN INVESTITIONEN IN
FORSTLICHE ENTWICKLUNGSPROJEKTE

von I. S. FERGUSON and J. J. REILLY

Australien

Die Anwendung eines gleichen Zinssatzes für öffentliche und private Investitionen ist wegen Unvollkommenheiten des Marktes nicht möglich. Die Benutzung eines künstlichen Diskontsatzes, welcher die Opportunitätskosten des Kapitals berücksichtigt, würde eine temporäre Verzerrung in der Mittelzuwendung der öffentlichen Hand verursachen. Demgegenüber würde die Anwendung eines Zinssatzes für die soziale Zeitpräferenz und eines separaten Schattenpreises für knappes Kapital die öffentliche Hand höchstwahrscheinlich in die Lage versetzen, ein Optimum der Mittelzuwendung (Faktorallokation) nach zeitlichen und anderen Gesichtspunkten zu erreichen. Für den Zeitpräferenzsatz der öffentlichen Hand wurde ein Rahmen von 4–6% geschätzt, für Nutzen-Kosten-Analysen wurde ein mittlerer Wert von 5% gewählt. Der Schattenpreis für Anleihekapital, der Hauptgrund für knappes Kapital, wurde auf A\$2.73 pro benutztem Dollar Anleihekapital geschätzt.

Paper 1

THE EXISTING AND POTENTIAL ROLES OF FORESTRY IN THE ECONOMIES OF DEVELOPING COUNTRIES

By J. J. MacGREGOR

Department of Forestry, University of Oxford, United Kingdom

The Study of Economic Development in General

Although my direct participation in development projects has been strictly limited I can perhaps claim a fairly wide familiarity with economic development issues, especially within the Commonwealth countries, because over the post-war years at Oxford we have had a succession of forest officers attending graduate courses in which my own (Economics) Section has been engaged especially through the weekly seminars. Additionally, I have had many graduate students who came to write comprehensive theses on the economic development aspects of their countries or on the general theory. Frequently one gets the impression that a small research unit—with fewer chances of publicity—makes little impact when such large questions are under consideration and accordingly I welcome this opportunity to draw attention to some of the development investigations made by Earl (1974, 1975), Gane (1969), Jackson (1972), Muthoo (1970), Sutton (1975), and Watt (1973) on such subjects as the potential of forest energy resources for economic and social development, priorities in planning, simulation study of wood-based industries, renewable natural resources planning for regional development, export potential of forest products, the planning and evaluation of forestry projects respectively. These can all be regarded as work on development in the strict sense which have emanated in recent years from our Economics Section and which have clearly helped to clarify and pioneer, after basic research, some of the issues in the economic development of forestry. Other development work at Oxford—mainly financed by the Overseas Development Ministry—is carried out by the Tropical Silvicultural Unit at the Commonwealth Forestry Institute. I have organised “land-use symposia for forestry and agricultural development” and these have been attended by some of the more senior members of developing countries. I mention these connections and, with training in and acquaintance with economic theory, I feel that these can help to identify some of the principles which are relevant to the title of the paper. The distinction between “existing” and “potential” in the title is significant and is made deliberately.

Economic development implies change and it is clear that those who argue a case for the forestry interest must look ahead and not be hidebound by what the industry has done in the past. One can

appreciate that existing contributions of forestry can be limited because historical events and institutions may have been a restraining influence. There is perhaps, little need in this audience to point out the special features of forestry—the special features which mark it off from any other enterprise—but the characteristic of the long period investment means that if planning is ever justified it must be in this industry since the dovetailing and timing of the production of the raw material and of the processing industries requires rather special skills and acumen.

In approaching any problem the classical concepts of economics are useful guides: the theory is much concerned with the allocation of resources—thus a choice has to be made among alternatives as resources as a whole are short in relation to potential needs or consumption. Concepts like opportunity cost, comparative advantage, elasticity, substitution, net discounted revenue, scale economies, and so forth have something to contribute when promoting a programme of development. In addition to the basic concepts new methodologies bring their own refinements and up-to-dateness.

Yet, it must be admitted one is left with a certain amount of disappointment, even scepticism, because the results do not seem to match or only move slowly towards reasonable expectations. A review of the literature on economic development and the experience of the International Agencies seems to bear this out. Fashions in methodologies, or in models, change and the confident reliance on yesterday's approaches often seems to wane.

I will try to be more specific. Anyone who looks at the development claims made by FAO in the past could find them neatly summarised in some nine aspects and these could be a starting base for a general discussion of principles (see Appendix A). How far do you agree with all these claims put forward? Certainly in the context which FAO and others meant them to be used, it is clear that a claim for an industry's expansion or development has to be put to Governments in a convincing manner—or in other words, the political hindrances have to be overcome even if, say, an economic case is convincing. Past attempts at inaugurating change with the intention of a “take off”, in the Rostow sense, all seem to have come under a barrage of criticism—probably with a good deal of hindsight. Unless

some of the points of view that have been adumbrated are put down to the accumulation of experience—the trials and errors—they can appear to be very disappointing at times.

Perhaps typical of an attempt to pin point what is wrong with research in developed countries (D.C.s) applied to less developed countries (L.D.C.s) is that by P. P. Streeten (1974). In one section of his paper a critical examination is made of the five main charges made by L.D.C.s against research on their problems and in their territory by scholars from richer countries.

- (1) Academic imperialism.
- (2) Irrelevance, inappropriateness, and bias of concepts, models and theories.
- (3) Research in the service of exploitation.
- (4) Domination through a superior and self-reinforcing research infrastructure.
- (5) Illegitimacy.

These may not be entirely self-explanatory although the real burden of their message should be clear enough. I will not explore them further here but would like to suggest that they provide some indication that all has not been well with development activities—partly because of a lack of altruism and objectivity.

Some remedies are examined and these imply a certain amount of participation and collaboration to achieve complementarity. If this can be achieved the question is posed: can there also be specialisation—a division of labour between research in D.C.s and in L.D.C.s? Some problems arise in setting up joint ventures of this kind but an awareness of the existence of the problems may help to achieve a more fitting and positive approach to the many activities which are likely to be under scrutiny. From the same writer an examination of the impediments to development in the 1950s and 1960s provided some qualified impressions on capital, entrepreneurship, skills, trade, agriculture, unemployment, population and debt.

A conclusion is that some of the obstacles considered by economists as serious turned out to be relatively easy to overcome and that most of the required measures are really within *social reform*. They include e.g. land reform, tax legislation and effective tax collection, trade union reform, vocational education linked with rural development and improved management and organisation.

Forestry in Integrated Rural Development

I feel that it has been necessary to say something about development in general as a run up to con-

centrating more on specifically forestry problems. My approach to this subject does not attempt to be very original and relies on synthesising many views and attitudes in an attempt to create a theme which will identify the basic contributions of forestry to the national economy.

How can one begin to measure the potential role of any section of the economy? It looks to be a more complex problem than at first sight might appear. However, in the belief that exploration may lead to some precise conclusions an attempt is now made to examine issues implied in the assessment of an optimally potential role. Developing countries in their critical five-year, and other, plans are unlikely to be so interested in the amenity and recreation capacities as the developed countries because they are more concerned to achieve basic necessities. One has obviously to be clear about the objectives for rural development and as the symposium 1971 FAO/SIDA stressed: "the ultimate aim of rural development is the enhancement of the quality of life of the rural populations who constitute the vast majority in developing countries". Increased agricultural and forestry productivity would be one of the basic pre-requisites for this improvement, and others would be a reasonably equitable distribution of wealth and income, a fair chance of employment and a steady improvement in education, health, communications and various social amenities. A main objective of development strategy must surely be to ensure consistency between the social aims and the basic economic solution. In passing it may be suggested that a similar objective lay behind the machinery of Rural Development Boards in Britain. These were intended to look at the place of all sectors of the rural economy simultaneously and not just from the point of view of say, either forestry or of agriculture.

P. J. Stewart (1975) from his Algerian experience has concluded that "there is a growing awareness that industrial strength is not necessarily the instrument that makes it possible to attain ulterior goals like satisfaction, self respect or cultural autonomy. The quality of life, pleasing activities in an harmonious environment, is seen now as a necessity rather than as a luxury, and one that often conflicts with the interests of industry." He further contends that a general programme of soil restoration and rural development may prove to be the most important way to resolve present doubts.

Problems in Forestry Planning

Although there have been vast improvements in the collection of statistics many of them are perhaps still very inadequate for refined calculation. Even in some of the industrially developed countries where it is reasonable to expect adequate data the

conventional way of classifying industries combines agriculture, forestry and fishing. However, it can be claimed that the development of any industry is likely to be measured against population changes, extent of natural resources, the rate of capital formation and the application of new technology. The measurement of these changes, or their extent, suggests the need for surveys and censuses and timber trend studies. While the knowledge of the existing structure is necessary as a starting point or a base the potential may be greatly different for some countries because some have more scope for dynamic policies than others depending on stage of development, degree of activity and initiative in the private sector, the special bottlenecks or impediments, the general attitude to Government measures and the quality and nature of data available.

Development policy implies:

- (a) the need for public intervention
- (b) financial and social evaluation e.g. by cost-benefit analysis
- (c) data for investment decisions e.g. on technology, investment and costs, and demand and supply.

If there were no public or government intervention the economic situation would be likely to stagnate: it would also be necessary in providing developments to have economic and social evaluation of the proposals and here clearly a comprehensive cost-benefit analysis would help to put emphasis and objectives of a policy on a sounder footing. Dr. Muthoo (1970) reviewed investment analysis under physical appraisals, financial appraisals, partial analysis and cost-benefit analysis and social aspects.

Much work in FAO has been devoted to timber-trend studies of which, for the most comprehensive coverage the well-known "Wood: World Trends and Prospects" is a good example. Apart from presenting the economic setting and analysis of resources it drew attention to the different rates of change in the demand for such products as sawnwood, wood-based panels, wood pulp products, roundwood and firewood. The "World Indicative Plan for Agriculture" had a rather different function in suggesting broad guidelines for forestry as well as for agriculture. Such well-known sources provide useful bases for assessing the main external changes which are relevant to the domestic policies of individual countries. In other words it is desirable for any individual country to fit its policy to the wider world environment where a variety of technological and other changes are altering the comparative advantages of one country against another and in different degrees depending on which forest products the country is most involved.

At the last British Commonwealth Conference Arnold (1974) made a comprehensive review of the planning problems in forestry and emphasised the need for interference to obtain desired goals, implications of the analytical approach, the interdependence of forests and forest industries, evaluation of costs and benefits, uncertainty, and the study of experience and many other issues which were pre-requisites of positive planning.

Criteria Used in Judging Forestry's Role

Elsewhere (MacGregor 1972) I have drawn attention to the limitations of the individual criteria which are sometimes used in judging the adequacy or otherwise of a country's national forest policy and these included most of the following:

- (a) degree of self-sufficiency and value of production in relation to gross national product
- (b) potential comparative advantage (*potential* in view of long-term production period)
- (c) proportion of land under forests and value of output per unit area
- (d) proportion of working population employed and productivity per head
- (e) value added by forest industries and efficiency of processing industries
- (f) effect on balance of payments, e.g. contribution to exports or reduction of imports
- (g) externalities, linkages and multiplier effects
- (h) extent of investment in forestry
- (i) revenue realisation and profit
- (j) contribution to social amenities or to net social benefit.

A general conclusion which could be drawn from this paper was that, in view of the limitations of any single one, several are needed to arrive at any worth-while assessment of the forestry contribution. A useful item of research would lie in the compilation of a comparative table of these measures for as many countries as possible. It would then probably be possible to provide a relative score and at least reveal some of the characteristics and contributions of forestry in individual countries or regions. In other words there could be some attempt at identifying the comparative advantages and this would imply which countries or regions would benefit most from an expansion of forestry. It is arguable that the most useful, general, criterion in the above list is "net social benefit" which requires a cost-benefit analysis for its measurement.

Support for the view about the limitations of individual criteria are well illustrated in an article on "How much forest does man need" (Stahelin, 1965). This article has a table showing accessible forest areas and consumption of industrial wood per capita for developed countries; it reveals that the consumption per head has little relation to the relative size of a country's own forest area—at least in the developed countries. For central and western Europe it was estimated that a per capita forest area of about two-thirds of an acre, assuming an annual yield of about 40 cu. ft. per acre, would be necessary for self-sufficiency at that date.

Some years ago the Director of the Agricultural Economics Research Institute at Oxford, Dr. Colin Clark, drew my attention to the marked variation between countries and over time within certain countries in the per capita consumption of sawnwood relative to real per capita income measured in Clark's International Units. It was noticeable that, apart from the general tendency for consumption to increase with income, countries with net imports of timber were more thrifty in their use of timber than those which were net exporters. However, some countries with high living standards and a small proportion of forest land consumed more timber per head than poorer, exporting countries with relatively large forest resources. Clark's diagram drew attention to the differing demands for a particular timber product: we now know more precisely that the relationships between income and consumption for various countries vary greatly for different categories of wood products.

In this paper I would have liked to dwell on forestry's changing role and prospects but as these were fully explored and described in such publications as "Wood: World Trends and Prospects" (FAO, 1966) I will not repeat them here in any detail. Suffice it is to say that most of the developing countries had the ability to grow trees and with man-made plantations there was the possibility of building up an export trade. This prospect was distinctly better than for the exporting of food crops which face recurrent crises—especially where population rates were increasing rapidly. Nor is there any need for me to reiterate, or to attempt to synthesise, the numerous and relevant publications which have emanated from FAO in the field which represents their active existence—one merely has to refer to the papers put forward by J. C. Westoby, J.E.M. Arnold, K. F. S. King, J. S. Spears and others to know what the prospects, problems and bottlenecks of development are likely to be.

From my own experience of organising symposia on land-use I would claim that the limitations to development whether natural or man-made can be recognised conveniently under a four-fold classifica-

tion: climatic and physical; technological; institutional, legal and administrative and social, economic and political factors. Others, like Paul Streeten, have shown the limitation of single cures proposed by: the price mechanists, the technologists and the radicals, but sees considerable force in the combination of all three. Perhaps there is some move towards the radical or revolutionary approach in the call by many foresters seeking a more dynamic policy for the industry. It might be useful to ponder over the real meaning or implications of a dynamic policy—already spelt out in several forestry policy papers in recent decades.

Products, Characteristics and Contributions of Forest Industries

The 1962 and later reports from FAO argue strongly that forest industries can play a large part in stimulating economic growth in countries which have low incomes per head. Bases for this assumption—which is supported by comprehensive statistical evidence—about forest industries can be summarised as follows:

1. They furnish a wide range of products (consumption and intermediate goods) which flow into many sectors of the economy.
2. The demand for these products rises sharply with economic growth.
3. The industries vary considerably in their raw material and other factor requirements and in such features as location needs, value added in processing, economies of scale, requirements for skilled labour, special features and expansion possibilities.
4. In most of them alternative technologies can be employed.
5. They are dependent on a renewable resource and are intimately linked with agriculture.

Perhaps the most outstanding thing which these features suggest is their great flexibility and adaptability for a wide range of needs and environments. (See also Appendix A.)

Significant contribution of forest industries to the economies of developing countries can be expected because wood is one of the few raw materials that all countries can have and thus, if properly exploited, it can be a basis for industrialisation. Earl (1975) has drawn attention to the possibility of tapping the vast energy potential of tropical forests for industrial processing. As wood, because its value in relation to its bulk is low, has limited "portability" there is an advantage in processing it as near to the growing site as possible especially as the raw material is a substantial part of the total cost of production.

EXISTING AND POTENTIAL ROLES OF FORESTRY

In spite of this many of the developing countries export unprocessed logs which they could convert economically for their own usage. Sometimes lack of infrastructure remains as the greatest impediment and for improvement here it is necessary to look to a consistent general development policy. Further points about forest industries which are argued in a FAO publication (Westoby, 1962)—and reiterated in Appendix A—are that they provide certain indirect advantages and external economies: as their products are not part of inessential or luxury expenditure they provide a good idea of what is needed for the welfare of a developing country. Because forestry investment creates “external economies” in a broad sense, some investments tend to prepare the way for complementary industrial production; forest industries are usually decentralised and their remote rural or backwood character creates a link between them and the infrastructure and thus leads to a reduction in “dualism”—sometimes described as the cumulative differentiation between two parts of the same region; there is also an indirect advantage in the high flexibility of forest work for reducing seasonal or disguised unemployment, and because of the degree of forward linkages and the inducement of derived demand there is, it is maintained, a stimulus to other industries. However, it is realised that before forestry can develop its full potential in an economy, much research will be required for application to a wide range of problems, the existence of which can be inferred from what has already been discussed. If one considers, for example, what the most suitable forest policy for a country might be at any given time, the kind of data on demand and supply aspects which are features of “production goal” techniques will give some conception of what is needed. Economic analyses or evaluations of past projects, it would be reasonable to expect, should point the lessons of experience, whether success or failure and provide a cumulative improvement. It seems to me that post evaluations would be a good emphasis for further research on economic development.

Conclusions

The assumption in this paper is that one has to relate the forestry case to the national or government level and not attempt to develop it in isolation. From the government point of view investment in the forestry sector will depend on alternative outlets for its scarce investment resources—so that the social return from the sector needs to be assessed even if this is complicated by the longer gap between investment and return on capital.

There are a number of outstanding directions

where investment in forestry and in its industries is being retarded through lack of basic data, of specialised forest industrial agencies, economists and industrial development planners, of coordination at the planning level, and of a suitable political environment.

What actions might be taken by Governments to promote forest industries? In view of the high capital investment for some of them, in particular where scale economies are attempted, it would be necessary to give security of tenure and assurances about a sustained flow of raw material and in general to improve the adequacy of legislation affecting investment in forestry and forest industries. Some years ago in an exploration of the methods by which forestry concessions are granted, nearly thirty items were listed (MacGregor, 1972) which could be part of any such agreements, say, between forest industries and governments. A related consideration would be to know about the sources of investment capital and the required conditions of the lending agencies where borrowing is involved.

In a relatively short paper on such large issues it is easy to be criticised for generalising. Even so, to make appropriate generalisation seems to me to help considerably in shaping the problems which have to be solved. It is for the individual countries, in their integrated and national programmes, to apply the appropriate measures or catalysts and these can perhaps be best introduced if there is even a broad familiarity with the problem areas. In these circumstances I make no apology for rounding off this presentation with a quotation from a paper (K. F. S. King, *et al*, FAO, 1969).

“Developing countries possess valuable forest resources and the demand for forest products is rising rapidly. They also have certain economic advantages over developed countries in the utilisation of their forests both for domestic use and for exports. However, despite these attributes, the forestry and forest industries sector of most developing countries has failed to make the important contribution to economic development of which it is inherently capable.”

“Although this failure may be said to arise directly from the inadequacy of investment in forestry and forest industries, it appears that this dearth of investment is largely the result of certain serious institutional weaknesses. The inadequacy of the training given to forestry personnel to equip them for their new tasks, the obsolescence of the forest administrative machinery, the inappropriate structures of many forest organisations, and the frequent irrelevance of the legal provisions under which the sector operates often reduce the effectiveness of forest services and, consequently, restrict the growth and development of the sector, to its disadvantage.

Moreover, the potential contribution of forestry to economic development is, in many countries, not clearly understood and expressed by professional foresters. As a result, governments often do not create the environmental conditions that are necessary if their countries are to profit from their forest resources. Development-oriented institutions are not established, adequate funds are not voted for the forest services, and investment is not encouraged. In consequence a vicious circle is created, and the flow of capital to the sector is often inadequate for the forestry and forest industries sector to demonstrate its development potential."

"Even though, because of their tariff walls and trade practices, the more industrialised countries must share some of the responsibility in this matter, it is suggested that the possession of a skilled and properly motivated forest service, able to bring to bear both imagination and expertise to its manifold tasks, is the prime essential for forestry development in the developing countries."

More recently, from his position as head of the Forestry Department in FAO, King (1975) has added some specific measures that are essential to forestry development policy. These should be widely known by all who express interest in the special aspects of the industry which are considered above. Any syntheses of the economic analysis that have emerged in recent decades will have made it abundantly clear that a very great deal has been written about what ought to be done to achieve development. It would be rewarding to know a bit more about what is actually being achieved so that the lessons of experience can bring their own particular contributions.

APPENDIX A

FEATURES OF FOREST INVESTMENTS OF PARTICULAR IMPORTANCE TO GOVERNMENTS*

1. Forests provide a versatile and renewable raw material resource suitable for the manufacture of an extremely wide range of products.
2. The high income elasticity of demand for forest products, particularly at low income levels, and the pronounced linkage effect of forest industries with other sectors of the economy, give such industries the potential to contribute to rapid economic growth.
3. Forest industries can help to speed up the 'pay-off' time of investments in infrastructural

* *Forest Investments from a Government Point of View*, John S. Spears, Forest Industrial Development Division, Ministry of Natural Resources, Kenya, Sixth World Forestry Congress Paper, 1966, G/Pl.4/1.

facilities such as roads, power and water supplies.

4. Since many of the forest industries are located in rural areas close to their source of raw material, they encourage a dissemination of technical skills and help to ease the transition from a subsistence to an industrialised economy.
5. The forest and forest industry sectors are characterised by a high degree of flexibility, particularly with respect to choice of product to be harvested, forest crop rotation and scale of industrial operation. This factor is of particular significance to developing countries with limited opportunities for industrial development and poor infrastructural facilities.
6. Forest industries in many countries have a considerable import saving and/or foreign exchange earning potential.
7. Forest industries may substantially increase the taxation base and provide a valuable source of indirect public income.
8. Many aspects of forestry are labour intensive, particularly those associated with tree nurseries, afforestation programs including planting, cleaning, weeding, pruning, thinning, etc. Forestry has traditionally provided a most useful source of unemployment relief in many countries. Forest labour requirements are often complementary to those of agriculture, a factor which facilitates the implementation of integrated forestry and agricultural schemes.
9. Finally, apart from the more obvious functions of providing a source or raw material for forest industries, it has long been recognised that forests have other valuable non-crop functions, including the provision of recreational, hunting and tourist facilities, the prevention of soil erosion and the protection of water catchment areas.

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Paper 2

EFFECTIVE POLICIES FOR STIMULATING INVESTMENT IN FORESTRY AND FOREST INDUSTRIES IN COUNTRIES WITH TROPICAL FORESTS

By H-J. von MAYDELL

The full version of this paper, which was prepared for another meeting, is not reproduced in the Bulletin. See Summary, page vii

Paper 3

THE ROLE OF FORESTRY IN ALLEVIATING POVERTY IN NIGERIAN RURAL AREAS

By Dr. O. O. OLAWOYE

Department of Forest Resources Management, University of Ibadan, Nigeria

Introduction

Poverty may be defined as (Johnson, 1966) existing when the resources of families or individuals are

inadequate to provide a socially acceptable standard of living. Poverty is a world-wide problem. The president of the World Bank, Robert S. McNamara,

was reported to have recently remarked that some 800 million people in the world live in absolute poverty, described as "a condition of life so degrading as to insult human dignity". Every nation, whether it is developed or less developed, contains elements that are poor. The main difference is that in the developed country poverty is a minority problem, whereas in the less developed country it is a majority problem. It is true, however, that poverty is a relative thing. Therefore any analytical exploration of the concept and definition of poverty is fraught from the onset with a number of difficulties. First it lacks both precision and universality. The population that would be regarded as poor in the United States of America may have a level and pattern of living that would compare most favourably with that of the people who would be regarded as materially well-off in many less developed countries. Poverty, therefore, can only be defined meaningfully within a particular historical setting (see Rowntree, 1901). Second, it is scarcely manifested in a single and unambiguous expression, and can be more apparent than real.

There are different kinds of poverty. Galbraith writes of these three kinds; namely, generalized poverty, island poverty and case poverty. *Generalized poverty* is the kind which yields to the process of economic growth in which the average productivity of labour is increased. *Case poverty* arises among those who suffer from some personal, physical or mental incapacity that excludes them from the general economic advance. *Island poverty* exists where an entire class of the working population becomes economically obsolete or an area of the country becomes economically depressed or suffers from economic disaster.

The latter two are the principal kinds of poverty remaining in a developed country like the United States.

Poverty in Nigeria

For a developing country like Nigeria, it is clear that the three kinds of poverty that Galbraith distinguishes exist. Most common of course is the generalized poverty version, and even with the most equitable distribution of income, poverty would remain a pervasive feature of the economy. Instances of island poverty and case poverty abound in urban and rural areas in Nigeria.

There seem to be two aspects of poverty, viz in terms of physical standards as reflected in diets, clothing, shelter and in terms of relative standards as reflected in levels of education, entertainment, personal transportation, etc.

Rural Income

Most rural households have low incomes averaging about N23 (\$35) per household per month. With about seven persons per household, estimated income is about N40 (\$65) per capita per annum. Average household expenditure is low. At about N21 (\$32) per household per month, household expenditure represents 90 per cent of household income. In other words the rural people in Nigeria are living at subsistence level. Adam Smith, two centuries ago, had the insight to recognise that "subsistence" should be more than simple physiological survival, which is the case in Nigerian rural areas, and that even the lowest class should have whatever society deems essential for decent living physically and mentally.

Nutritional Deficiency

One of the greatest problems facing Nigeria today is that her society, although predominantly agricultural, is becoming acutely short of food, and there is widespread underfeeding and malnutrition.

TABLE 1
NUTRITIONAL CONTENT OF FOOD EXPENDITURE IN SELECTED VILLAGES OF IFE DIVISION, 1972

Food item	Grams	Calories		Proteins	
		(K Cal)	%	Grams	%
Animal Protein	20.87	40.93	1.63	4.09	9.21
Staple	683.90	1894.43	75.26	38.36	86.33
Vegetable Fruits	131.47	566.40	22.50	1.84	4.14
Oils & Fats	15.33	12.32	0.49	—	—
Other Food	8.10	3.01	0.12	0.14	0.32
All Foods	859.67	2517.09	100.00	44.43	100.00

Source: Adeyokunnu, T. O.: *Expenditure Analysis for Eggs in Western Nigeria*. Ph.D. Thesis, University of Nottingham. 1974.

ROLE OF FORESTRY IN NIGERIA

Consumption levels fall far short of recommended minimum levels in both caloric and nutritional terms. Table 1 gives a breakdown of the nutritional contents of the food of Nigerian people. The United States Department of Agriculture food balance sheet (1965) gave estimates of 2,450 kilocalories, 51.3 grams of protein, and 43.8 grams of fat per day as the *per caput* consumption in Nigeria. Estimates of FAO, (1966) and of Olayide *et al* are in agreement with the USDA report. The disparity between the recommended and actual consumption levels, according to Olayide, is due to wastage of food during domestic preparation. The report further stated that a minimum supply target of 65 grams of crude protein and about 2,420 kilocalories per head per day would be required to ensure that the food and nutritional needs of the population are met. It has been predicted that the Nigerian consuming public will still be calorie-short in 1985. The policy implication of this is that a big programme of food production has to be mounted to prevent hidden under-nutrition.

Rural Unemployment

The unemployment situation in the rural areas has led to massive rural-urban migration in Nigeria. The irony of the situation is that the cities are congested and have high rates of unemployment. I have shown elsewhere that with an assumption of constant rate of growth in the total labour force, it will take Nigeria 31 years (base year at 1967/68) to achieve a zero rate of growth in agricultural employment. This will require the transfer of 14.73 million people from agriculture. The process of outmigration requires substantial industrialization, particularly in the rural areas so that the rural people will not have to go to the already congested cities.

Illiteracy

Rural poverty in Nigeria is closely associated with illiteracy (Table 2). The high incidence of illiteracy characteristic of rural areas limits the capacity of rural inhabitants to look for and obtain alternative employment opportunities in the non-farm sector. Illiteracy also tends to narrow the rural inhabitants' horizon and makes them suspicious of change and innovations (Olayide and Essang, 1975).

Shelter

Poor housing is another feature of rural poverty in Nigeria. Osuntogun (1975) found of the 690 houses that were surveyed in five villages in 1973 only 6.5 per cent were plastered with cement. About 77 per cent were mud houses. It was further observed that none of the houses in the villages surveyed had

modern facilities like a decent toilet, kitchen and bathroom.

TABLE 2
EDUCATIONAL BACKGROUND OF SELECTED
FARMERS IN KWARA STATE, 1973

Educational Background	Farmers	
	Number	Percentage
No formal Education	978	87.3
4 years of primary school	73	6.5
Completed primary school	27	2.4
Completed modern school	1	0.1
Did not complete modern school	3	0.3
Completed secondary school	1	0.2
Completed Teachers Training Certificate	2	0.2
Adult Education	34	3.0

Source: *Rural Development Paper No. 8, Department of Agricultural Economics, University of Ibadan, 1973.*

Other Social Infra-structure

Other symptoms of poverty in Nigerian rural areas include inadequate or complete absence of medical facilities, lack of good roads, lack of social amenities such as electricity, pipe-borne water and recreational facilities.

Remedy for Rural Poverty

In formulating concrete proposals for mitigating poverty it is very essential to distinguish among situations or circumstances that led to poverty. The analysis of poverty must probe not only the factors which retard economic growth but allow those forces which constitute the structure of inequality and which systematically generate and perpetuate poverty.

The remedy for case poverty lies mainly in improved public and private welfare and public expenditures to alleviate the conditions of their living. Improved rehabilitation programmes for the physically handicapped are essential.

The remedy for island poverty includes efforts to promote general and balanced economic growth of the economy and the reduction or elimination of geographical pockets of poverty or depression. As the national product increases, given a fair or more equitable distribution of the national income, the areas of depression and poverty reduces. Poverty can be reduced by spreading economic development and expanding total production.

In order to increase the capacity of the insular poor, more equal educational training and retraining opportunity is essential.

Remedy for generalized poverty will include provision of non-farm job opportunities, rural housing improvement programmes, more than proportionate investment in the children of the poor community, establishment of high quality schools in rural areas, strong health services, special provision for nutrition and recreation. Also it should include introduction of modern techniques of production, provision of credit, changes in the system of land-tenure and improved marketing system.

The Role of Forestry

Employment

The provision of rural employment is one of the most effective strategies for reducing rural poverty. It is easily understood that if a person has a job which provides a regular income some of the worst effects of poverty are alleviated.

Many countries have taken up forestry on a large scale as a tool against rural depression and unemployment and as a provider of momentum for rural rehabilitation.

Studies have shown forest industries as ranking very high in terms of industrial employment in Nigeria. In a survey of rural industrial establishment of the 24 divisional capitals of the Western State of Nigeria, forestry oriented rural industries have played a great role. Carpentry ranks second only overtaken by tailoring. Wood carving, furniture making and sawmilling are also playing some role in this endeavour. With plans to establish wood industries in parts of Nigeria, particularly close to sources of raw material in the rural areas, the role of forestry in rural employment will greatly increase.

Owing to the need for better management of existing forest areas and the conversion of many of these into plantations in Nigeria, there is potential for employment through forestry operations. Various estimates have been given for labour requirements for plantation establishment. Stenkivist's study⁽¹⁾ indicated that 20 labourers per 100 hectares can be directly employed in the conversion of tropical high forest in Nigeria carried out under an agri-silvi-

cultural system. With a potential of over 8 million hectares of forest land convertible to plantations in Nigeria⁽²⁾, and with the great attention being given to forestry, a lot of rural employment can be generated. A warning must be sounded, however, that effective generation of employment through forestry projects will require the government to induce the people to stay in the rural areas and this can only be done by developing these areas and providing social amenities. Also there is the need for forestry to be able to pay competitive wage rates.

Provision of food

Forestry can play a vital role in providing food for the rural population and improving their diet. Forestry's contribution to alleviating hunger in Nigeria can be evaluated under three categories. One is production of food from forest trees, the second is protein from wildlife and fisheries within the forest areas and the third is the production of food crops in forest areas – a system known as agri-silviculture.

Food is obtained from leaves, fruits, bark, stem and roots of some Nigerian trees. In the Western State and Mid-Western State alone 500,000 hectares are estimated to be covered by wild palm producing about 12,400 tons of palm oil in 1961 and 187,300 tons of palm-kernels in 1964. In the Eastern States there are about 1 million hectares producing 300,000 tons of palm oil and 200,000 tons of palm kernels. Wild palm also produces a large quantity of palm wine which is a very common drink among the village and town people.

The importance of food obtained from trees is considerable in view of the fact that the nutrition of many people in the country continues to be firmly linked with the productivity of natural forest ecosystems.

Wildlife and fish from forests have been the major sources of protein particularly for the rural people. Bushmeat and other naturally produced animal protein were worth \$105 million in 1965.

The combined production of tree crop and food crop, in other words agri-silviculture, can also result in major contributions to food production in Nigeria. Right after the civil war in Nigeria the forestry department of the East Central State accepted the responsibility of food production to alleviate the acute problem of food shortage in the war-torn area. Thousands of tons of maize were produced. My earlier work (1973) shows that, using maize as an example of a mono-cropping system, food up to the value of \$7.5 million can be produced by the five southern states of Nigeria annually.

The present effort being made to intensify the system of agri-silviculture by various state govern-

(¹) Stenkivist, K: *Employment Opportunities in the Tropical High Forest Created by the Agri-Silvicultural System. A Report Study on Nigeria*. FAO, Geneva, 1974.

(²) Olawoye, O. O: *The Employment Generation Potential of Tropical High Forest*. A Paper prepared for the FAO Technical Conference on Tropical Moist Forest.

ments in Nigeria will go a long way to reduce the problem of hunger in the country.

Fiscal Policy

Government can reduce rural poverty through fiscal measures in many ways. It can increase expenditures on public health in the rural areas in an effort to raise the health and productivity of rural inhabitants. Fiscal measures can be used to entice industries into the rural areas. Finally, by vigorously fighting inflation and liberalising imports of essential commodities, it is possible to raise rural welfare by fiscal measures (Olayide and Essang, 1975).

The Nigerian fiscal policy in forestry serves two purposes: to collect revenue and give incentive to local processing of sawlogs and veneer logs. Revenue collection paid to local government and export duties collected by federal government can help the government to achieve its fiscal policy objectives.

Rural Infrastructure

Another important area where forestry can contribute to the alleviation of rural poverty in Nigeria is in the improvement of rural infrastructure. Permanent settlements have been established along with forestry sawmills. Omo sawmill is an example of thriving Nigerian "forest village" of over 900 inhabitants with a church, cinema house, dispensary, small shops and pipe-borne water. Awi in the South-Eastern State is another example of development of rural infrastructure through forestry activities. There, forest workers live in good houses with modern amenities.

It is true that many rural communities are isolated from each other owing to lack of roads. This can be a great hindrance to trade and joint communal ventures. Timber-oriented roads have developed and created new opportunities and were used by people to develop a type of exchange economy. The most beneficial consequence of forest exploitation is the large number of former extraction and transport routes which have become state and local council roads. The usefulness of these roads is enhanced by the fact that they link settlements or run from settlements to enclaves in forest reserves. These roads are used by farmers for transporting agricultural produce.

Rural electrification has been advocated by many people as one of the basic necessities of rural communities. The role of forestry in this venture will be the provision of poles to be used in place of very expensive imported reinforced concrete and cast-iron poles. If forestry can meet this challenge adequately, the cost of rural electrification can be

substantially reduced to the extent that they can be met by local community efforts.

Forest can play a major role in watershed management. The forest can help to even out and improve the flow of water courses and to reduce their siltation. The sponge mat (leaf litter) and multitudinous water channel system provided by the tree roots and rootlets greatly increase the water storage capacity of the soil. In this role, forestry can contribute to the stable provision of adequate water supply to the rural areas.

In the immediate future, it is doubtful if sophisticated fuel – electric cooker, gas or kerosene – will be used in the rural areas. So fuel wood will still play an important role in the life of the rural people. Fuel wood will be used constantly for domestic cooking and also for heating during colder periods of the year, particularly in the northern states.

Recently the nation was hit by drought. In the arid environment, with very low rainfall annually, there is the desiccating harmattan, cold, dry and dust-laden, which results in bodily discomfort, death of animals and extremely harsh conditions. These conditions really impair the productivity and well-being of the people. Forestry has played and will play a great role in easing this hardship through the establishment of shelter belts.

A shelter belt is a wind barrier of living trees and shrubs maintained for the purpose of protecting farm lands from adverse factors. Among other things, the purposes of shelter belts include the provision of comfort for human and animal life. It can be said then that forestry, through shelter belt establishment, can contribute to rural development by improving the well-being of the people which, in turn, can result in higher productivity.

Education

One way in which forestry can improve the education of the rural people is related to employment. When the people are employed, their income is enhanced and so they can afford to send their children to school.

Also with the Universal Primary Education (UPE) programme in Nigeria, there will be a need for building many schools particularly in the rural areas. With the present scarcity of building materials in the country this task may be impossible. However, the wooden buildings will be good substitutes and will go a long way to make the UPE programme a success particularly in the rural areas.

Conclusion

The limitation placed on the length of this paper has necessitated only a brief treatment of each item. However, I hope it has been made sufficiently clear

that forestry can play a great role in alleviating poverty in Nigerian rural areas. It is hoped that policy makers will make increased efforts to exploit the contribution of forestry to Nigerian rural development.

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Paper 4

THE ROLE OF FORESTRY FOR INCOME AND EMPLOYMENT

By G. von MALMBORG

Department of Forest Economics, Royal College of Forestry, Stockholm, Sweden

Introduction

The title for this paper suggests that I am going to give an account of the contribution of Swedish forestry to the national income and overall employment. Originally, however, I intended to limit myself to presenting a research project with this name, which started last year, but I have found it necessary to give some of the background as well.

My basic theme is the flexibility and adaptability of forestry to various needs such as employment, income, etc. That is also at least one of the main hypotheses of the research project. That means we are trying to get away from looking at forest production as being fairly rigid and with very limited adaptability.

This way of looking at forestry as an integrated part of an enterprise or a region/county may not be new, but I have a feeling that in Sweden anyway, we have had a tendency for the last 10 to 20 years to look at and manage forestry separately and more or less isolated from the rest of the economy – micro or macro.

This aspect is discussed later in this paper, but before that I am going to give some figures on the forestry area and its distribution according to ownership and geographical location. In that connection I will also touch upon characteristics of different types of ownership and structural features of the forestry holdings.

Forestry Area and its Distribution with Respect to Ownership and Geographical Location

Sweden is divided into agricultural regions based on productivity ranging from the most fertile alluvial plains in southernmost Sweden over the forested regions in middle Sweden to the northern parts of Lapland.

In Table 3 ownership distribution is presented in relative numbers for three such regions.

- Gsk, the forested regions in south Sweden
- NN, the west (inner) parts of lower Norrland
- NÖ, the west (inner) parts of upper Norrland

FORESTRY FOR INCOME AND EMPLOYMENT: SWEDEN

It can be seen from the table that there are big differences between different regions, and these differences are even more striking if one looks at the individual counties.

The individual holdings vary greatly among the company forests, from SCA (Svenska Cellulosa Aktiebolaget), which is the largest non-state company in Europe with 2.13 mill. ha. to fairly small holdings by, for example, small sawmill companies.

The private holdings may, in certain cases, be

fairly large (5,000–10,000 ha.) but those are exceptions. As can be seen from Table 4 the average holding is around 50 ha., which means it is considerably lower in southern Sweden.

Even if some of the forest area listed as not combined with agriculture for all practical purposes is combined, it is obvious that a large part of the private forests today is no longer farm forest in the true meaning of that concept.

In Table 5 the farms are grouped without any

TABLE 3

DISTRIBUTION OF FOREST AREA ON DIFFERENT TYPES OF OWNERSHIP IN THREE PRODUCTIVITY REGIONS:
RELATIVE FIGURES

Region	Percentage				Million hectares
	Private	Company	State	Other	Total
Gsk	78	8	7	7	3.2
NN	45	44	5	6	5.7
NÖ	32	21	38	9	8.9
					17.8

Source: *Yearbook of Agricultural Statistics*, Stockholm 1974

TABLE 4

FARMS IN SWEDEN IN 1971

	All	
Number Forest area	247 thousand 10,585 thousand hectares	
Number Forest area	Combined forestry and agriculture (>2 ha of arable land) 113 thousand 5,241 thousand hectares	46% 50%

TABLE 5

FARMS GROUPED ACCORDING TO FOREST AREA

Forest area	Number of farms		Area	
	1,000 units	percent	1,000 hectares	percent
< 25 ha	138	56	1,469	14
25— 50 „	52	21	1,900	18
50—100 „	35	14	2,489	24
100—200 „	16	7	2,240	21
>200 „	6	2	2,487	23
Total	247	100	10,585	100

Source: *Yearbook of Forest Statistics*, Stockholm 1972

consideration of the combination with agriculture. The largest part of the forest area is in the class 50 – 100 hectares, but almost a third of the total acreage belongs to holdings with less than 50 hectares.

Area, however, is not an appropriate measure of productivity in a country like Sweden. On the average, the productivity in south Sweden is about twice as much as it is in northern Sweden. The figures presented in Table 5 show that almost all privately owned forest properties in Sweden are so small that highly mechanized and specialized logging methods cannot be used on the *separate* units.

Ownership Characteristics

State and companies, each of which own about a quarter of the total acreage, work very much along the same lines as far as management methods etc. are concerned. They are usually labelled as large-scale forestry and one main characteristic is that they produce raw materials for forest industry which in most cases is owned by the same owner – state or company.

The private owners on the other hand vary with respect to size of holdings and management objectives. Of course, their timber will become raw material for the industry, too, but that is not a main goal. Instead, the goals usually are to obtain

- income
- capital for investment
- savings
- employment

Depending on which of these goals is most relevant, the management of the forest may vary considerably from heavy cutting, as when a farmer needs capital for investment in the farm and/or employment, to very light cuttings and intensive silvicultural and regeneration practices, when investment in real property is the main objective.

We do not know very much about the goals and behaviour of the different types from a purely scientific point of view, but we have, of course, some general knowledge. Also, some studies based on inquiries have been done. Here, I am going to make some fairly general and sweeping statements based on my general knowledge.

First, we have the farmers, that is about half of the owners as we saw from Table 4. Some of the farmers are specialized in agriculture and have neither time for nor interest in forestry. At the other end of the scale are those farmers who concentrate on forestry, but they are probably very few. In between, we have all kinds of combinations. And that is the most complicated and most interesting part of private owners from our point of view. Among the non-farmers you have all kinds of people. Usually, they

do not manage their forests, many (perhaps most) of them do not even live on the farm and they do not depend on the forest income or employment. On the other hand, it may mean a lot as an investment opportunity or from a sentimental point of view. These kinds of owners are often considered very difficult to handle, just because forestry means so little to them in economic terms. As I see it, it may be easier to deal with them through regulations, just because they do not depend on forestry for their living.

The “combined farmer” is the group where it is more difficult to use a simple and efficient approach just because they need the job opportunities in their own – and perhaps also in their neighbours’ – forests. But not even all “combined farmers” depend on their forest for income and employment. This varies to a large degree, I think, with their age and needs for capital and/or income which, in many cases, are correlated to age, because young owners usually have more loans than the older ones, who have paid them back. Thus, age seems to be an important factor for the need of capital or income as well as for the ability to do forest work.

The figures in Table 6 indicate that about half of the farmers have reached an age when they are less able to do forestry work. But on the other hand, the younger half of the farm population may need more work outside the agrarian part of the farm than can be had on their own forest. That aspect is taken up in Tables 7a and 7b which show the relative numbers of farmers fully employed on their own farms.

There has been a tendency towards fewer full-time farmers during the period despite efforts from the state authorities to create more full-time farms – or even two-family farms. In later years it seems as if the trend has changed somewhat and that part-time farming is becoming acceptable again – as it once was! In the period in between, part-time farmers have sometimes been looked upon as almost disloyal to their full-time colleagues.

All those owners who are not able to – or interested to manage their forests themselves can be served by the forest owner associations or by other types of forestry entrepreneurs. And in most cases the same technique as that employed in large scale forestry can be used. Consequently, from a purely micro-economic point of view, they can be handled “efficiently”.

Finally, one important aspect for most private owners is taxation. Forestry income is taxed according to the same general rules as for other income, with a few important exceptions. One is that income is created first when the trees are harvested. Value increment is not taxed until one sells the property – if at all. Another is that income from forestry can be levelled out over a 10-year-period.

FORESTRY FOR INCOME AND EMPLOYMENT: SWEDEN

TABLE 6

THE RELATIVE AGE DISTRIBUTION AMONG FARMERS IN 1973

Age	< 40	40—55	55—67	> 67
Percent	16	36	34	14

Source: LRF (Lantbrukarnas Riksförbund), unpublished material.

TABLE 7a

FULL-TIME FARMERS IN 1961 AND 1972 RESPECTIVELY BY AREA OF ARABLE LAND: RELATIVE FIGURES

Arable land	1961	1971
2—10 hectares	59	46
11—20 „	79	54
> 20 „	87	61

TABLE 7b

FULL-TIME FARMERS BY REGION IN 1961 AND 1972 RESPECTIVELY: RELATIVE FIGURES

Region	1961	1971
Plains	79	58
Forestry	68	52
Norrland	55	42

Source: LRF (Lantbrukarnas Riksförbund), unpublished material.

TABLE 8

NUMBER OF FOREST WORKERS (JOB-OPPORTUNITIES) 1973

Large scale forestry		Percent
Total	40,240	100
Permanently employed	21,900	51
> 1,200 hours	17,380	41
Private forestry		Percent
Total	146,700	100
Forest owners	70,470	48
Family member	23,580	16
Others	52,650	36
Hours worked per head		
≤ 400	129,140	88
400—1,200	15,100	10
> 1,200	2,460	2

Source: SCB Am 74:10

Tax considerations consequently are very important for the private owners, but far less for the state – which pays only local property taxes – and the companies, which pay the general flat company tax.

Consequences with Respect to Production

(a) Timber

Generally speaking, all types of owners are interested in a high and sustained production. And the “Forestry law” is based primarily on that objective. Of course, there are differences, but it seems that the various owner-categories are becoming more and more alike in that respect. One main difference may be observed, however. Private owners – and to some extent companies – may put less emphasis on a stable cut than e.g. the state forests. As has been pointed out previously a newly started owner may need a lot of capital at once and after that he may be able to build up the forestry capital for the rest of his time as a farmer.

(b) Logging

For large scale forestry low costs and consequently high technical efficiency are a main objective. The same is true for at least a large proportion of those private owners that do not do the work themselves. But for the truly “combined farmers”, efficiency in a narrow sense is not the prime objective. For them the goal is to obtain a satisfying result from the total farm. That means that – probably in most cases – they are working at a technically less efficient level and using less highly mechanized methods. There may be disadvantages from a purely forestry point of view, connected with that use of resources, but there are probably also some advantages, e.g. a greater flexibility with respect to silvicultural practice.

(c) Labour force

The result of recent developments is shown in Table 8.

Consequences with Respect to Regional Policy

Looking back, we can note that 20 or 25 years ago the combination between agriculture and forestry was a fact which was not very much discussed. The combination was not limited to the individual farm, but the farm population was also the main source of forest workers for state and company forests.

The change in labour policy which started at that time was caused by

- the need for labour in the industrial sector
- specialization and structural changes in agriculture

- efforts on the part of the labour union to establish forest workers as “professional” (instead of being half farmers)
- efforts on the part of forestry to cut costs.

These are only a few examples but in my thinking they are some of the more important reasons.

The result is illustrated by the figures in Table 8, which indicate that the endeavour on the whole has been successful.

Today people are beginning to wonder whether the development has not been too successful. Some parts of the country are now so sparsely populated that it is difficult and expensive to keep up social services, communications, etc. At the same time the need for labour in the industrial sector seems to have levelled off. Here we have the whole complex of energy crisis, consumer revolt, green wave, etc. But though there may be temporary influences from the actual business cycle, we have, I believe, reached one important turning point. And that means that what we define as the “area-bounded production” is beginning to attract some interest as a possible source of employment and income. One sign of that interest is that our “State Bank Fund” is financing a project concerned with “Regional Consequences of Contraction of Certain Branches of Production”.

The title may sound a bit negative, as if we were just interested in how we can decrease the branches in question. The scope of the study, however, is wider than that, and we intend to study how, for example, different levels of production affect income and employment. We also will try to evaluate the results from a macroeconomic point of view.

The project at the moment is divided into four subprojects. Some are closely inter-connected.

Subproject 1 is primarily concerned with finding “break points” in the farm enterprises, e.g. when does a farmer extensify (or intensify) production, when does he give up farming on different types of farms, etc.

Subproject 2 is primarily focused on different types of production – in agriculture and forestry – and how they influence job-opportunities and income. In the study we will try to define “type farms”, “type situations” and “type farmers”. The tool of analysis we are going to use is a method for planning of combined enterprises which has been developed at the Agricultural Economics Research Institute. A second step in the study will be to create a model for aggregating the “type farms” on a regional (local community) basis. Thus we are trying to get away from a sectorial approach and instead build up the region from the basic enterprises it is composed of. Large-scale forestry is included, too, but the main interest is focused on the private owners and primarily on the farmers.

Subproject 3 is an input-output analysis comprising not only agriculture and forestry but also the industry based on it.

Subproject 4 is a kind of summary project, but at the same time includes some specific studies of labour movements, etc.

Subproject 1 and 3 are carried through at the Department of Agricultural Economics at the College of Agriculture, subproject 2 is handled by the Department of Economics at the College of Forestry and subproject 4 is handled by the Department of Geography at the University of Umeå.

Professor Bylund at that Department functions as coordinator and the project is supported – up to now anyway and hopefully also in the future – by a special group for regional studies at the Department of Labour.

The closest connection seems to be between subproject 1 and 2, both of which are concerned with the farms on a microeconomic basis. There are, of course, also links with the other two subprojects and particularly with subproject 4, but they are more concerned with the macroeconomic aspects.

DISCUSSION OF PAPERS BY MESSRS MACGREGOR, VON MAYDELL AND VON MALMBORG

Chairman: Dr. W. E. S. MUTCH

Arising out of MR. MACGREGOR's paper and the discussion which followed it, it was generally accepted that it was first necessary to identify the true aims of rural development. Even if one single aim were to be found, it was not at all clear that a single criterion served to measure its achievement. The fact that various attitudes exist, represented by Streeten's groups of price mechanists, technologists and radicals, suggested that there could be no one "right" answer to the question of an appropriate criterion. It would be nice to think that people in the country or region concerned should be asked to say what measures of success were important to them and it was pointed out that a start has been made on this sort of participation in certain fields in developed countries, but there was a general view that votes in the next election were often the most important determinant of the economic goals chosen by governments. Forestry was generally not a vote-catcher and because of this suffered from a lack of investment.

DR. VON MAYDELL had also asked why people should invest in forestry. He concluded that there were important benefits from forestry which were, for one reason or another, undervalued and that more investment was needed. This required stimulation. The idea of investment groups including links between forest owners and wood users was canvassed but such schemes were by no means assured of automatic success. Environmental consequences of forest management deserved careful consideration in investment appraisal. In developing countries these effects were important but tended to be over-

shadowed by the problem of rural poverty arising from unemployment and under-employment. On the side of wood use, a major difficulty was that markets were not so well developed that price signals could be relied upon to direct the use of a product such as firewood to what appeared to be more valuable ends.

DR. OLAWOYE reviewed the different forms of poverty that exist. In Nigeria a massive shift from agriculture was needed to alleviate poverty and the extent of help available on forestry in providing employment and the possible methods of achieving this absorption of labour were discussed.

Studies referred to by PROFESSOR VON MALMBORG in Sweden had their lessons for developing countries. Among these were that cultural and demographic features such as types of land ownership and the ages of landowners were among factors influencing owners' attitudes to forestry activity including new investment. In planning for forestry with the aim of contributing to economic development it was important to consider the whole regional economy and not just the forestry and forest industries sector.

The discussion emphasised the need for realistic identification of the objectives and the possible roles of forestry in serving these. The group noted the need for care in choosing an operationally useful objective function and recognised the dangers, as Professor Von Malmberg put it, that "there were too many foresters in the forest", when they should be concerned with influencing planners in other fields and decision takers, and generally looking at the wider view.

Paper 5

FORESTRY'S CONTRIBUTION TO ECONOMIC AND SOCIAL DEVELOPMENT IN MALAYSIA

By J. W. KER

Dean, Faculty of Forestry, University of New Brunswick, Fredericton, New Brunswick, Canada

Malaysia is a developing country that is using its extensive natural resources, including timber, to finance economic and social development. Whether the resulting rapid liquidation of Malaysia's forests is in its long-run national interest will depend upon the wisdom with which the resulting revenues are re-invested, and, in particular, upon the adequacy of steps taken to replace and manage the forest resource.

Historical Perspective

Under British colonial rule scant use was made of Malaysia's valuable timber resources, either for domestic use or for export. In retrospect, this seems strange; the reasons, no doubt numerous and complex, lie beyond the scope of this paper.

West Malaysia (Malaya), which occupies a strategic position on the eastern side of the straits of Malacca, the gateway to the Orient, has long been an important base for east-west trade. Vast areas of lowland forest have been cleared during strip-mining for tin and to make way for plantations of *Hevea brasiliensis*, the principal source of natural rubber. The tropical high forest that predominates in both East Malaysia (Sabah and Sarawak) and West Malaysia has been of significance only to the local economy until well after World War II.

Development of the Malaysian economy is a relatively recent phenomenon. The hiatus created by the Japanese Invasion in 1941 and Occupation until 1945 was followed by a period of political instability. The Malayan Union of 1946 was followed by the Federation of Malaya in 1948. For the next twelve years (1948-1960) normal economic activity was inhibited by the Emergency, a period of extensive Communist guerilla activity, in both East and West Malaysia. Terrorism persists to this day, but on a smaller scale in both intensity and extent.

In 1959 the Federation of Malaya achieved full self-government within the British Commonwealth. Malaysia was created in 1963, incorporating Malaya, Sabah, Sarawak and Singapore, from which Singapore withdrew two years later to form an independent republic.

Malaysia today therefore consists of West or Peninsula Malaysia, formerly Malaya, and East Malaysia, i.e., Sabah (North Borneo) and Sarawak. West Malaysia comprises the 11 states of Johore,

Kedah, Kelantan, Malacca, Negri Sembilan, Pahang, Penang, Perak, Perlis, Selangor and Trengganu and, since 1974, the capital district of Kuala Lumpur.

The Forest Resource Base

The natural vegetation of most of Malaysia's land area is dipterocarp forests, unique amongst the tropical hardwood forests of the world for their high commercial value and potential industrial productivity. The potential of these forests for permanent management gives Malaysia a considerable comparative advantage over most forest production areas of the world (see References). Of a total area of approximately 128,000 square miles (see Table 9) some 10,000 are covered with marine alluvial (mangrove) swamp forests, of which 60 per cent are in Sarawak. Areas gazetted as forest reserves cover 36,000 square miles, 28 per cent of the total land area. Some 70 to 75 per cent of the forest reserves are classified as productive forests, comprising lowland dipterocarps growing up to 1000 or 1500 feet in elevation. The remainder, classified as protection forests, are hill and upper-slope dipterocarps growing on catchment areas, steep slopes and mountains.

While efforts continue in Sabah and Sarawak to expand the area covered by forest reserves, the Forest Department's hold on productive forest land is tenuous, especially in West Malaysia. The more highly productive and accessible land at lower elevations continues to be converted to agricultural use, earlier for rubber, more recently for plantations of oil palm, tapioca, and other crops. Land clearing and development appears to be carried out with little attention to the prevention of soil erosion and the possible salvage of existing timber values, despite rapidly dwindling log supplies for local saw, veneer and plywood mills.

"Control over forest harvesting is effective only within Forest Reserves. State Land forests are generally subject to uncontrolled wasteful harvesting, illegal felling and water catchment damage through badly aligned roads and inefficient extraction practices; these forests contribute only a small proportion of their economic potential and represent an outstanding example of poor management, even if the objective is conversion to agricultural use." (FAO, 1971).

FORESTRY'S CONTRIBUTION TO DEVELOPMENT: MALAYSIA

Forest Production and Exports

Malaysia's roundwood production (Table 10) increased steadily from 1961 to 1972 and rose rapidly in 1973 as a result of a 62 per cent increase in production from Sabah. Over the same period Malaysia's share of world production rose from about one-half of one per cent to almost 1.3 per cent.

Meanwhile roundwood exports (Table 11) for the country as a whole increased consistently up to 1973 as a result of increasingly heavy exports from Sabah. From Sarawak and West Malaysia, on the other hand, exports of wood in the round peaked in 1970 and may be expected to decline further as federal export restrictions come into force. The percentage of wood exported in raw form culminated at 52 per

cent in 1969 and is now expected to drop sharply. Sabah has accounted for 61 per cent of Malaysia's roundwood exports since 1961.

Three countries account for some 80 per cent of Malaysia's log exports (Table 12). Japan took 50 per cent or more since 1971, followed by Korea and Singapore. West Malaysia's curtailment of roundwood exports is now virtually cutting off Singapore's customary source of supply.

As Malaysia, beginning in West Malaysia, places increasing emphasis on domestic manufacturing, the production and export of sawnwood, veneers and plywood may be expected to increase. The production of sawnwood and sleepers and share of world production for 1962 to 1973, inclusive, are given in

TABLE 9
FOREST RESERVE AND LAND AREAS OF MALAYSIA (CIRCA 1970)

	Productive	Protective	Forest	Mangrove	Other	Total
	Land Area, square miles					
West Malaysia	8,808	3,964	12,772	440	37,703	50,915
Sabah	9,315	2,022	11,377	3,560	14,491	29,388
Sarawak			11,920	6,000	29,668	47,588*
Total	18,123	5,986	36,029	10,000	81,862	127,891*

*Figures vary somewhat depending on portion of source document consulted.

TABLE 10
ROUNDWOOD PRODUCTION, MALAYSIA, 1961-73 INCLUSIVE

Year	Sabah	Sarawak	West Malaysia	Total Malaysia	Total World	Malaysia's Share
	000m ³	000m ³	000m ³	000m ³	million m ³	%
1961	3,033	1,812	6,055	10,900	2,049	0.53
1962	3,216	1,996	6,285	11,497	2,073	0.56
1963	3,893	2,371	6,795	13,049	2,116	0.62
1964	4,017	2,537	7,290	13,844	2,194	0.66
1965	4,622	3,028	7,570	15,220	2,222	0.68
1966	5,683	3,728	8,245	17,656	2,250	0.78
1967	6,170	4,370	9,080	19,620	2,275	0.83
1968	6,400	5,022	10,110	21,532	2,313	0.93
1969	6,694	5,147	10,515	22,353	2,350	0.95
1970	7,072	5,543	11,520	24,135	2,400	1.01
1971	7,480	4,802	11,755	24,037	2,436	0.99
1972	9,048	4,097	13,255	26,400	2,470	1.04
1973	14,636	4,190	13,255*	32,081	2,501	1.28

*Estimated

Table 13. The corresponding export statistics are presented in Table 14. Most pronounced are the lack of manufacturing in Sabah, the preponderance of both manufacturing and export of sawnwood in West Malaysia, and the sharp rise in West Malaysia's exports in 1973. These trends were expected to continue through 1975, with sawnwood exports projected to be 2,415,000 cubic metres in 1974 and 2,560,000 cubic metres in 1975. Unit prices, however, were expected to drop substantially from 1973 levels.

By 1973 the estimated export value of sawlogs and sawn timber exceeded for the first time the export value of tin and was second only to rubber. From 1970 to 1975 the export value of plywood and veneer, relatively new products of Malaysian industry, is expected to increase from \$50 million (Malaysian) to \$143 million. Malaysia's export earnings are summarized for this period in Table 15.

Economic Planning

Malaysia plans on a five-year basis through the Economic Planning Unit of the Prime Minister's Department. This includes four divisions: (1) national planning, (2) regional planning, (3) sectoral planning, and (4) project analysis, evaluation and capital budgeting. For example, the Agriculture section of the sectoral planning Division conducts analyses on land alienation and development, market prospects for major agriculture crops, and the economics of competing land uses for crops and forestry.

The First Five-year Malaya (West Malaysia) Plan, 1956-60, resulted in an expenditure of 23.6 per cent of public development expenditures on agriculture, including only 0.2 per cent for forestry. The second Malaya Plan resulted in an expenditure on forestry of 6.6 million dollars Malaysian (\$1 Malaysian =

TABLE 11
ROUNDWOOD EXPORTS, MALAYSIA, 1961-73 INCLUSIVE^{3,4}

Year	Sabah	Sarawak	West Malaysia	Total Malaysia	Exports/Production Ratio
	000m ³	000m ³	000m ³	000m ³	%
1961	2,302	533	17	2,852	26.1
1962	2,494	717	12	3,223	28.0
1963	3,011	897	72	3,980	30.4
1964	3,387	878	993	5,260	37.9
1965	3,802	1,219	1,147	6,168	40.5
1966	4,856	1,937	1,492	8,285	47.0
1967	5,321	2,244	1,615	9,180	47.0
1968	5,796	2,993	1,970	10,759	49.9
1969	6,187	3,121	2,290	11,598	52.0
1970	6,150	3,307	2,683	12,140	50.8
1971	6,558	2,764	2,487	11,809	49.1
1972	7,929	2,245	2,311	12,485	48.8
1973	10,346	2,098	1,235	13,679	42.7

TABLE 12
MAJOR IMPORTERS OF MALAYSIA'S SAWLOGS AND VENEER LOGS⁴

Country	1971	1972	1973	1971	1972	1973
	000m ³			%		
Japan	5,866	6,828	8,388	49.6	55.0	61.1
Korea	1,418	1,611	1,657	12.0	13.0	12.0
Singapore	1,774	1,378	779	15.0	11.0	5.7
Others	2,090	1,779	2,059	23.4	21.0	21.2
Total	11,148	11,596	12,883	100.0	100.0	100.0

FORESTRY'S CONTRIBUTION TO DEVELOPMENT: MALAYSIA

40 c Canadian/U.S.) or 0.3 per cent of public monies spent. Meanwhile (1961-65, inclusive), the forestry contribution to GDP was growing at the annual rate of 8.0 per cent, the highest of the resource sectors, compared with 7.5 per cent for fishing, 4.5 per cent for mining and quarrying and 4.0 per cent for agriculture.

The First Malaysia Plan, 1960-70, projected a 10.9 per cent annual growth in GDP for forestry, 10.0 per cent for manufacturing, 8.0 per cent for construction and an over-all average for West Malaysia of 4.8 per cent. In fact, forestry achieved a

13.2 per cent growth rate, fishing 13.3 per cent, manufacturing 9.9 per cent, construction 4.1 per cent and the average was 5.5 per cent over the five-year period. This rapid growth in the forestry sector is reflected in average growth rates of 13 per cent in the volumes of wood exported and 16.1 to 19.6 per cent increases in corresponding export values. Re-investment in forestry for the period 1966-70 had a target value of 12 million dollars, or 0.3 per cent of the public development expenditure. In fact, almost 15 million dollars were spent on forestry.

According to the Second Malaysia Plan, 1971-75,

TABLE 13

PRODUCTION OF SAWNWOOD AND SLEEPERS, MALAYSIA AND WORLD, 1962-73⁴

Year	Sabah	Sarawak	West Malaysia	Total Malaysia	Total World	Malaysia's Share
	000m ³	000m ³	000m ³	000m ³	million m ³	%
1962	56	280	1,370	1,706	349	0.49
1963	48	345	1,550	1,943	361	0.55
1964	56	400	1,337	1,793	379	0.47
1965	61	445	1,354	1,860	384	0.48
1966	66	425	1,424	1,915	383	0.50
1967	70	545	1,774	2,389	387	0.62
1968	75	500	2,062	2,637	401	0.66
1969	80	475	2,105	2,660	412	0.65
1970	86	630	2,455	3,171	412	0.77
1971	93	550	2,525	3,168	427	0.74
1972	96	511	3,227	3,834	436	0.88
1973	101	609	3,227	3,937	443	0.89

TABLE 14

EXPORTS OF SAWNWOOD AND SLEEPERS, MALAYSIA, 1962-73⁴

Year	Sabah	Sarawak	West Malaysia	Total Exports, Malaysia	Total Production, Malaysia	Exports/ Production
	000m ³	000m ³	000m ³	000m ³	000m ³	%
1962	12	183	395	590	1,706	34.6
1963	6	208	496	710	1,943	36.5
1964	5	261	459	725	1,793	40.4
1965	7	271	475	753	1,860	40.5
1966	3	222	489	714	1,915	37.4
1967	4	275	583	862	2,389	36.0
1968	4	311	888	1,203	2,637	45.7
1969	10	305	877	1,192	2,660	44.9
1970	12	315	1,090	1,417	3,171	44.6
1971	6	282	1,054	1,342	3,168	42.4
1972	8	303	1,537	1,848	3,834	48.2
1973	13	251	1,982	2,246	3,937	57.0

the forestry contribution to the regional economy of West Malaysia was then expected to drop from a GDP growth rate of 17.9 per cent in 1971-73 to only 5.9 per cent over the five-year period 1971-75, compared to growth rates of 11.3 per cent and 8.9 per cent, respectively, for all sectors.

Public development expenditures of \$18 million (Malaysian) originally allocated to forestry for the Second Plan period (1971-75) have been revised upward to \$40 million, \$29 million for Peninsula Malaysia, \$8 million for Sabah, \$3 million for Sarawak. Forestry's share of public expenditures would thereby rise to 0.4 per cent of the \$9,350-million-dollar budget for the five-year period to the end of 1975. Forestry is thereby receiving one-fifth of the allocation for agriculture and rubber planting (\$190 million each) and one-eighth of the allocation for drainage and irrigation (also mainly for agriculture).

National Objectives

The Second Malaysia Plan, 1971-75, clearly identifies the nation's national objectives. The first and overriding objective of the country is national unity.

The two-fold objectives of the New Economic

Policy for development, enunciated in the Second Malaysia Plan, are:

"(1) to reduce and eventually eradicate poverty, by raising income levels and increasing employment opportunities for all Malaysians, irrespective of race, (2) to accelerate the process of re-structuring Malaysian society to correct economic balance so as to reduce and eventually eliminate the identification of race with economic function. This process involves the modernisation of rural life, a rapid and balanced growth of urban activities, and the creation of a Malay commercial and industrial community in all categories and at all levels of operation, so that Malays and other indigenous people will become full partners in all aspects of the economic life of the nation."

Distribution of Income

To measure the progress being achieved by the New Economic Policy, Malaysia has, in its Mid-term Review of the Second Malaysia Plan, identified the contribution of each of its four main ethnic groups, i.e., Malay, Chinese, Indian, and Other. The percentage distribution of Peninsula Malaysia

TABLE 15
MALAYSIAN COMMODITY EXPORTS, 1970-75

Commodity	Year					
	1970	1971	1972	1973 (Est.)	1974 (Proj.)	1975 (Proj.)
	Value, millions of dollars (Malaysian)					
Rubber	1,724	1,460	1,298	2,242	1,999	1,768
Tin	1,013	906	924	888	836	815
Sawlogs	643	641	590	938	736	704
Sawn timber	201	192	275	592	469	407
Plywood and veneer	50					143
Sub-total, Forest products	894	833*	865*	1,530*	1,205*	1,254
Other products	1,582	1,818	1,757	2,216	2,565	2,943
Totals, All Commodities	5,163	5,017	4,844	6,826	6,605	6,637
Forest products, as % of all Commodities	17.3	16.6*	17.9*	22.3*	18.2*	18.9

*Exclusive of plywood and veneer

Source: 1973, Mid-term Review, Table 3-3, pp. 44-45.

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households by income and race in 1970 had the distribution of modes in Table 16.

Similarly, the distribution of households by income in Peninsula Malaysia in 1970 revealed the modal values shown in Table 17.

Distribution of Ownership

The ownership of assets in agriculture and industry by race (see Table 18) reveals the predominance of non-Malaysian investment in the corporate sectors*, of Malay capital in the non-corporate agricultural sector**, and of Chinese capital in the industrial sector***.

Restructuring the Racial Composition of Employment

"The second prong of the New Economic Policy (NEP) is designed for the creation of a society in which all Malaysians participate and share equit-

ably in economic and social development. An important aspect of this objective is racial balance in employment through full employment. . . The targets also imply inter-sectoral migration leading to increased Malay participation in the modern sectors of the economy in line with the proportion of Malays in the total labour force".

Percentage employment by race and sector in Peninsula Malaysia in 1970 and targets for the year 1990 are presented in Tables 19 and 20 respectively. The 1990 targets are to be achieved by means of a series of annual or periodic adjustments facilitated by an intensive educational program. A national, rather than a state responsibility, educational facilities and opportunities are being expanded rapidly, with enrolment preference being given to the Malay and other indigenous peoples. Public development expenditures allocated to education, maintained at 8 to 10 per cent of the total federal budget, have

TABLE 16

MODAL VALUES FOR THE PERCENTAGE DISTRIBUTION OF MONTHLY INCOME BY RACE, WEST MALAYSIA, 1970⁸

Monthly Income (\$)¹	Malay (M)	Chinese (C) Modal Values (*)	Indian (I) Modal Values (*)	Other (O)	Total
1—99	*		*		*
100—199		*		*	
200—399					

Source: 1973, Mid-term Review, Table 1—1

¹Mean Monthly Income \$269; % Total of 100 applies only to total of all monthly incomes.

TABLE 17

MODAL VALUES FOR THE DISTRIBUTION OF HOUSEHOLDS BY INCOME, WEST MALAYSIA, 1970

Monthly Income (\$)¹	Urban				Rural				Total			
	M	C	I	O	M	C	I	O	M	C	I	O
					Modal Values (*)							
1—99					*				*			
100—199						*	*			*		
200—399												
400—699												
700—1499	*									*		
1500—2999		*						*			*	*
3000—			*	*								
Mean (\$/month)	328	464	442	1492	154	333	237	563	179	387	269	950

Source: 1973, Mid-term Review, Table 1—2

¹Over-all Mean Monthly Income \$269; % Totals of 100 apply to each class of monthly income.

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TABLE 18

PERCENTAGE OWNERSHIP OF ASSETS IN MODERN AGRICULTURE AND INDUSTRY, PENINSULAR MALAYSIA, 1970

Ownership	Area under Modern Agriculture		Fixed Assets of Industry	
	Corporate Sector	Non-Corp. Sector	Corporate Sector	Non-Corp. Sector
	%	%	%	%
Malaysians	29	94	43	98
Malay	0.3	47.1**	0.9	2.3
Chinese	25.9	32.8	26.2***	92.2***
Indian	0.3	10.1	0.1	2.3
Other	2.7	1.8	14.3	0.8
Gov't	—	2.3	1.3	—
Non-Malaysians	71	6	57	2
% of Total	70.4*	29.6	87.4*	12.6
Totals	100.0		100.0	

TABLE 19

PERCENTAGE EMPLOYMENT BY RACE AND SECTOR, PENINSULAR MALAYSIA, 1970

Sector	Malays %	Chinese %	Indians %	Others %	Percentage of Total Employment
Agriculture, Forestry, Fisheries	67.6	21.4	10.1	0.9	49.1
Mining & Quarrying	24.8	66.0	8.4	0.8	3.1
Construction	21.7	72.1	6.0	0.2	2.8
Manufacturing	28.9	65.4	5.3	0.4	10.5
Utilities	48.5	18.0	32.3	1.4	0.8
Transport, Storage, Communications	42.6	39.6	17.1	0.7	4.1
Commerce	23.5	65.3	10.7	0.5	10.6
Services	48.5	35.7	14.0	1.8	19.0
Total	51.5	36.9	10.7	0.9	100.0
% of Labour Force	51.5	36.6	11.1	0.8	100.0
% of Unemployed	8.0	7.4	11.0	0.0	8.0
% of Population	52.7	35.8	10.7	0.8	100.0

FORESTRY'S CONTRIBUTION TO DEVELOPMENT: MALAYSIA

increased from 277 million dollars (Malaysian) in 1961-65 to 733 million dollars for the Second Plan period, 1971-75, inclusive (see Table 21). Level of attainment at completion of education (Table 22) by West Malaysian students shows considerable improvement from 1960 to 1970, with marked reductions in the numbers terminating at the Primary level and sharp increases at Lower Secondary to University levels. Increasing enrolments are projected for the period 1970 to 1975, ranging from 14 per cent at the Primary to 168 per cent at the College level (see Table 23).

Progress in re-structuring the educational levels attained by West Malaysians of various racial origins is indicated by enrolments given in Table 24

for the years 1970 and 1973. This racial re-distribution is being achieved, in part, by the establishment of new institutions, including two universities and two institutes of technology, to which Malay students have access on an exclusive or a preferential basis. Total and percentage enrolments in tertiary education in Peninsula Malaysia are summarized in Table 25. The most pronounced changes have occurred at the university (degree) level.

Achieving this target composition by racial group is however creating voids in many essential categories of employment. For example, only about 15 per cent of administrative and research positions within the Forestry Department in 1973-74 were occupied by qualified staff members.

TABLE 20

TARGET EMPLOYMENT PERCENTAGES BY RACE AND SECTOR, PENINSULAR MALAYSIA, 1990

Sector	Malays %	Chinese %	Indians %	Others %	Percentage of Total Employment
Agriculture, Forestry, Fisheries	60.0	29.1	10.2	0.7	32.8
Mining & Quarrying	50.3	39.2	9.8	0.7	1.8
Construction	50.0	40.2	9.6	0.2	3.9
Manufacturing	50.0	40.0	9.6	0.4	23.8
Utilities	52.5	29.0	17.1	1.4	1.3
Transport, Storage, Communications	52.5	36.0	10.8	0.7	3.9
Commerce	48.0	40.0	11.5	0.5	14.1
Services	46.5	39.4	12.8	1.3	18.4
Total	52.5	36.0	10.8	0.7	100.0
% of Labour Force	52.5	36.0	10.8	0.7	100.0
% Unemployed	3.4	3.4	3.4	3.4	3.4
% of Population	53.7	35.0	10.6	0.7	100.0

TABLE 21

PUBLIC DEVELOPMENT EXPENDITURES FOR EDUCATION AND TRAINING

	Period		
	1961—65	1966—70	1971—75
	277 8.9	392 9.7	733 7.8
Allocation, million \$			
Proportion of Total, %			

Sources: 1965 First Malaysia Plan, Table 4—1

1969 Mid-term Review, Table 1—2

1973 Mid-term Review, Table 5—1

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TABLE 22

EDUCATIONAL OUTPUT TRENDS IN WEST MALAYSIA, 1960—70

Level of attainment at completion of education*	Number completing education				
	1960	1965	1967	1968	1970
University	47	657	740	1,050	1,700
Tech. & Agric. Coll.	99	203	230	250	330
Sixth Form (incl. Muslim C.)	692	1,756	4,900	6,150	5,870
Teachers Colleges**	2,130	2,531	6,200	6,310	7,160
Upper Secondary	9,724	14,494	23,870	23,920	54,370
Academic	9,338	13,728	23,200	22,960	41,580
Technical	107	306	480	560	4,180
Vocational	279	460	190	400	8,590
Lower Secondary	4,782	23,752	38,200	73,400	99,100
Primary	140,947	45,309	30,800	26,100	20,900
Total	158,421	88,702	104,950	137,180	189,410

Source: 1965 First Plan, Table 5—2

*Includes drop-outs and failures but excludes those who will continue their education.

**Includes a large number of part-time in-service trainees.

TABLE 23

PROJECTED PERCENTAGE INCREASES IN ENROLMENT, 1970—1975

Educational Level	Increase (%)
Primary	14
Lower Secondary	48
Upper Secondary	85
Post-secondary (Higher School Certificate)	55
Teacher Training	113
College	168
University	98
Average	24.4

TABLE 24

ENROLMENTS BY RACE AND BY LEVEL OF EDUCATION, PENINSULAR MALAYSIA, 1970—73 (%)

Level of Education	1970					1973				
	M	C	I	O	Total	M	C	I	O	Total
Primary	53.4	36.0	10.0	0.6	100.0	54.2	35.4	9.8	0.6	100.0
Lower secondary	50.9	38.8	9.6	0.6	100.0	52.3	37.9	9.2	0.6	100.0
Upper secondary	48.8	43.4	7.0	0.8	100.0	52.7	40.5	5.9	0.9	100.0
Post secondary	43.3	49.6	6.0	1.0	100.0	49.8	44.2	5.2	0.8	100.0

*Abbreviations: M = Malay, C = Chinese, I = Indian, O = Other

Source: 1973 Mid-term Review

FORESTRY DEVELOPMENT IN WEST AFRICA

TABLE 25

ENROLMENTS IN TERTIARY EDUCATION BY RACE, PENINSULAR MALAYSIA, 1970—73

Level		1970					1973				
		M	C	I	O	Total	M	C	I	O	Total
Diploma & Certificate	No.					3,457					8,184
	%	82.9	15.5	1.0	0.6	100.0	85.0	13.7	0.9	0.4	100.0
Degree	No.					8,148					11,749
	%	39.7	49.2	7.3	3.8	100.0	52.7	38.8	7.7	0.8	100.0
Pre-university and Preliminary	No.					1,719					2,259
	%	30.3	66.4	2.7	0.6	100.0	31.2	63.8	4.8	0.2	100.0
Total	No.					13,324					22,192
	%	49.7	42.7	5.1	2.5	100.0	62.4	32.1	4.9	0.6	100.0

Source: 1973 Mid-term Review, Table 11—4

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Paper 6

FORESTRY DEVELOPMENT IN THE NEW ECONOMIC COMMUNITY OF WEST AFRICA (ECOWAS)

By S. K. ADEYOJU

Department of Forest Resources Management, University of Ibadan, Nigeria

Until 28 May, 1975, West Africa was merely a geographical expression and could hardly be construed as an "international economic region" or "market area" along the definition suggested by Mikesell (1957). Mikesell's concept refers to a contiguous area which includes the territories of two or more countries, for which substantial economic advantages could be realized by the elimination of barriers to the movements of goods and services and productive factors within the area. This definition is

not absolutely applicable to the new Economic Community of West African States (ECOWAS) comprised of the countries named in Table 26. A cursory look at the map of population densities and location of economic activities indicates that ECOWAS contains one major economic region from Calabar in the South-Eastern State of Nigeria to Abidjan in the Ivory Coast. This region is somewhat connected with a second but smaller region of relatively high population concentration

and intense economic activity, consisting of parts of the northern states of Nigeria, southern Niger and the River Niger districts of Upper Volta and Mali. The third small centre of activity situates in Sierra Leone and around Dakar in Senegal. It is obvious that while the elimination of barriers to trade may be of immediate significance to the major economic areas described above, the impact is going to be slower in Guinea, Guinea-Bissau, Mauritania, Mali, Niger and Upper Volta.

In spite of the impressive physical size of the region and the fairly large number of people living in it, its economic size is relatively small. Only twelve countries in developing Africa had a *per capita* income in excess of US \$300 (at 1970 prices) in 1972 (ECA, 1973); the Ivory Coast is the only member of ECOWAS in this category. Three countries in which the product per head lay between US \$200 and \$300 were Ghana, Liberia and Senegal. However, five or six of the poorest countries in the world with a GDP per head of less than US \$100 are also in the Union: these are Dahomey, Guinea, Mali, Niger, Upper Volta and probably Guinea-Bissau.

Agriculture is the largest contributor to the GDP in the large majority of members of ECOWAS, but its importance varies from country to country. The obvious exception is Liberia where agricultural contribution to GDP is negligible. Countries where agriculture is particularly important include Gambia,

Ghana and Niger. But where agriculture is not the dominant source of output, considerable importance usually attaches to mining. This is true of Liberia (iron ore), Nigeria (petroleum), Mauritania (iron ore and copper), and Sierra Leone (diamond). Manufacturing is of noticeable importance to output in Senegal, accounting for more than 15 per cent of the GDP. Elsewhere, it is still less than 10 per cent although, with the establishment of two motor-assembly plants in Nigeria, others in the process of being established and with iron and steel, natural gas, pulp and paper, more cement and other industries soon to go into production, the manufacturing component of that country's GDP may be radically different in the near future.

The difference between relative weights in manufacturing and agriculture as between developed and developing countries is much sharper than in the case of commerce and other services. Generally, commerce and other services make significant contributions to the GDP in many African countries, and in 1972 these services contributed more than 20 per cent of the GDP in virtually all the countries of ECOWAS.

It is also useful to consider the political background of the ECOWAS, since political affinities have been indispensable for fostering the economic bond. Since 1966 nearly every member of ECOWAS has experienced a series of political polarizations

TABLE 26
AREA, POPULATION, AND GROSS DOMESTIC PRODUCT OF THE ECONOMIC COMMUNITY OF WEST AFRICAN STATES

Country	Area ^a (km ²)	Popula- tion (1973)	Density (persons per km ²)	G.D.P. per head US \$ (1972) ^b (1962 values in parenthesis)
Dahomey	112,622	2.91	26	90
Gambia	11,295	0.49	44	137
Ghana	238,537	9.36	39	269 (291)
Guinea	245,957	4.21	17	77 (97)
Guinea-Bissau	36,125	0.51	14	?
Ivory Coast	322,463	4.64	14	363
Liberia	111,369	1.66	15	287
Mali	1,240,000	5.38	4	46 (58)
Mauritania	1,030,700	1.26	1	166
Niger	1,267,000	4.30	3	82 (85)
Nigeria	923,768	59.61	65	131
Senegal	196,192	4.23	22	222 (245)
Sierra Leone	71,740	2.86	40	185
Togo	56,000	2.12	38	133
Upper Volta	274,200	5.74	21	65

Sources: *United Nations Demographic Yearbook*, 1973; and *United Nations (E.C.A.) African Economic Indicators*, 1973

(^a) Land and water

(^b) Between 1962 and 1972, per capita income fell in the five countries noted

culminating in successive military interventions or the adoption of previously condemned stances so much that it is no longer meaningful to particularize any government. They are now generally moderate and distinctly less obsessed with foreign ideologies. The only classifications which might be applied with some degree of validity are whether a government is a "parliamentary democracy", "presidential autocracy", "military authoritarian" or "military consultative". In whatever way it is viewed, the political changes of the last ten years have provided instructive lessons in good neighbourliness to all and within members of ECOWAS.

To conclude, it can be asserted without any exaggeration that West Africa, with its irrational mixture of small, and sometimes ridiculously small, national states, as well as large land-locked countries, is perhaps the region of the world where economic integration, or at least the avoidance of disintegration, is most imperative for economic development. At the same time, economic integration encounters very considerable political, social and cultural and economic difficulties.

Characteristics of Primary Production

An essential factor influencing the pattern of primary production in these countries is the ethnic ownership of land which makes large-scale migrations of whole families or family groups difficult short of civil war. The elimination of ethnic warfare after the consolidation of colonial conquest resulted, therefore, in a situation where areas already overcrowded gradually become even more congested, in spite of the existence of large tracts of empty fertile land belonging to other ethnic groups, sometimes in relatively nearby areas. Although there is, on the whole, no shortage of land in ECOWAS, the extremely uneven distribution of population in relation to land has had major consequences for production, migration and trade within the region. The steadily growing population in the overcrowded areas had frequently resulted in near-starvation conditions in parts of the savanna belt.

The population densities concerned are startling within the context of West African agricultural technology. With the exception of plantations of tree crops and a few irrigated zones, agricultural production depends on the erstwhile "bush fallow rotation". This system, primitive though it may seem, is so far the only practicable method of preserving the natural fertility of the soil, hence the persistence of peasant production.

The second consequence of the maldistribution of population is the large-scale migration all over the region particularly from the rural areas to urban centres. The third and more general consequence of

the West African population pattern and of the related migrations has been the intensification of intra-regional trade in domestic produce and imported goods carried out by specialized and highly mobile groups such as the Hausas and Dioulas in the savanna belt, and the Yoruba and Ibo who not only trade but settled in large numbers throughout the coastal countries for decades before they were repatriated between 1965 and 1970.

Perhaps the most favourable feature of the economic geography of West Africa is the complementarity that exists between various parts of the region with respect to agricultural production. Broadly, there are two areas of production, one of which is the forest belt in the south devoted to tree crops grown for exports such as cocoa, coffee, rubber and timber and to the production of root crops for subsistence. By contrast, the savanna belt in the north is an area of livestock and grain production. This contrast is further accentuated by the fact that the prevalence of the tsetse fly renders cattle-raising in the forest belt virtually impossible at present. On the other hand, an important feature of production is the indigenous fishing industry along the bigger rivers yielding significant amounts of dried and smoked fish.

The natural complementarity of the various parts of the region is, of course, not limited to agricultural production. In the field of industry, natural conditions are determinant only for a relatively narrow range of products, whereas transport facilities, marketing conditions, technology and the availability of labour are very strong locational factors for manufacturing industries. Yet, in some industries, the nature of the raw materials is the compelling locational factor. Thus timber processing (a vitally important activity not only for export to overseas countries but also for trade within the region) is necessarily localized in the forest belt. The same applies to the first stages of processing of other tree crops, such as rubber, coffee and cocoa, though these are of minute importance for intra-ECOWAS trade. In the savanna belt, slaughtering, cotton ginning, and groundnut processing industries are very important to the intra-regional trade.

The geographical imbalance of industrial activities which characterizes not only the final stages of manufacturing but also most primary processing industries of some importance, is a very serious problem to ECOWAS. This is because the combined effect of the initial advantage, transport distances, and market size is such that the land-locked and/or small countries' industrialization prospects are very poor indeed. However, having regard to economies of scale and to the fact that the first loyalty is now towards member countries, there is no doubt that both land-locked and small countries would benefit

considerably from the enlarged economic activities of the Union.

Forest Resources

The resources described here are not easy to comprehend because the data from virtually all the countries concerned are most inadequate. The category "forests" encompasses both areas endowed with wood resources of a magnitude and richness paralleled in few other places in the world, and other areas in which the forest is no more than a sparse open woodland.

Given the limitations of information on the forestry sector, the data in Table 27 must be viewed with extreme caution. In most cases, the data are those of more than a decade ago, and even then, they were rough estimates. Under the heading "closed forests" the data obtained by Persson (1974) have been presented for all the countries excepting Nigeria. Persson defined "closed forest" as areas with trees whose crowns cover more than 20 per cent of the area, and not used primarily for purposes other than forestry. This definition is a variant of FAO's (1967) closed high forests comprising types of forest that tend to have a high log content; and other natural forests including (a) the moist tropical forests at low and medium altitudes; (b) the montane forests of the tropics, as also the floristically akin, lesser group of temperature and subtropical evergreen forests; and (c) indigenous Mediterranean high forest of Aleppo pine. In the case of Nigeria for which more reliable information is available, the actual high forest component of total forest reserves has been given as "closed forest".

In spite of the paucity of firm data, some preliminary observations emerge from a study of Table 27. First, total areas of forest lands are fairly large in the coastal countries of Ghana, Ivory Coast, Liberia, Nigeria and Senegal. Second, although there are forest lands in Mali, Mauritania, Niger and Upper Volta, these forest lands carry virtually only desert and semi-desert vegetation. Third, Guinea-Bissau, Ivory Coast and Liberia each have a quarter of their territory under "closed forest". While these data indicate some potential limits, there is no doubt that these countries also having low population densities would play a major role in the supply of timber or even constitute the bulwark of timber supply from the natural forest in the Union. Fourth, the countries with the highest population densities such as Nigeria, Gambia, Sierra Leone, Ghana and Togo are proportionally poorly forested. Finally, little attention has, so far, been paid to the establishment of man-made forests throughout the Union; only Nigeria appears to have built up small but rapidly expanding plantations over the years.

However, there are indications of growing interest in man-made forestry in Ivory Coast, Dahomey, and Senegal.

The general forest resource picture of ECOWAS is an interesting mosaic of "surplus", "adequate", "inadequate", "critical shortage", and "non-existent" situations. Even within the same country such as Nigeria or a small country like the Gambia, there are distinct variations between different parts. The high forest belt more or less parallel to the coast is the timber base, while forestry activities in the extensive savanna belt are oriented primarily toward the supply of firewood and poles to local inhabitants as well as ameliorating the climatic regime.

Apart from the generally inadequate forest resource base, the forests are subject to destructive drain due to 'bush fallow' cultivation, uncontrolled grazing and other factors. The present area of the "closed forest" probably represents not more than 60 percent of the original area of these forests, a diminution that must be ascribed mainly to the traditional farming systems. In more recent years, however, clearing has been proceeding at an accelerated rate, largely because of the expanded cultivation of permanent crops such as cocoa and coffee. At present, bush fallow farming appears to be spreading at a fairly fast rate throughout large parts of the high forest zone. For instance, in the Ivory Coast where bush fallow cultivation already extends over more than 4 million hectares, it has been estimated (FAO, 1967) that each additional cultivator clears an average of 4 hectares of forest in the course of his working life, destroying in the process a volume of wood several times larger than the quantity which he and his dependants are likely to consume during their lifetimes. Again, in Nigeria, a high degree of forest destruction and tenurial instability have been experienced over the years owing to the desire of farmers to take advantage of the supposedly rich forest soils. In some districts, farmers daringly and unilaterally establish farms and even plant cocoa and cola nut trees in forest reserves. It has been observed (Adeyoju, 1975a) that these forest destructive activities are least related to agricultural land shortage; they are due to a new phenomenon known as "forest hunger" which is probably also the underlying cause of increasing forest destruction in Ghana, Liberia and Ivory Coast.

Three other factors which are of critical importance to the management of forest resources pertain to the ownership of forest lands, forest utilization contracts and forest administration. In all the countries of ECOWAS, the government is the principal owner and/or managing agent of forest estate. However, because of the existence of many powerful kingdoms and deeply entrenched teners of communal ownership in Ghana and Nigeria

FORESTRY DEVELOPMENT IN WEST AFRICA

TABLE 27

ESTIMATE OF FOREST LAND

Country	Land Area, 000ha	Forest Land		Closed Forest		Man-made Forest		Closed forest as % age of Total Land area
		Year of Estimate	Total forest Land, 000ha	Year of Estimate	Total Closed forest, 000ha	Year of Estimate	Total man-made forest, 000ha	
Dahomey	11,060	1971	2,144	1971	250	1972	18.4	2.3
Gambia	907	1971	303	1971	25	1971	0.8	2.7
Ghana	23,787	1963	12,250	1963	2,000	1969	11	8.4
Guinea	24,586	1960	1,046	1960	1,100	1971	2	4.5
Guinea-Bissau	2,800	1971	1,000	1971	760	1970	0.3	27.1
Ivory Coast	32,246	1964	12,000	1971	9,000	1972	28	27.8
Liberia	9,632	1964	5,585	1971	2,500	1971	0.5	25.9
Mali	120,402	1960	4,520	1971	—	—	—	—
Mauritania	108,470	1964	9,785	1971	—	—	—	—
Niger	118,000	1964	14,000	1971	—	—	—	—
Nigeria	92,369	1973	9,342	1973	1,886	1973	62	2.0
Senegal	19,472	1963	5,318	1971	430	1970	14	2.2
Sierra-Leone	7,200	1962	2,300	1971	290	1970	6.5	4.0
Togo	5,360	1964	500	1971	380	1971	3	7.1
Upper-Volta	27,420	1965	2,000	1971	—	—	—	—

Sources: FAO, *World Forest Inventory*, Rome 1963;
Yearbook of Forest Products Statistics, 1965—73; Persson, 1974.

the principle of alienation as a pre-requisite of forest reservation had to be abandoned. The only feasible alternative in these two countries was to reserve forest lands while the ownership remains that of local communities. The intricate involvement of local councils in forestry matters is, throughout the tropics, peculiar to Nigeria and Ghana (Adeyoku, 1975b).

A great deal of the forest resources of the community has been depleted through defective long-term timber contracts or concessions. All the coastal countries with high forests have experienced a multitude of highly exploitative timber agreements which had little or no consideration for the economic and social development of localities (FAO, 1971 & Somberg, 1975): the concessionaries were rarely forest products manufacturers, with skills, experience, management and investment capacity for developing new industries. Their sole concern was to "cream" the forest for select timbers for processing in home-based (European) mills. Thus the economic benefits of tropical forest exploitations have largely

accrued to overseas countries leaving the host countries materially poorer, faced with consequent environmental problems, and yet remaining glorified producers of (qualitatively) diminished forest resources (Adeyoku, 1975c).

Forest administrations in most countries of ECOWAS are particularly weak and ill-equipped for the multiplicity of functions involved in managing natural forests, promoting the forests, establishing man-made forests, promoting economic and social utilization of forest resources, participating fully in national economic development policy formulation, and implementing policy objectives. It is only in Nigeria, Ghana, and to some extent Sierra Leone, that strong and experienced corps of foresters exist.

Although the various parts of ECOWAS differ greatly in the extent to which they are endowed with forest resources, a great deal of the unproductiveness and/or beneficial use of forest lands can be remedied through the improvement of professional skills available to forest services. It is now feasible

through advances in forestry science to augment considerably the provision of forest resources and thereby alleviate hardships due to shortages. In taking advantage of the new forest resource-generating technologies, a strong and well-informed forest service is essential.

Forest Industries and Trade

The ECOWAS forest industries have two main centres and three other potentially important areas of

activities. The first main centre lies in Western Liberia, Ivory Coast, and Western Ghana. The other important centre lies in the Western and Mid-western States of Nigeria. These two areas account for more than 80 per cent of the wood processing plants as well as 95 per cent of the overseas log, sawnwood and plywood trade. Available data on some aspects of forest industrial census for four countries containing major on-going activities are presented in Tables 28 to 30.

In spite of the unsatisfactory nature of the data on

TABLE 28
SAWMILL CAPACITY (JULY 1974)

	Ghana	Ivory Coast	Liberia	Nigeria
Number of mills	61	53	12	313
Production capacity in 000m ³	800	500	120	600
Production 000m ³ (data of last complete year available)	348	360	121	500
New mills planned	13	5	4	78
Total capacity in 000m ³ (including new mills)	N.A.	575	N.A.	940

Sources: Data for Tables 28 to 32 have been compiled from various FAO special country studies and information obtained from author's recent study tour of Liberia, Ghana and Nigeria.

TABLE 29
PLYWOOD CAPACITY AND NEW CAPACITY PLANNED

	Ghana	Ivory Coast	Liberia	Nigeria
Number of mills	5	3	—	4
Production capacity 000m ³	50	43	—	60
Production 000m ³ (last complete year available)	47	35	—	50
New mills planned	2	2	2	1
Total capacity 000m ³ (including new mills)	67	65	60	75

TABLE 30
BLOCKBOARD, FIBRE BOARD AND PARTICLE BOARD

	Ghana	Ivory Coast	Liberia	Nigeria
Number of blockboard mills	1	—	Nil	1
Number of fibre/particle board mills		1	"	—
Production capacity 000m ³	5	8	"	8
Production 000m ³	4	7	"	7
New mills: blockboard	2	—		3
fibre board and particle board	1			

forest industries, it is clear that in many respects, larger processing capacities and slightly more advanced industrial plants exist in Nigeria than elsewhere although Nigeria has the smaller high forest potential of the four countries. To some extent, the Ivory Coast forest industries are more varied than those of Ghana, although the former are predominantly export-oriented. The Liberian situation is a paradox; it is not only one of under-utilization but also probably one of inertia in the midst of plenty.

Other potentially important areas of forest industries are (a) Western Senegal, Coastal Guinea-Bissau, and South-West Guinea; (b) the Mano River Basin (between Liberia and Sierra Leone); and (c) the South-Eastern State of Nigeria. Apart from the Sierra Leone part of the Mano River Basin which is already depleted of its best timber species, the resources in these three areas are relatively untapped and unmanaged. A recent ECA/FAO Consultancy (1974) for the Mano River Union has proposed that an expansion of the Sierra Leone Forest Industries Corporation plants at Kanema as well as those of the Liberian six small mills within the basin be undertaken to process the available preponderance of lesser-used species. No concrete proposals have yet been made for the intensive utilization of the natural forest resources of Guinea and Guinea-Bissau. However, since 1972, considerable interest has been shown in the over-mature forests of south-eastern Nigeria. A gigantic international wood-complex is due to go into production in Calabar in late 1975 while numerous sawmills are being established.

The volume of international trade in wood products is a reflection of the capital investments in the sector. However, in the case of Nigeria, the generally small volume of wood exports is partly due to the large and rapidly expanding domestic market and partly to the unrecorded but substantial wood exports to neighbouring Dahomey, Togo, Niger and Tchad. Thus although Nigeria has a high concentration of wood processing units, her wood exports have dwindled to mere fractions of those of either Ghana or of Ivory Coast which is undisputably the premier timber exporter of ECOWAS.

Understandably because of historical association with France and membership of the Youndé Convention, Ivory Coast exports are mainly to the European Economic Community (EEC). Poland is the only eastern European country showing interest in her wood exports, but this may also be due to the French technical and economic agreement with Poland since 1969. Secondly, until 1972 she was not a notable plywood exporter; this is because she did not have the capability since Gabon was manufactur-

ing plywood and the Ivorian role was restricted to that of veneer producer.

A notable feature of the trade in timber products pertains to the selective interests of Japan in sawlogs, and of U.S.A. and Western German interests in veneers. The United Kingdom demand is more or less uniformly multi-purpose although the quantity of veneer purchase is much less than that of Western Germany or the U.S.A. On the whole, Ghana earns the largest volume of foreign currency for her wood exports. However, three important facts of the international timber trade that cannot be adequately summarized here are those of quality variations, prices and marketing organizations.

Nevertheless, it is apparent that the potential export market for ECOWAS forest products is still substantially untapped. There is no reason why Liberia, Guinea and Guinea-Bissau should not, at least, come on the list of African wood exporters. At present Nigeria is the only country that exports wood products to members of ECOWAS. But because the prices in these countries are uncompetitive (Adeyoku, 1975c), there is no incentive for the wood surplus countries to sell to either Gambia, Senegal, Mali or Mauritania. But if the current Nigerian economic buoyancy is maintained, it is probable that her wood exporters will rapidly diminish out and she may, in fact, start importing special wood products not only from ECOWAS member countries but also from Cameroon, Congo, Gabon and Zaïre. The free-trade possibilities initiated under the Lagos Treaty are therefore of special importance to the forestry sector.

International Co-operation for Forestry Development

The Treaty of Lagos declared the need for co-operation in the development of transport, industry, agriculture, natural resources, and financial and cultural matters. The furtherance of cultural renaissance is the unusual feature of the "economic" treaty, otherwise its spirit and intent are identical with those of the Treaty of Rome which gave birth to the EEC and the Lomé Convention of February 1975 which embodies economic relationships among 46 developing countries of Africa, the Caribbean, and the Pacific (ACP of which ECOWAS members are also members). ACP has now launched an Export Revenue Stabilization Plan of about US \$450 million for the development of twelve principal products including those of the forestry sector.

In spite of the apparent attractions of ECOWAS there are imponderable difficulties to the harmonization of development policies which cannot be overlooked. For instance, because of language barriers, there are more or less "polar distances" between foresters of the English-speaking countries on

the one hand, and those of the French-speaking territories on the other. Thus most Ghananian, Nigerian, and Sierra Leonean foresters know a great deal more about temperate forests in general than of the neighbouring Dahomey, Togo, Ivory Coast, or Guinea forests. These observations are also valid of the state of knowledge of French-speaking foresters in the various member countries of ECOWAS. And more pathetically, within the English-speaking which have more advanced forest services and whose leaders have similar or identical training programmes, there is no exchange of information whatsoever. Therefore, over the years, there have existed exceedingly isolated corps of foresters and an almost palpable fog enveloping national forestry practices throughout the sub-continent.

In these days of increasing multilateral agencies and development functions, the world economic scene is quite familiar with the use of political power in proportion to the quality and quantity of committed economic resources. Consequently, the location of projects, capital financing, labour movement, and manpower contribution must necessarily remain a subject of political decision for ECOWAS' supreme body as is the case with similar organizations. Once a decision is made, its technical implementation will give rise to a set of problems.

What then are the forestry projects capable of stimulating international cooperation? The answer to this question is complicated by the vast potentialities of numerous projects and a priority ranking of

possible projects runs the risk of unnecessary political interpretations.

The feasibility of international cooperation for forestry development is attested by the increasing involvement of multilateral agencies in financing and executing various schemes (Table 31). Moreover, it should be remembered that forestry problems are not delineated by international boundaries especially in ECOWAS which lacks natural barriers or frontiers.

The existence of certain wood-based industries is critical to economic development, and it is common for countries to aspire to establish such industries. Where indigenous raw materials are not available, substitute species are established in plantations. Generally, these industries also require considerably large investments while a viable domestic market for end-products is imperative. The pulp industry which is basically wood-based as well as capital-intensive falls into this category. As may be observed in Table 32 by February 1975, ten pulp/paper mills were planned in ECOWAS: 4 in Nigeria, 2 in Ivory Coast, and one each in Ghana, Guinea, Liberia and Sierra Leone. Only Nigeria has an existing mill at Jebba which is still dependent upon imported pulp; most of the other nine mills are expected to start production in 1985-90 by which time establishment costs would have more than tripled.

An intractable difficulty is that these countries cannot afford, from their own financial resources, the capital which is required to establish viable pulp mills. Foreign exchange is often in short supply; the

TABLE 31
ON-GOING AND PROPOSED FORESTRY PROJECTS SUPPORTED BY UNDP/FAO JANUARY 1975

Country	Industry	Resource Survey	Plantation Establishment	Marketing	Wildlife	Arid zone Forestry	Education & Training	Resource
Dahomey		×			×			
Gambia								
Ghana	×				×			
Guinea		×					×	
Guinea-Bissau			×					
Ivory Coast	×						×	
Liberia	×	×					×	
Mali								
Mauritania						×	×	
Niger								
Nigeria	×	×	×	×	×	×	×	×
Senegal	×	×	×			×		
Sierra Leone								
Togo	×							
Upper Volta	×		×		×	×		

Source: *FAO FORESTRY DEPARTMENT LIST OF FIELD PROJECTS* as at 1 January 1975, Rome

FORESTRY DEVELOPMENT IN WEST AFRICA

TABLE 32
PRELIMINARY LIST OF PULP/PAPER PROJECTS IN WEST AFRICA (FEBRUARY 1975)

Code ¹ Country and location	Type of Mill ²	Capacity (Tonnes per year)	Product	Market	Raw Material ³	Capital Investment ⁴ (Mill.US\$)	Expected Start-up Period Remarks
1. Nigeria							
1.1 Jebba (existing)	Pulp/Paper	30,000 (expan- sion)	Industrial	Domestic	Plantation wood	40	1980-85
1.2 Calabar	Pulp/Paper	60,000	Industrial	Domestic	Plantation wood	70	1980-85
1.3 Iwopin	Pulp/Paper	60,000	Writing Printing	Domestic	Plantation wood	80	1980-85
1.4 Abeokuta	Paperboard	30,000	Multi-ply Paper- board	Domestic	Waste Paper	20	1980-85
<i>Sub-total - Nigeria</i>		<hr/> 180,000 <hr/>				<hr/> 210 <hr/>	
2. Ghana							
Daboasi	Pulp/Paper	50,000	Industrial Writing Printing	Domestic	Mixed tropical hardwoods	60	1980-85 Switching to plan- tation wood later
3. Ivory Coast							
3.1 San Pedro	Pulp/Paper	50,000	Industrial Writing Printing	Domestic	Mixed tropical hardwoods	60	1980-85 Switching to Plan- tation wood later
3.2 San Pedro	Pulp	250,000	Bleached Pulp	Export	Plantation wood	150	1985-90
<i>Sub-total - Ivory Coast</i>		<hr/> 300,000 <hr/>				<hr/> 210 <hr/>	
4. Guinea							
Kolente	Pulp/Paper	50,000	Industrial Writing Printing	Domestic	Plantation wood	60	1985-90
5. Liberia							
Bomi Hills	Pulp	250,000	Bleached Pulp	Export	Plantation wood	150	1985-90
6. Sierra Leone							
Bumbe	Pulp/Paper	50,000	Industrial Writing Printing	Domestic (Mano River Union)	Plantation wood	60	1985-90

¹ Not in order of priority.

² All mills are assumed as sulphate pulpmills, unless indicated otherwise.

³ All hardwood (short-fibre), unless indicated otherwise. Plantation wood could be either softwood (pine) or hardwood (*Gmelina* or *Eucalyptus*), although it would initially probably be hardwood.

⁴ Based on 1973 prices. The capital investment figure includes that of logging equipment but does not include the cost of plantations. 1975 prices would be at least 20 per cent to 30 per cent higher.

local markets are often too small to absorb the output of the large plant recommended to them by experts whose thought processes have been conditioned by the norms of the developed economies, and these countries are therefore forced to consider export markets for planned pulp mill capacities although the industry is notorious for its fluctuating fortunes. The solution to the inherent factors and risks is either that each country should establish a small factory or a group of countries should pool their resources in establishing viable large factories. The possibility of the first alternative is remote; small production plants or economic proto-types are yet unknown to the industry, and as has been pointed out, the technical designers do not favour such projects. The second alternative is far more favourable partly because of the obvious economies of scale to be derived, and partly because Ghana, Ivory Coast, Liberia, Sierra Leone and Guinea constitute a contiguous territory and locational decisions should not present unsurmountable problems. Thus instead of the six small and comparatively expensive mills now being planned in these five countries, three economic complexes can be established with a view to supplying not only the needs of the host countries but also those of Guinea-Bissau, Mali, Mauritania, Senegal and Upper Volta, which are the immediate neighbours.

Ghana and Ivory Coast have recently shown keen interest in charcoal making. Charcoal making is a small but thriving enterprise in various Nigerian localities (Adeyolu, 1975c). This industry offers a solution where demand is highly concentrated and where fuelwood can no longer be made available as in urban areas in the high forest and savanna zones. Its special advantage is that it can be economically transported over longer distances than firewood. This solution does not radically change the picture from a forestry point of view, but it does call for the application of managerial skills in producing and marketing the charcoal. If the Ghanaian project is successful it should be possible for the local producers to upgrade their technology and also provide a competitive fuel substitute to millions of people in the Sahel zone who depend on cow dung for cooking for most of the year.

The need for cooperation in the marketing of forest products is compelling. Many primary products such as cocoa, coffee, sugar and tea have international agreements offering tremendous advantages to producers. Ghana is the only country that has a national organization for the marketing of wood products. Even the Ghana Marketing Board has been faced with teething problems mainly because of prejudice from importers and also because it has no comparable counterparts in African timber exporting countries. The establishment of an

efficient ECOWAS timber promotion organization will not only enhance the competitiveness of West African wood products in world markets but also foster the establishment of advanced processing, storage facilities, and grading rules, and lead to higher consumption of forest products. In June 1975 some countries set up the African Timber Organization (ATO) to promote timber, seek price stabilisation and establish a common position for producers. Although the organization is to be based in Libreville, Gabon, which is not a member of ECOWAS, nevertheless, when fully in operation, the potentialities of the organization should be of interest to ECOWAS.

In the field of plantation establishment the results obtained at the Savanna Forestry Research Station, Samaru, Nigeria have proved to be of fundamental consequence to tree planting practices in African Savanna (FAO, 1974). Similarly the concepts of agri-silviculture now in vogue in parts of Nigeria offer exciting symbiotic possibilities for the development of both forestry and agriculture to meet the increasing demands for food and for homogeneous supplies of wood (Enabor & Adeyolu, 1975). Rather than duplicate efforts, some of the existing research results can be rapidly adapted for management and plantation establishment purposes in relevant ecological zones.

Six members of ECOWAS have desert or semi-desert climate. All activities designed to ameliorate the effects of this climatic regime are essentially forestry-based. It is therefore most desirable that these countries should collaborate and exert concerted efforts to rehabilitate the miserable human and animal resources of the Sahel region.

Wildlife development and fire protection are also two major subjects of international cooperation principally because like most other forestry problems, forest fire and wildlife resources are no respecters of international boundaries. Some of the West African wildlife species are now extinct or are seriously threatened by local as well as international poachers. It is because of these problems that the Department of Forest Resources Management, University of Ibadan, Nigeria, is organizing an International Symposium on Wildlife Management in West and Central African Savanna in September 1975. An important objective of the Symposium is to collate existing information and identify areas of international cooperation. All UNDP/FAO wildlife projects in Africa, the International Union for the Conservation of Nature (IUCN) and the World Wildlife Fund are expected to be represented at the Symposium. The Mambilla Plateau between Nigeria and Cameroon, and the Futa-Jallon Hills in Guinea and Mali offer unique attractions for the development of mid-altitude forestry, wildlife, and livestock re-

sources, leading to a more balanced pattern of land-use and rural economy.

The foregoing summary points to the fact that foresters in ECOWAS or elsewhere must endeavour to learn about pertinent problems of their countries, exchange information with one another, and encourage the emergence of joint solutions to common problems. One way of doing this is through the establishment of training facilities, regular seminars, and workshops for different groups of forest managers, research workers, and technicians. Another approach lies in the formation of virile professional associations. The ECOWAS foresters have a genuine case for urgently instituting a West African Forestry Association for the advancement of their profession, and as an expression of their grave concern to find feasible solutions to forestry problems and thereby pass on a well-managed West African environment to posterity.

Conclusion

On the eve of the Treaty of Lagos in May 1975, the then Nigerian Federal Commissioner for Economic Development forecast that it would take at least five years to develop a West African Economic Community. The obstacles to its achievement remain formidable.

One obstacle has been removed; the division in West Africa between States associated with the EEC and the rest has disappeared. It is also to be hoped that the ACP states, particularly those of West Africa, will have learnt how to take a joint stand in trade relations with the world.

Since it has not yet been ratified by the required minimum of seven countries to set it into being, (as at the time of writing, early July 1975), ECOWAS is, to all intent and purpose, still a proposal and it is therefore probably presumptuous to postulate in detail the forestry contribution.

The problems of forestry development within the community may be divided into three main categories. The first pertains to the harmonization of technicalities such as removal of obstacles to trade, uniform classification of wood so as to improve commercial practice, introduction of programmes and freedom to supply services in forestry, provision of state aid to forestry (co-ordination of occupational training) co-ordination of planned research programmes to avoid overlapping in order to make the work of research institutes more effective; dissemination of information and compilation of reliable essential statistics. The second set of problems concerns timber production policy. In view of the notably uneven supply and demand patterns, steps should be taken not only to stabilize total output, but also to improve the distribution of

timber products to individual member states. In the long term, one envisages that national forest policies should be co-ordinated in a comprehensive community or indicative plan of forest resource production and management. The third set of problems relates to decisions on the regional development of protection forestry, structural investments in agriculture, forestry, and other projects characterized by extensive land use; policy on timber concessions and taxation and incentives for stabilizing forest land tenures in a rapidly changing ECOWAS society.

Basic to all proposals and problems of ECOWAS is the provision of finance which would have to be on a sustained large scale. Since forestry is commonly afflicted by scarcity of development resources, it is imperative that the sector should articulate clearly and forcefully its requirements at the earliest opportunity.

Finally, the birth of ECOWAS represents an advance over previous statements of specialized or sectoral objectives existing between various member groups. With the benefit of hindsight, ECOWAS conceptual framework resembles the conventional development approach which has been the mainstay of economic growth in developed countries since the end of the Second World War. However, in the circumstances of underdevelopment, there is need for a re-ordering of priorities. Rather than relying wholly on the modern sector – with its implicit predilection for economic growth – there is need for pursuing alternative planning strategies and alternative policy instruments in order to face the growing challenge of accentuated poverty. For instance, there is a need for different patterns of production and investment allocation as well as for technologies which are simultaneously modern, efficient and labour-intensive. Forestry possesses special potentials which are crucial to the attainment of these aspects of economic development. It also promises major ecological and environmental contribution – a subject of grave concern to most members of ECOWAS.

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Paper 7

FOOD FROM WOOD

By MORRIS WAYMAN

Professor of Chemical Engineering and Applied Chemistry and Professor of Forestry, University of Toronto, Canada

Introduction

We share an increasing concern over food shortages in various parts of the world, sufficiently serious that it is regarded by many as a continuing food crisis (Boerma, 1975). Much of the actual and perceived shortage has, at the present time, a political and economic basis, rather than a technical basis. There is little doubt that agricultural land could sustain all of the world's people, if somehow need could be translated into demand. Much of the concern over populations which have expanded rapidly is misplaced: the world's most populous country is not over-populated (Wortman, 1975). Objective calculations suggest that present agricultural activity, given reasonable political support, could satisfy the needs of twice the present world population (Shebeski, 1975).

Yet visible changes in food habits in countries emerging into affluence and continuing rapid expansion of population taken together constitute a threat which cannot be ignored. People who can afford it demand high protein diets, especially meat. It takes about 6 kg of grain to produce 1 kg

of meat. An enormous proportion of the world's grain production has been diverted from human food to animal feeding. My country, Canada, is perhaps the greatest sinner in this direction, but we are in the august company of both the U.S.A. and the U.S.S.R., and of most of Western Europe (World Food Outlook, 1974). As the economy of Japan catches up with the West, its people can be expected to develop the same expensive food tastes, although hopefully not to the same extent. This massive diversion of food to feed forces us to give consideration also to alternative sources of animal fodder, in order to free grain supplies for food.

The rapidly increasing population is also a threat to food supply. We are now about 4 billion souls on earth—are there more in heaven?—and earlier we quoted an estimate which suggested that we could readily sustain twice that many. The plotters tell us that the world's population will double by the end of the century, which is not too far off. It is clear that new sources of food supply will be required before many years have passed. It is probable that in the long term, food and fodder will come to us

from the sun and the air, via photosynthesis, and from the soil via nitrogen fixation. We know now how to fix the nitrogen of the air, but our present processes are highly energy-intensive. Natural processes utilising nitrogen-fixing genes are much less energy intensive. We use these processes now when we plant legumes and rotate crops. Recent developments in plant genetics suggest (Shanmugam and Valentine, 1975) that we shall learn new low energy ways to turn the nitrogen of the air into useful protein.

The science of photosynthesis has also advanced (Govindjee, 1975) and there is little doubt that we shall eventually be able to operate industrial photosynthetic processes. Like our present nitrogen reduction processes, CO₂-reduction processes are presently highly energy-intensive. But in our forests we possess huge photosynthetic capacity. The world has 2.25×10^9 hectares of productive forest of which about 600 million are in Africa and in South and Central America, regions of high photosynthetic activity. The present annual wood harvest is about 1,000 million tons, dry basis. By way of comparison, world production of all grains, is the same, about 1,000 million tons. Sugar production in contrast is under 100 million tons. These figures suggest that if forest operations were planned and directed to carbohydrate production for food purposes, including plantations established in the most suitable areas, but even beginning with better utilisation of existing forests, the potential contribution to food production could be considerable and significant. For example, it has been calculated (Wayman and Obiaga, 1975) that of the 50 million tons of wood now cut annually in Canada, 12 million tons are recoverable waste (Figure 1). This could be used to make 3 million tons annually of single cell protein (biomass) suitable for food or feed. Similar calculations taken to a world scale raise these figures by an order of magnitude.

Wood utilisation for food depends on the availability or development of suitable technologies. With the prospect of increasing pressures on food supply, then, it is appropriate to consider here what has been done, and what can be done, in this direction.

Present Status

The chart of Figure 2 represents those processes for food or feed from wood which are now practical, or are in a development stage which promises commercial practice. The various elements in the chart will be discussed here.

Browse

Wood as such is not eaten by people or by animals, being indigestible, except that young green trees,

including branches, leaves and bark form an important part of the diet of many game animals from deer to rabbits, especially as a maintenance diet during the winter months. While the measured digestibility of this material is low, its use by wild animals suggests a possible marginal application of this form of wastes of forest harvesting operations as animal feed. The amounts of young twigs, bark and leaves which are wasted incidental to industrial forest operations is large.

Leaf Meal

Stone (1975) has reviewed the large scale development of utilisation of forest leaves in the U.S.S.R. Stone reports that the U.S.S.R. production of leaf meal "muka" is 100,000 tons/year, from both conifer needles and broad leaves. The leaves contain 8 to 16% protein, as well as chlorophyll and vitamins. In many respects it is similar to alfalfa. It is used at a 5% addition level in feed for poultry, beef cattle, dairy cattle and hogs. In addition, a chlorophyll-carotene paste is produced by solvent extraction of fresh leaves which is fed at a vitamin level to poultry and cattle with beneficial effects.

Stone suggests that there are 6 million tons of foliage associated with the annual forest harvest in Canada, all remaining in the forest. Some Canadian research and development work on its utilisation has begun. This includes work on protein extraction aimed at direct food use.

The Bender Process

The simplest treatment which produces digestible matter from wood is the process developed by F. Bender (1972). This is a high temperature short time steaming. It is effective on hardwoods such as poplar or birch, and has little or no effect on the conifers. The hardwood may be in the form of chips or sawdust, and in its most recent development, the process can accept beneficially wood including bark and leaves. In poplar these contribute digestible matter. In a typical Bender process poplar chips are steamed at 190°C for 5 minutes followed by fiberisation in an Asplund Defibrator. The product has a digestibility by ruminant animals of 55%, about the same as hay. However, unlike hay, this feed lacks protein and is solely an energy source. The lack can be compensated by other components of the diet, such as urea.

The potential of Bender's process is enormous. Hardwoods are much underutilised in North America. The Canadian allowable annual cut of aspen (poplar) is in excess of 10 million tons, with an actual cut of about 500,000 tons (Maini and Cayford, 1968). The difference, representing underutilised aspen alone, is an amount equal to one-third

of the total annual hay cut in Canada of about 25 million tons. Hay (forage) has been used in Canada largely as winter maintenance. Like all agricultural crops, the amount produced is subject to weather and many other factors, and is therefore quite variable. It is obvious that widespread adoption of the Bender process, possibly with urea fortification, could compensate for these natural variations, and take up any slack. There is also in Canada a visible increase in use of forage in the cattle growing

cycle, resulting from the higher costs of feed grains. Bender's animal energy source could contribute in this development.

A Canadian company has been formed which expects to be in commercial production of Bender's feed this year, 1975 (Bender, 1975). While there have been reports of similar research developments in the U.S.A., no reports of commercialisation have yet reached us.

Somewhat parallel processes have been developed

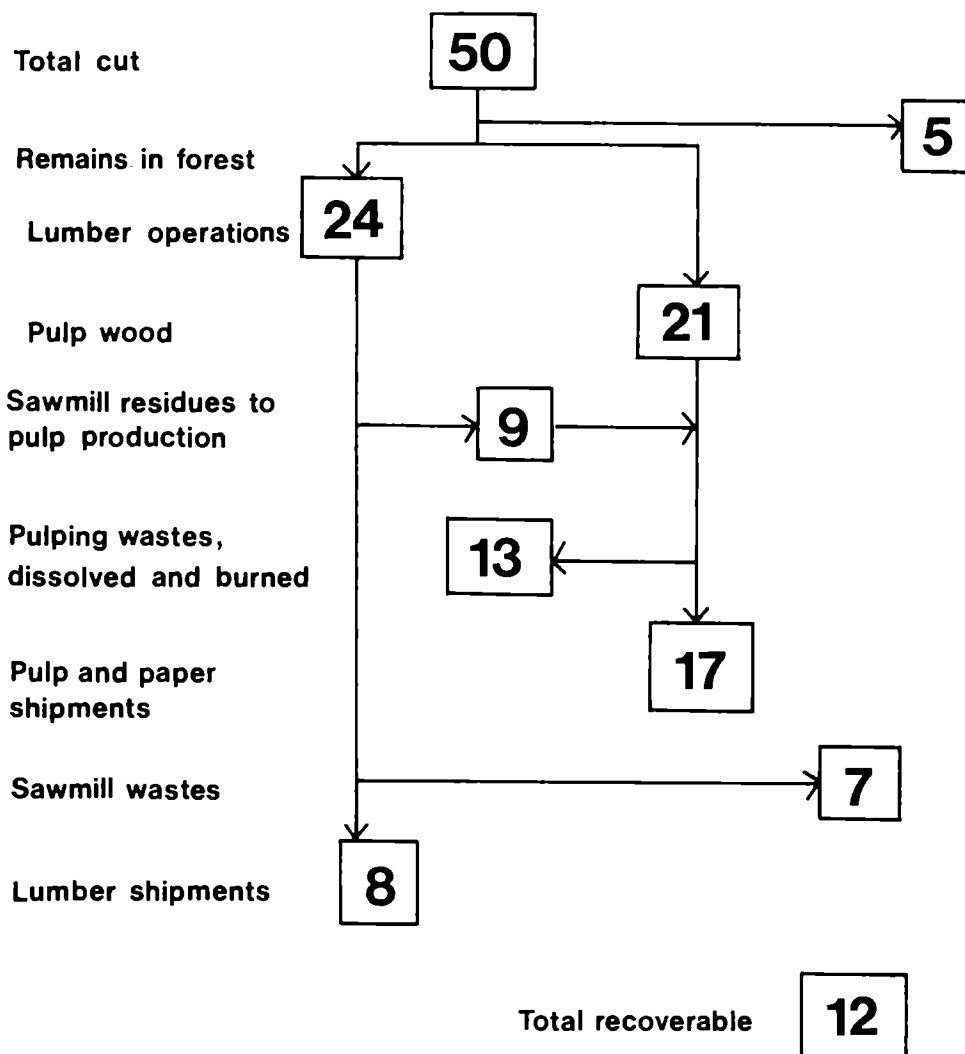


Fig. 1. Canadian Forests Industries Material Balance, in million tons per annum

Factors: 100 cubic feet roundwood = 1.25 tons
 1000 feet board measure = 1.04 tons
 1 ton pulp and paper = 0.92 tons fibre

on the West coast of North America for treating sawdust or wood chips with alkali or ammonia to improve digestibility. In one of these processes chipped alder log wastes and pulp mill tailings are cooked with alkali to lower the lignin content to 4 to 5 percent. The product is coated with molasses for improved palatability. Like Bender's product, it is primarily an energy source, not a protein source. A great deal of research work on wood as an energy source for cattle is proceeding at Washington State University, Pullman, under the direction of Professor I. A. Dyer (Clark and Dyer, 1974). A variety of different approaches to the problem has been described by Baker *et al* (1975).

Hydrolysis

Wood hydrolysis as a source of carbohydrates for food and for feed has been studied and practiced for many years. Bergius' 1937 paper (Bergius, 1937) described German work begun during World War I on conversion of wood to carbohydrates using concentrated hydrochloric acid as the chemical

agent. The Forest Products Laboratory at Madison, Wisconsin, report on wood hydrolysis for sugar production, published in 1955 (Lloyd and Harris, 1955) reviewed the earlier history in America. This included 2 commercial plants developed by M. F. Ewen and G. H. Tomlinson also operated during World War I, using dilute sulphuric acid. The Scholler process also uses dilute sulphuric acid, at high temperature and pressure, with removal of the sugar solution from the reaction zone soon after forming.

Industrial practice of wood hydrolysis became most highly developed in the U.S.S.R., during the period around World War II. The process used was a modification of the Scholler process, and has been described by B. I. Tokarev (Tokarev, 1966). The objective of all of these earlier industrial plants was the manufacture of industrial alcohol. However, more recently wood hydrolysis products have been used for food and feed products. This use was anticipated also in an early Madison report (Wood Molasses for Stock and Poultry Feed).

As Figure 2 shows, hydrolysis may be carried out

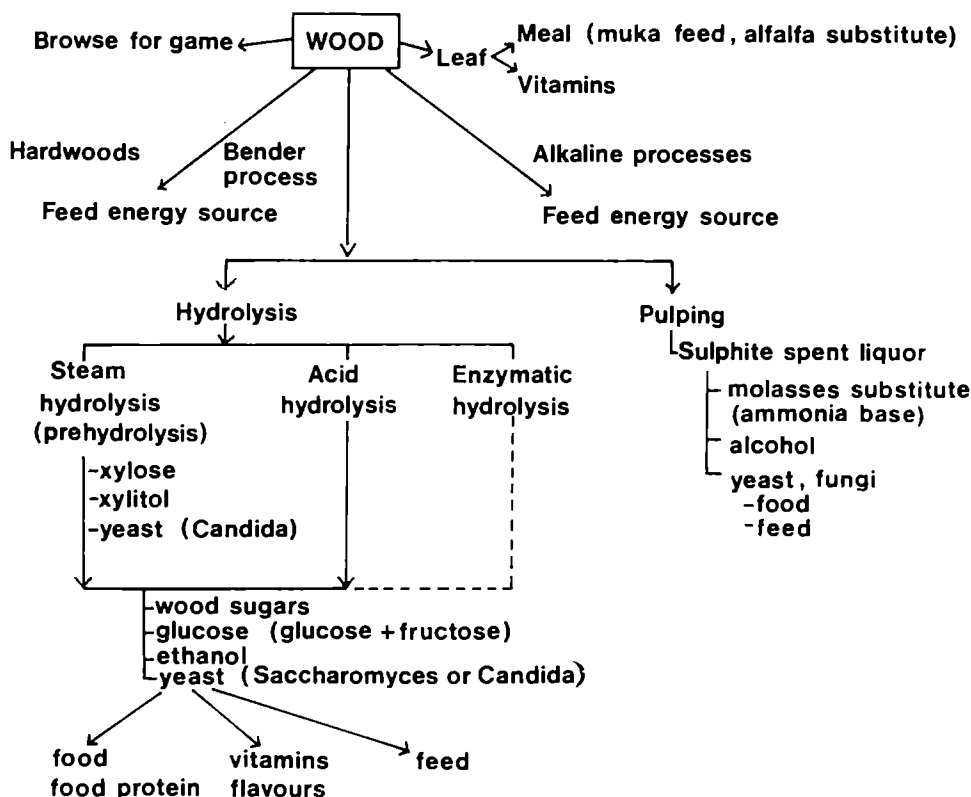


Fig. 2. Food and feed products from wood

by various agents and with various levels of intensity. Steam hydrolysis of hardwoods such as gum or aspen, when carried on at elevated temperatures such as 185°C for 15 minutes, is effective in almost complete removal of "pentosans" (xylose, arabinose). This is a large scale commercial process practised in 3 pulp mills in the U.S.A. and several in Europe. The treatment in these mills is a "prehydrolysis" prior to a pulping operation whose aim is to produce pure cellulose for rayon. The xylose removed in the prehydrolysis is not recovered for use, although it has that potential. Xylose is fermentable by various microorganisms including *Candida utilis* to generate biomass.

Xylose is manufactured by dilute acid hydrolysis of wood at Kotka, Finland. It is then hydrogenated to make xylitol, a sweetener (Lurgi in the Pulp and Paper Industry, 1974).

In the processes which aim for complete wood hydrolysis by acids, glucose can also be recovered in crystalline form. It is useful to quote Bergius' 1937 paper:

"The total yield of the different sugars amounts to 60-66 per cent of the original dry wood. . . Extensive tests. . . have proved that the food value of this raw sugar is equivalent to that of barley. The fodder so obtained can be stored for a long time. . . During the past few years a process for producing crystallised glucose and xylose from the raw sugar has been developed. The more important of the two is the crystallised glucose, which is consumed in large quantities. The inverted raw sugar is neutralised, filtered and concentrated, and can then be easily crystallised. By recrystallisation a very white and very pure dextrose is obtained.

"The mother liquor, still containing some glucose, mannose and other sugars, can be fermented or used as fodder. In this way no sugar is lost. By a special process xylose also can be recovered in crystallised form.

"One of the by products of the process is acetic acid."

Bergius' ancient paper is well worth careful study today.

Wood sugars can be fermented to alcohol, with yields of about 20 to 24 percent based on dry wood substance, or they may be used as the basis for biomass production, especially *Candida* yeasts for fodder. The earlier plants in the U.S.S.R. were oriented towards alcohol production, primarily for their synthetic rubber program in World War II. While we have no hard information, it is our understanding that there are now about 30 plants operating in the U.S.S.R., producing annually about 100,000 tons of fodder yeast. This would give the U.S.S.R. a very large lead over any other countries in this wood-based development.

Yeast need not be used solely for fodder. The European single cell protein program is based largely on hydrocarbons—a development which had its origin before the 1973 steep rise in hydrocarbon prices—and the biomass product is aimed primarily at animal feed, especially young animals, veal, poultry and piglets. The North American development has taken quite a different turn. Yeasts are grown there for food purposes (Amoco). There is a technical problem with some food yeasts arising from their high content of nucleic acid. There has been progress in overcoming this problem (Lawford, *et al*, 1975). The scale of development in North America is still small, but acceptance of yeast for food appears to be developing, and larger scale industrial installations can be expected. In consequence, any consideration of single cell protein must also take into account its potential for bypassing the animal system and moving directly into food use. This is probably the most significant single development to be discussed in this paper.

In addition to feed, then, single cell protein biomass may enter directly into food as such, or as purified protein. By products from the protein purification process are vitamins, flavours and other valuable substances.

Another direction in which wood glucose may well find a use is in isomerization to glucose-fructose sweet syrups. This process is already widely practiced with saccharified corn starch (Aschengreen, 1975). The adoption of the process awaits a more highly developed wood hydrolysis industry, and a better grasp of the associated economics.

Finally mention should be made of enzymatic hydrolysis. So far this has had its principal development with lignocellulosic wastes such as bagasse (Ghose and Kostick, 1969). Its application to wood wastes in suitable circumstances can be foreseen.

Spent Pulping Liquors

In chemical pulping of wood, lignin and hemicellulose are dissolved. Spent pulping liquors from the sulphate (kraft) process are evaporated and burned to recover chemicals and energy, and their sugar content is not available. An exception is the prehydrolysis liquor obtained when making rayon pulp by the prehydrolysed kraft process. This liquor is rich in xylose. The amount of xylose available when pulping hardwoods such as gum by this process is considerable, amounting to about 150,000 tons annually in the U.S.A. It has not yet been used commercially.

Many European mills, especially in Scandinavia, have fermented spent sulphite liquor, which contains the sugars dissolved from the wood in the sulphite process, to make alcohol. Alcohol fermenta-

tion of spent sulphite liquor is also practised in Canada. Recently, there has been increasing interest in fermentation of these liquors to produce yeast. One of the first mills in Europe to establish a yeast plant was the pulp and paper mill at Waldhof, near Mannheim, in Germany. Alcohol is made by the yeast *Saccharomyces cerevisiae*, utilizing the six-carbon sugars glucose, mannose and galactose in the medium. This yeast does not consume the five-carbon sugars, xylose and arabinose, which are also present. However, these sugars are used as substrate by yeasts of the *Candida* genus, such as *Candida utilis*. The pulp mill at Attisholz in Switzerland ferments its sulphite liquor to alcohol with *Saccharomyces*, and then grows *Candida* on the alcohol plant effluent as a source of fodder yeast. The fungus *Pekilomyces* is grown on spent sulphite liquor in Finland for fodder protein.

By far the largest development of sulphite yeast has taken place in the U.S.S.R. where, we are informed, production of fodder yeast amounts to about 150,000 tons annually.

There are two sulphite yeast plants in the U.S.A., and two are under design for Canadian sulphite pulp mills. The yeast to be produced by these North American mills will be primarily for the food market, in contrast to the fodder orientation in Europe.

Finally it should be mentioned that the solids obtained by evaporating spent sulphite liquor are also used to a minor extent in feed formulation. Sulphite solids are an excellent binder used in pelleting feeds, especially for poultry. When ammonia is used in the sulphite pulping process, the evaporated spent liquor is used as a molasses substitute in animal feed formulation.

Economic Impact and Potential

In the U.S.S.R. commercial development of feed stuff based on wood has reached a higher level than anywhere else. While we have no accurate figures, the following represents our present information:

leaf meal	— 100,000 tons
hydrolysis fodder yeast	— 100,000 tons
sulphite fodder yeast	— 150,000 tons
	<hr/>
	350,000 tons

This large tonnage must be assessed against the total high protein feed concentrate used in the U.S.S.R., which is probably of the order of 10 million tons. Thus the wood based fodder is about 3 percent of the total protein concentrate supply.

Nowhere else in the world does production of fodder yeast have a significant economic impact.

The potential is of course quite different. As

indicated above, widespread application of Bender's process could make underutilized hardwoods very important contributors of feed energy, especially for winter maintenance of farm animals. With proper formulation, Bender's product would contribute significantly to animal growth as well. The earlier calculation suggested that in Canada this could amount to about one-third of the annual forage requirement, and this may be typical of at least some other countries as well.

Equally important economic results could flow from widespread adoption of wood sugar manufacture and its conversion to sweet syrups and to single cell protein. It was pointed out earlier that the present world wood harvest is about 1000 million tons. If the present wasteful practices in wood harvesting which we see in Canada are characteristic of all countries—and I suspect that Canada is no worse than the others—there are now available 240 million tons of recoverable forest waste. This wood can be hydrolysed and processed to single cell protein, and the amount so obtained would be about 60 million tons. This would be more than ample to supply the full amount of the recommended dietary requirement of protein for all of the world's children.

There is some precedent for this. In Taiwan there is a Waldhof type fermenter which produces yeast from the "wastes" at one of the Taiwan Sugar Corporation's sugar mills. Much of this is coated and given in pill form to school children as a daily dietary supplement.

The capital cost of installing these plants to prepare the wood sugars and convert them to single cell protein would be about \$10 billion. This needs to be compared with present world expenditures on armaments, which are running *annually* to about 25 times that figure.

There is a need for several technological developments before wood sugars can be fully used for food. They may be listed as improved:

- forest husbandry and forest harvesting practices
- processes for wood hydrolysis
- crystallization of wood sugars, and inversion to sweet syrups
- production processes for yeast based on wood sugars
- formulation of attractive foods using yeast
- purification of yeast proteins for food use.

None of these developments seem to me to represent formidable tasks. I see the will to get at them as developing, and I expect to see wood, processed via these steps, make an important contribution to human food supply in the future.

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Paper 8

QUANTITIES, EVALUATION AND THE FORESTRY SECTOR CONTRIBUTION TO DEVELOPMENT

By P. A. WARDLE

Economics and Statistics Branch of the Forestry Department, Food and Agriculture Organisation of the United Nations, Rome

Introduction

In general the activities of the Forestry Department of FAO aim to contribute to improvement of the well-being of developing countries through the improvement of their forestry and forest industries sectors. With this broad objective in view the work of the Department is focused on four main subject areas of importance to developing countries, namely: tropical forestry, the synthesis of forestry activity with food production and general rural development, supply and production of pulp and paper and the trade in forest products. The FAO contribution is made in two ways. First it acts through its regular programme on a global and regional basis through research, education, publication and advisory effort in the fields of statistics, economic analysis, policy, forest operations and forest industries. Secondly, it assists through development projects in individual countries to improve technical capacity planning and infrastructure. This national input is frequently orientated to the identification of investment projects which may in turn be suitable for financing by international institutions such as the World Bank.

In this note I should like to concentrate on the work of FAO in the fields of statistics and economic analysis in its global and regional studies and in the national projects.

Forestry and Forest Products Statistics

Among the objectives in international collection and publication of statistics on forest resources, and production and trade in forest products is to make available comprehensive data for the study of supply potential and trends in supply and consumption for national and regional planning and for market planning. Apart from the international coverage these statistics provide information on national and regional self sufficiency, and the composition of consumption by types of commodity and trends in both magnitude and composition.

FAO has a long tradition in assembling statistics on resources, production and trade. Its first investigation of the world's forest resources was published in 1948, as were its first statistics on pro-

duction and trade for the years 1945–1946. Reviews of resources for the European, Asia Pacific and Latin American regions will be published over the next two years in connection with trend studies for these regions. A review for Africa is also being compiled. Preliminary statistics have been published by Persson (1974, 1975), one of the team formerly working on these studies. Various deficiencies of the inventory statistics it has been possible to assemble are recognised. A particularly serious limitation has been their inadequacy in measuring change in the state of the forest area. The destruction of forest in various regions by destructive logging, shifting cultivation, conversion to agriculture and destructive grazing is believed to be taking place at a rate which has been estimated to be as high as 10 million ha per annum. A programme for monitoring through remote sensing is at present being developed by the inventory section in FAO. Up to now the statistical records kept by countries concerned have been inadequate to allow a reliable estimate of the extent of alienation or objective assessment of its significance for future timber supply.

On the production and trade front, a major development in the last two years has been the introduction of the use of a computer to compile statistics of production and trade. The 1972 and 1973 Yearbooks of Forest Products contain a 12 year series for all commodities and a supplement to the 1973 Yearbook – Regional and Country Tables of Production, Trade and Consumption – contains a 14 year series of data for individual regions and countries for the main commodities.

Of great importance in gauging the potential of tropical forests is a knowledge of the utilisation characteristics of the species of which they are comprised and the penetration of the market by species with different characteristics. A major study by the marketing section of reported characteristics and a statistical review of the species composition of production (industrial wood) and exports from tropical regions is currently in hand to provide objective information and international coverage in this area.

According to the Yearbook record, fuelwood

constitutes 45% of world consumption of roundwood. For developing market economies this ratio is 84% – 840 million out of 1000 million m³ being fuelwood. This is an extremely important magnitude but not one for which statistics are presented with great confidence. For most countries it has been necessary to base the estimate of fuelwood consumption on one of the very few national studies of wood consumption in rural areas that have been carried out in the last 10–15 years. Almost no statistics are available on a regular basis or even on a periodic sampling basis. In relation to the contribution of the sector to developing countries, this clearly represents a very serious deficiency.

An important parameter in the study of supply and demand for forest products is the price. Because of difficulty of collecting consistent series only very limited information has been available on an international basis and that mainly for the Economic Commission for Europe region. Both for the ECE and on a world basis, it is planned to extend and improve this coverage with the objective of getting meaningful data for long term supply studies and the estimation of price elasticities.

As my last remark on the question of the international collection of statistics, I will mention the data collected on industrial capacity. For a number of years data on the current and projected capacity of the pulp and paper industry have been collected annually and periodic collections of data on the capacity of the panel products industry have been made. These surveys include statistics on the composition of the industry and allocation of capacity and types of product and the numbers of mills. Although the sawmilling industry is more important in terms of total roundwood consumption, it has unfortunately not been possible to collect information on a world basis on the capacity and composition of the sawmilling industry.

Analytical Studies for Forecasting Sector Development

Important in national and enterprise planning is the assessment of development of consumption of particular products or product groups and its relationship to capacity to supply that type of product in order to estimate additional capacity that might be established, changes in the level of imports or the likely scarcity of the product concerned. Because of its ability to assemble information on a regional and international basis, both as respects the supply and consumption of forest products, FAO is in a position to carry out regional and international studies of the development of supply or consumption.

A series of such regional reviews, the Timber

Trends Studies, have been published. The most recent comprehensive review of this kind was "*Wood-World Trends and Prospects*" – FAO, 1967. New studies are currently in progress for the European, Asia Far East and Latin American regions. These studies attempt a review of the development of consumption in relation to supply in order to arrive at a broad indication of the likely development of consumption and the implications for forest production, forest industries and trade in the region concerned.

I should like to mention a detail of the work on the estimation of future consumption. Over the past two years making use of the Yearbook statistics to derive apparent consumption figures and UN series on population and gross domestic product, Buongiorno, working in the Economics and Statistics Branch, has developed an econometric model of the relationship between consumption and income that combines a time series and cross sectional analysis. His consumption functions take the form:

$$C_t = a_1 Y_t^b C_{t-n}^c Y_{t-n}^d$$

or in the logarithmic form:

$$\log C_t = a_2 + b \log y_t + c \log C_{t-n} + d \log Y_{t-n}$$

Where C_t = Apparent *per caput* consumption at time t

Y_t = GDP *per caput* at time t

Y_{t-n} = GDP *per caput* at time $t-n$ (the previous period)

C_{t-n} = Apparent *per caput* consumption at time $t-n$

a_1, a_2, b, c, d are constants.

The aim in developing these functional relationships has been to provide an objective basis for making projections in which the assumptions made were explicit. In so far as they were based on the data about variable behaviour of a large number of countries it was also an aim to be able to make some statement about the error.

In developing these models it was found that the relationship for developing countries was significantly different from that for developed and, as was perhaps to be expected, that the variability of data and resulting error term for the developing countries model was greater.

This type of modelling has been used in preparing Commodity Projections for Panel Products and Pulp and Paper (FAO, 1975). The first regional projections – those for Europe – have also been presented (FAO/ECE, 1975).

Though this type of formal projection model is considered as of great value in providing an objec-

tive basis for forecasting, no formal method of equating demand and supply in the long term seems to be available to us, so the final outcome of such studies remains somewhat arbitrary.

Sector and Project Planning at the National Level

Many development projects in the forestry and forest industries sector include components concerned with economic analysis and planning. My remarks are confined to these components in projects. It should be borne in mind that the analytical and planning activities of the economist are dependent for their usefulness on the technical work in such fields as inventory, logging, forest management, forest industries and environmental aspects of forest land use and on statistical services which are also potential components of any project.

According to the situation of the sector in the country concerned, the economists' activities may include the general review of the current and potential role of the sector in the economy. This would start with the assembly of a basic framework of information on resources, domestic and foreign demand for products and potential products, accessibility of raw material, the development of harvesting, transport and processing industries; and the contribution of the sector to the economy.

From this basis of information, the analysis may have to identify the potential change in the contribution and the form and magnitude that such changes might take. This step may be supported by evaluation of the contribution associated with alternative forms of development. The final stage may be the appraisal of particular investment projects or the establishment of a general plan for development of the sector.

Such a rational process of review, information assembly, identification of alternatives, evaluation and formulation of plans with priorities and quantification of resource requirements and expected benefits, is essential to the orderly direction of forest and other resources to courses of action which will contribute best to the countries' economic development. In the absence of such a review, there is a risk of technical solutions being pursued without consideration of their relative contribution with resulting misallocation of scarce resources.

Because of contributions being made by other speakers on these countries, I should like to mention economic aspects of FAO/UNDP forestry projects in Malaysia, Nigeria and Surinam. In all these countries the information and review process has been, or is being, carried out, involving studies of resources, market potential, harvesting and industrial processing.

In Surinam the social cost and benefit of alterna-

tive courses of investment was examined following somewhat the lines of Little and Mirlees (1969), and the precedent of Arnold's evaluation of the Forest Industries Feasibility Study in Zambia (1972). The assessment of the consequences of possible programmes of expansion of the forestry, forest industry sector in relation to forest resources and labour, capital, infrastructure, and impact on markets was then made; so that the implications both for social benefit and the load on particular types of resources could be seen.

A similar aggregating approach was adopted in Peninsular Malaysia. In this case in order to make rather full use of detailed inventory data and information on the cost structure and resource use of harvesting transport and industrial processing, a computer model of the sector was constructed. The objective of the analysis is the formulation of a strategy for the national exploitation of the forest resource. The method adopted does not itself determine which is the best strategy but provides certain indicators and criteria which can be used by the policy maker in deciding which of many alternative strategies comes closest to his preferences. The analysis estimates the effect of each alternative strategy on such policy criteria as employment, foreign exchange earnings, capital formation, Government revenue, costs and sales revenues. For each strategy a sequence of computational operations produces estimates of these effects, thereby simulating the alternative strategies.

Needs for the Future

In the previous sections, I have discussed very briefly the main activities of FAO forest economists in the field of statistics and economic analysis. In these concluding remarks I will highlight the areas where I think more work is urgently needed and would be particularly rewarding. I am referring particularly to work to be communicated internationally.

The first requirement is to maintain the momentum to improve national statistics on resources, production, trade, costs and prices and the structure of industry in the forest or forest industries sector. It is essential in any country to get a reasonable base of quantitative information for national decision-making on the sector. Sharing this information internationally is of mutual benefit to all the countries that contribute in that it improves their ability to relate national courses of action to the regional and world situation.

Perhaps our most serious area of ignorance is of the rural use of wood in developing countries. If our current statistics give of the right order of magnitude, 25-30% of energy consumption in

developing countries derives from fuelwood and it is certain that in many of these countries the rural population depends almost totally on wood as a source of fuel. Our knowledge of the use of wood as a material in these communities is very limited. On the resource side I would also mention the matter of forest destruction and the alienation of forest land. Both these are subjects for survey within the countries as a means of building up the appropriate records, rather than being problems of the statistical services to process records collected.

The whole field of improving forestry and forest products statistical information services is one in which the transfer of technology might be regarded as relatively easy to accomplish but, with the exception of the forest inventory field, it is one which has been neglected relative to other technical fields in development programmes.

The second major need is the extension of objective appraisal of projects and courses of development and of forestry and forest industries sector planning as a catalyst to the appropriate mobilisation of resources to generate the optimum contribution of the sector to economic development.

As a means of monitoring advance in these two main areas, the time may be appropriate for compiling a register of the state which statistical and planning services in various countries have now reached.

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DISCUSSION OF PAPERS BY MESSRS KER, ADEJOYU, WAYMAN AND WARDLE

CHAIRMAN: Dr. H-J. von MAYDELL

DEAN KER's paper emphasised the central question on the exploitation of existing forest resources – that of timing. A low rate of exploitation might theoretically be desirable but political necessity, qualified by market conditions in the case of exporting countries, would often be the determinant. Too rapid clearance of forest might cause unfortunate losses both in poor use of foreign exchange gained from exports and in environmental effects. Income distributional effects of forest removal were usually valuable in the sense that at least some poor and unemployed people gained. But the identification of the real contribution of any particular cutting plan to economic and social welfare was difficult to assess and more measurements were needed to serve in project appraisal.

A method of sharing the benefits that one country might enjoy in one particular field with countries rich in opportunities in other was the formation of

economic communities. The scope for the sort of arrangement described in DR ADEJOYU's paper was limited by countries' caution about the loss of sovereignty implied. At a less ambitious level there was scope for institutions dealing with exploitation and marketing and more attention should be given to discovering the reasons for both failures and successes of national timber marketing boards.

PROFESSOR WAYMAN's paper was a most valuable one in detailing the various important developments going on in conversion of wood for direct or indirect use in human nutrition. The application of these methods and other possibilities referred to in the paper would be likely to differ from region to region depending partly on the potential of more conventional agriculture and also on costs of distribution of its products. Costs of manufacturing wood-based food deserved further

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assessment,⁽¹⁾ and it was useful to remember how widely and for diverse reasons, food production by normal agricultural techniques was subsidised.

The group made a number of comments in response to MR WARDLE's invitation for suggestions on ways and means of improving the statistical services provided by FAO in the forestry field. In the first place more precise attempts should be made to assess forestry's contribution to the economy, not only in terms of products, but in terms of income and employment generated. Secondly more data were needed on the rate of forest destruction as well as on

environmental effects of cutting. In relation to specific programmes or projects for forest development the emphasis must be on collection of data, including qualifications as to their reliability, which were likely to be relevant to the tasks of planners and decision makers.

⁽¹⁾ *Editor's Note:* An example of a cost assessment is Professor Wayman's paper: How single cell protein will help food costs, *Chemistry in Canada* September 1975, 22-24.

Paper 9

FORESTRY IN REGIONAL ECONOMIC DEVELOPMENT IN DENMARK

by F. HELLES

Royal Veterinary and Agricultural University, Department of Forestry, Copenhagen, Denmark

INTRODUCTION

In the time since 1789 a total area of some 360,000 acres of 'obligatory forest'⁽¹⁾ has been planted on heathland and other infertile areas in Jutland. These plantations now make up about 30 per cent of Denmark's forest area. In addition, over 125,000 acres of 'non-obligatory' forests and woodlots were planted in the same region of Jutland.

The establishment of these relatively extensive plantations implied large investments, defrayed partly by public funds and partly by private capital. In many instances these investments have from a business point of view yielded a satisfactory rate of return, but very often this has obviously not been the case. There is, however, another aspect of the economic problem, viz. whether or not the establishment of the plantations meant a promotion of the local economy.

HYPOTHESIS

The ongoing research work of the author is based upon the following hypothesis:

In most backward parts of the heath region forestry played over a long time a significant rôle in economic development. This rôle had mainly the character of catalyst effect. Money and materials were transferred from the plantations to the local population which thereby became able to make crucial initial investments in agriculture. And forestry also was of significance to local commerce and services, crafts and small-scale industry.

In view of the work involved, testing of additional hypotheses must, unfortunately, be postponed.

(1) The principle of 'obligatory forest' was introduced by law 1805. The Forestry Act at present in force is based upon the same principle. The central provision of this Act runs as follows: 'Obligatory forest areas must be kept covered with trees of such a kind, quality, and quantity, that they form, or by continued growth within a reasonable period will be able to form, closed high forest'.

(2) For a better understanding of this point reference is made to the supplementary paper: 'Outline of the history of afforestation work in the heath region of Jutland', obtainable from the author.

(3) A scholar at Agricultural University of Norway is at present applying the models in Nigerian conditions.

At the time when plantation forestry was built up, the socio-economic setting in the heath region offered many points of resemblance to present settings in developing countries. It is this author's belief that a thorough investigation of what in fact within comparatively few years did turn local people's attitudes towards afforestation of heath land from rejection to support may very well reveal elements which can, of course with the utmost caution, be useful to current afforestation work in developing countries.⁽²⁾

RESEARCH METHOD

In this paper main emphasis is laid on presentation of the research models used.⁽³⁾ A few data from a pilot area are, however, shown in order to give an idea of how the models work.

(a) Delimitation

The delimitation of the research work involves three dimensions: subject, period of time, and territory.

(i) The subject has already been described. Centres of interest are the flows of money to and from the plantations.

(ii) In principle, the period of time extends from the Seventeen eighties when the Government started afforestation, and to the Nineteen thirties when the plantations' impact on local economies is supposed to have become negligible. The greatest importance is, however, attached to the time after the foundation of the Danish Heath Society, i.e. after 1866.

(iii) A territory consisting of three contiguous districts (note 4, page 51) has been chosen, and as many as possible of the plantations situated there are analysed. This choice is, of course, subjective. The bias implied is held to be reasonably well compensated for by giving a thorough explanation of the criteria used and of all relevant factors.

Briefly the *selective criteria* employed were: (a) the region should embody distinctly non-productive heathland localities along with less pronounced heathlands in order to allow inter-district comparisons; (b) plantation forestry should have been practised during all or most of the period under review; (c) the different size classes and ownership categories comprised within Danish heathland

forestry should be broadly reflected in the survey area; (d) adequate and interpretable source data should be available.

A *random selection of plantations* was refrained from mainly because of these disadvantages: (a) Relating individual plantations to their surroundings would imply overwhelmingly many detailed studies of local communities. (b) Special difficulties of interpretation might turn up, for example, only one of two neighbouring plantations is selected but the workers dealt with are employed in either of them.

In certain cases it is felt natural to let the analysis cross the boundaries of the territory chosen. With a view to evaluating the representativity of the territory a number of plantations outside are included in the analysis.

(b) Source material

For many of the plantations established under the supervision of the Danish Heath Society a complete set of annual balance sheets is preserved. These sheets constitute the basic source material. In the cases where balance sheets are missing this is due to accident, i.e. there is no direct relation between size and treatment of a plantation on one hand and the completeness of available material on the other.

From the biggest and best treated plantations there usually exists supplementary source material which adds valuable particulars, for example, account books, vouchers, and correspondence.

So far, it has not been possible to discover source material from the comparatively few private plantations not established under the supervision of the Danish Heath Society. As for the State plantations, source material very similar in kind, proportion, and quality to that from the big private plantations is at hand.

As to source material of a secondary character, many articles and books on heath reclamation have been published, and a few do give socio-economic information on plantations, for instance, working conditions and performances.

(c) Research models

Two models are used concurrently, both of which are based upon three concepts:

(i) *Elementary circle* (E), i.e. the plantation in question. This is a theoretically well defined concept, and experience has proved that it operates almost without problems.

(ii) *Economy circle* (Y), i.e. the local community

(i) So-called 'herreder', an administrative unit no longer used. This unit is, however, held to be the more coherent in an economic-cultural way for the period in question.

to which the plantation belongs. It is difficult to draw up a distinct definition of this concept. However, experience has proved that in despite of being conceptually diffuse it operates consistently well.

A few *examples* of what is included under 'economy circle' may give an idea of what is meant by the concept: (a) The area in which workers normally employed in the plantation live. (b) The area in which persons rendering services to the plantation live, provided that all or most of the payment remains inside the circle during the first 'circulation'. (c) Payment for materials and tools is included if the supplier obviously belongs to the local community.

At the outset it was supposed that the 'economy circle' had to be treated as a dynamic concept, among other things in view of the improvement of transport facilities. The pilot area has, however, not given support to the idea of dynamics.

(iii) *The outside world* (O), i.e. the regions beyond the 'economy circle'.

Model I

This model aims at measuring *money flows*. The idea is to trace the flows as far as possible in order to approach some kind of multiplier effect.

The multiplier question still holds unsolved problems because so far efforts have been concentrated on plantation accounts. It has, of course, been checked that somehow it is possible to relate the socio-economic data for plantations to those of local communities.

Model I can be expressed by four equations:

$$\begin{array}{ll} 1. O \rightarrow E = \sum O_n^E & 3. E \rightarrow O = \sum E_q^O \\ 2. Y \rightarrow E = \sum Y_p^E & 4. E \rightarrow Y = \sum E_r^Y \end{array}$$

E: elementary circle. Y: economy circle. O: outside world. The arrows illustrate money flows. The small letters refer to the various entries, see below.

The following entries are employed:

Eq. 1 and 2	Eq. 3 and 4
O ₁ /Y ₁ : grants	E ₁ : wages
O ₂ /Y ₂ : sales of forest products	E ₂ : services
O ₃ /Y ₃ : sales of by-products	E ₃ : purchase of materials and tools
O ₄ /Y ₄ : rentals	E ₄ : taxes and charges
O ₅ /Y ₅ : interest revenues	E ₅ : interest costs
O ₆ /Y ₆ : deficit	E ₆ : profit
O ₇ /Y ₇ : sundry incomes	E ₇ : sundry costs

As far as possible note is made of the names of workers and suppliers, because it is important for the evaluation of the plantations' effect on local economy to know between how many workers and

suppliers amounts were divided. In big plantations so many workers are involved that it has proved unmanageable to make notes for each year, so years for analysis are selected at random. The procedure has been tested and found suitable. Data on dimensions of employment are booked in order to get an idea of the workers' chance of being employed somewhere else.

Model II

The aims of this model are to illustrate:

(i) The material impact of plantations on the local community, i.e. the amounts of fuelwood, timber and by-products flowing from 'elementary circle' to 'economy circle'.

(ii) Differences between plantations as regards allocation of costs. Such differences may contribute to explain variations of impact on local economy.

Model II can be expressed in this way:

1. $I_1^O, I_2^O \dots I_n^O$
2. $I_1^Y, I_2^Y \dots I_n^Y$
3. $I_1^O + Y, I_2^O + Y \dots I_n^O + Y$
4. $C_1^O, C_2^O \dots C_m^O$
5. $C_1^Y, C_2^Y \dots C_m^Y$
6. $C_1^O + Y, C_2^O + Y \dots C_m^O + Y$
7. $Q_1^Y, Q_2^Y \dots Q_p^Y$

I: income. C: cost. Q: quantity. Y: economy circle. O: outside world.

The figures and small letters refer to the various entries, see below.

The following entries are employed (only the principal entries are shown).

Incomes	Costs
Sales of forest products	Logging and transport
Sales of by-products	Afforestation and
Rentals	regeneration
Grants	Forest improvement
Interests	Residences
Sundries	Taxes and charges
	Distribution, marketing
	Interests, repayments
	By-products
	Sundries.

Pilot Area

The two models have so far been implemented on plantations in a pilot area of four parishes with a total area of 85,760 acres.

1. *Jyndeved*. Establ. 1901. 801 acres. Owner: businessman, absentee. 2. *Hogildgard*. Establ. 1868. 1,992 acres. Owner: landed proprietor, absentee. 3. *Harreskov*. Establ. 1873. 2,076 acres. Owner: The Danish Heath Society (up to 1929: landed proprietor, absentee). 4. *Birkebaek*. Establ. 1872. 2,380 acres. Owner: The Heath Soc. 5. *Skarrild Krat*. Establ. 1867. 311 acres. Owner: The Heath Soc. 6. *Hesselvig*. Establ. 1877, partly 1889. 1,552 acres. Owner: The Heath Soc. 7. *Fasterholt*. Establ. 1898. 719 acres. Owner: local farmer.

(iii) Plantations not analysed as yet.

(iv) Two 'economy circles'. No. I is related to plantations no. 1-4 and 7, no. II to plantations no. 5 and 6.

Two *methodological problems* are immediately evident:

(i) It is not possible to obtain congruence between the 'economy circle' and the local community proper, because in order to produce general socio-economic data the latter must be based upon administrative units.

(ii) Data registered as belonging to the 'outside world' with regard to one 'economy circle' belong in fact to another 'economy circle' and must accordingly be registered twice. For example, money transferred from plantation no. 6 to Herning are 'outside world money' for 'economy circle no. II' but 'economy circle money' for no. I. The implication is that in principle all the 'economy circles' must be identified from the very beginning of the analysis.

Some data from one of the plantations, viz. Birkebæk, are shown, just to give an idea of the present stage of the research work.

Birkebæk Plantation has been chosen arbitrarily. Data of a similar kind are available on the other six plantations. As space only permits very brief comments on data it was not thought worth while to list data on all the plantations, the more so as they would anyhow form a basis too slight for a judgment on the hypothesis.

Socio-economic Data for the Local Community

In Table 33 are shown some data for the local community. Data are immediately available only for the years shown because most official statistics very early in the period became related to units bigger than parishes. It is, however, realistic to expect that a search in various archives will bring out further material.

Attention is drawn to the general 'take-off' during the 1880's, the period in which afforestation began to accelerate. How to interpret this relationship is virtually what the present research work is about.

Data for Birkebæk Plantation

In Table 34 are shown some flows of money to and from Birkebæk Plantation.

For the sake of clarity the flows are added up for periods of five years. Aggregate incomes and aggregate costs are shown, but among sub-entries only the most interesting ones. Furthermore, it is shown what share of the amounts in question flew from or to the 'economy circle'.

The reason why amounts have not been deflated is that no suitable official index exists for years prior to 1914. This problem has not been solved as yet.

It is immediately obvious that the plantation was not a profitable investment from a strict business point of view. In most of the years the bulk of the incomes from sales of forest products came from the 'economy circle'. The main market for by-products was the 'outside world', a fact which is no surprise as they were principally decorative branches and charcoal. As to costs it is noteworthy that flows to a very great extent went to the 'economy circle'.

In Table 35 are shown the amounts paid as wages and for materials and tools. Attention is drawn to these points: (a) Wages always made up a big percentage of total costs.⁽¹⁾ (b) Payments for materials and tools made up a varying, but always big percentage of total costs; most of these amounts went to the 'economy circle' which means that local

suppliers were important to the plantation – and, perhaps, vice versa.

From Table 36 is seen how many workers were employed in different months of the years selected, the selection, among other things, aiming at this kind of information required in Model I. Unfortunately the source material only gives current information on the month in which the wages were *paid*, and there is evidence that a delay of several months between work done and payment was not unusual.

Attention is drawn to the large number of different workers employed. There were great variations between wages, a fact which is only to a certain degree mirrored in the last two columns.⁽²⁾ As just one single frame of reference can be used the annual income of three agricultural worker families in northern Jutland 1893, according to an official investigation, viz. between 390 and 460 Dkr.

No information can be given on the quantities of fuelwood and industrial wood sold to the local community because problems in connection with conversion factors have not yet been solved.

(1) It is only natural that amounts paid as wages went in total to the 'economy circle', cf. definition of that concept.

(2) A special reason is that staff members often did manual labour, too, and were comparatively well paid. Such wages are excluded from the last column.

TABLE 33
SELECTED SOCIO-ECONOMIC DATA FOR 'LOCAL COMMUNITY' IN PILOT AREA

Inhabitants		Number of farms and houses				Utilization of land				Livestock				
Year	Number	Year	Farms	Houses with land	Houses without land	Year	Agri-culture acres	%	Plan-tation acres	'Un-used' %	Year	Horses	Horn-ed cattle	Pigs
1801	1,371	1852	134	182	33	1861	20,980	25	x	(75)	1861	260	2,500	400
1840	1,726	1860	136	175	21	1866	20,970	25	x	(75)	1866	270	2,900	570
1860	2,342	1873	128	327	42	1871	23,330	27	x	(73)	1871	290	3,160	720
1880	3,190	1885	125	469	107	1876	23,510	28	x	(72)	1876	370	3,390	1,010
1890	3,671	1895	122	521	95	1881	28,400	33	3,930	63	1881	460	4,170	970
1911	4,959					1888	34,350	40	4,620	55	1888	760	4,110	1,910
1916	5,455					1896	38,720	45	7,830	46	1893	980	5,230	1,640
1921	6,047					1907	41,600	49	10,830	39				
1925	6,475													
1930	6,428													

x: Data not available.

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TABLE 34

FLOWS OF MONEY TO AND FROM BIRKEBAEK PLANTATION, IN 1,000 DANISH KRONER, NON-DEFLATED.
BOLD FIGURES: PER CENT OF AMOUNT FROM OR TO 'ECONOMY CIRCLE', RESPECTIVELY.

Period	Incomes				Costs					Surplus
	Total	Sales of forest prod.	Sales of by-products	Grants	Total	Log. and transp.	Affor. and regen.	Residences	By-products	
1875-79	1 100	0	1 38	0	122 42	0	35 84	15 99	0	—121
1880-84	4 59	0	1 98	2 0	(16) ¹ 53	0	7 88	1 100	0	(— 12)
1885-89	13 28	* 100	4 96	9 0	46 63	0	16 97	10 77	3 88	— 32
1890-94	34 39	1 39	26 44	5 0	58 78	1 100	33 75	11 59	3 96	— 24
1895-99	37 39	6 55	26 42	7 0	56 81	6 100	35 87	6 90	2 97	— 19
1900-04	40 38	3 19	38 39	0	61 82	11 100	27 92	4 85	7 82	— 21
1905-09	40 35	5 49	35 33	0	50 80	11 100	16 89	5 100	5 83	— 10
1910-14	42 17	5 67	36 7	* 100	50 76	14 100	9 93	2 100	10 76	— 8
1915-19	99 25	28 61	64 6	0	90 67	26 100	6 90	15 99	11 64	9
1920-24	143 47	76 56	59 16	* 100	126 88	62 100	11 84	10 100	16 85	17
1925-29	121 52	74 59	38 27	* 100	109 92	60 100	11 94	10 95	9 81	12
1930-32 ²	105 41	48 71	52 6	1 100	96 95	31 100	6 97	6 100	38 99	9

*: ≤500 Dkr., >0.

¹ Cost account does not exist for 1882 and 1883.

² Three years.

TABLE 35

PAYMENTS FOR WAGES AND FOR MATERIALS AND TOOLS,
BIRKEBAEK PLANTATION, IN 1,000 DANISH KRONER, NON-DEFLATED

Period	Wages			Materials and tools		
	Total	Per cent of total costs	Per cent to econ. circle	Total	Per cent of total costs	Per cent to econ. circle
1875-79	38	31	100	17	14	65
1880-84 ¹	(7)	(43)	(100)	(2)	(11)	(52)
1885-89	20	44	100	11	24	71
1890-94	32	55	100	19	32	61
1895-99	32	56	100	17	31	72
1900-04	39	63	100	14	24	71
1905-09	31	63	100	8	17	74
1910-14	32	63	100	6	13	53
1915-19	46	51	100	15	17	69
1920-24	93	74	100	15	12	73
1925-29	86	79	100	12	11	75
1930-32 ²	66	69	100	21	22	98

¹ Cost account does not exist for 1882 and 1883.

² Three years.

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TABLE 36

NUMBER OF WORKERS EMPLOYED AND WAGES PAID (NON-DEFLATED) IN
SELECTED YEARS, BIRKEBAEK PLANTATION

Month Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Number of diff. workers	Average wages per worker, D. Kr.	Max. wages per worker, D. Kr.
1879	5	4	5	13	18	23	6	10	23	31	10	4	30	120	550
1886	21	1	0	8	5	4	4	1	3	2	3	1	10	330	530
1890	45	3	12	0	8	20	0	11	0	0	9	1	32	200	410
1892	7	0	1	6	16	11	0	7	0	1	4	4	20	240	260
1894	57	12	8	9	16	9	5	0	4	1	6	3	37	200	350
1896	9	10	1	6	1	6	0	6	3	3	3	2	15	520	170
1898	4	0	1	5	3	1	3	0	0	0	3	2	6	750	500
1904	12	4	11	0	4	0	2	4	3	0	4	8	19	300	1,050
1909	13	3	18	0	2	2	2	1	4	3	1	2	21	310	330
1915	2	0	0	10	2	5	0	1	1	3	0	2	13	220	1,260
1919	8	8	18	9	4	1	4	0	3	1	5	12	35	330	640
1922	26	2	13	5	6	0	3	3	2	0	1	1	20	480	750
1927	24	23	24	15	1	9	0	15	0	5	2	6	29	570	780
1930	52	31	19	29	12	9	14	5	0	3	5	4	42	470	460

Paper 10

PROJECT DATA HANDBOOK SECTION 7 FORESTRY AND WOOD-USING INDUSTRIES

by T. R. BLACKFORD

Ministry of Overseas Development, United Kingdom, London

This project data handbook (1975, 105pp) prepared by the Economic Planning Staff of the United Kingdom Ministry of Overseas Development is not

reproduced here but may be obtained free of charge from the Ministry at Eland House, Stag Place, London, SW1E 5DH.

PROBLEMS INVOLVED IN HARMONIZATION
OF ECONOMIC OBJECTIVES WITH TECHNICAL,
ENVIRONMENTAL, AND SOCIAL CONCERNS
ABOUT FOREST DEVELOPMENT¹

by J. HARRY G. SMITH

Professor, Faculty of Forestry, University of British Columbia, Vancouver 8, B.C., Canada

Introduction

My paper will deal with a few of the practical problems that are sometimes overlooked in making policy "to protect the environment".

You may be interested in how a professor of forestry became involved in the area of economic development. In 1963 I spent 8 weeks in Taiwan under the auspices of the UNTAB/Special Fund (now UNDP) with the following terms of reference:

"To undertake an overall survey of the forestry and forest industry situation in Taiwan, China, and to advise on (a) the terms of reference and (b) the composition of a team of consultants whose task, in turn, is to study the situation in detail with the aim of making proposals to further development of the forest industries. More specifically, the team of consultants will be concerned with making recommendations for necessary reforms in policy, laws, regulations and institutions and with drafting a development plan for forestry and the forest industries."

My report (Smith, 1964) led to establishment of the program which issued its final report in 1970 (FAO/SF: 84/CHA 21). In addition to a further brief assignment in Taiwan in 1968 I undertook short FAO missions to Ecuador and to the Dominican Republic and headed a review mission for the UNDP in Turkey, and took part in a review of Sulawesi for CIDA. These contacts with the field of forest development helped stimulate the writing of several master's theses and of Nautiyal's Ph. D. thesis (1967) on "Possible contributions of timber production forestry to economic development". Nautiyal and I collaborated in a 1968 paper which asserted that "Acceleration of economic development depends on harmonization of technical and economic objectives for forestry". This was followed by a 1971 analysis with David Haley of the "Justification and sources

for funding of forestry operations in developing economies". We also reviewed (1972) the "Implications of current concerns for improved forest environments". This background combined with my participation in the Pacific Science Association Meeting in Australia in 1971 and a continuing interest in British Columbia's future in forest products trade in Asia and the Pacific Area (Matthews, 1965) encouraged me to volunteer a paper.

I will not review the results of these studies here.

Naturally, I have some ideas about how well Taiwan's forests have contributed to the process of development. I think that Taiwan is an outstanding example of successful cooperation between Chinese and American interests. The Chinese-American Joint Commission on Rural Reconstruction seems to me to be excellent model for melding of American capital and knowledge to accomplish a wide range of socially valuable resource management objectives. Much of the credit for Taiwan's remarkable growth must also be given to men such as K. T. Li, first as Secretary General of the Council for U.S. Aid, later as Minister of Economic Affairs, and currently as Minister of Finance. According to an item in *Time*, May 14, 1973, Taiwan's population of 15 million ranks 40th in the world but last year it climbed into 20th place among all trading nations with a giant 45% increase in its foreign commerce to \$5.9 billion. Its gross national product jumped 12%, the fastest rise in all Asia, and average family income reached \$1,500, a figure exceeded among Asian countries only by Japan and Singapore.

My paper describes the process of forest development, reviews the objectives and attitudes that are involved, and gives some ideas about how the apparently conflicting dimensions of the problems can be harmonized. I was tempted briefly to take the line held by Ivar Samset, a famous Norwegian Professor of Forest Harvesting, who gave the H. R. MacMillan Lecture March 1973 at the University of British Columbia. He implied that foresters had solved all the important forest environmental management problems in Norway more than 100 years ago. He asserted that all that is needed there is to apply well the results of more than a century of

¹ Prepared originally for a panel discussion in the A.S.P.A.C. '73 Conference, Vancouver, B. C. June 14-16, 1973, entitled "Implications of the Stockholm Conference for Asia: Reconciling the needs of developing nations with the need to protect the World environment."

research and experience. Obviously, we have much less than a century of experience here and many of the old lessons need to be up-dated or revised in the light of the Stockholm Conference, and many other modern events and problems.

The Asia-Pacific Region

The difficulties of generalization are obvious when one considers the variety of countries in the Region.

The Asia-Pacific Region has been defined by FAO (Matthews, 1965) as containing the following sub-regions:

<i>South Asia</i>	Ceylon, India, Nepal, and Pakistan
<i>Continental South-east Asia</i>	Burma, Cambodia, Malaya, Laos, Singapore, Thailand, and North and South Vietnam
<i>Insular South-east Asia</i>	Brunei, Indonesia, East New Guinea, Netherland New Guinea, North Borneo, the Phillipines, and Sarawak.
<i>East Asia</i>	China (Taiwan), Hong Kong, Japan, and Korea
<i>Oceania</i>	Australia and New Zealand
<i>China (Mainland)</i>	

Contributions of Forest to Society

In the broad sense forest resources satisfy many human needs. I like the approach (Smith and Lessard, 1971) which says:

“Forestry has as its objective the growing of trees and the management of forest resources for their present and potential contributions to the economic, social and physiological well-being of society. These contributions include wood, water and forage for domestic and wild animals, as well as non-consumptive amenity values and environmental, recreational and scientific benefits”.

It is unfortunate that so few forests are managed to provide the full range of goods and services which could be derived from them. Most are managed for one dominant use established by the ownership rights, or lack of them, that govern the local situation. Even many well financed and carefully managed publicly owned forests have contradictory or confusing policy statements.

During 1973 I reviewed goals and standards for forest land management espoused by many North American public agencies and forest based com-

panies. I also attempted to relate the standards employed in land management to their goals. This turned out to be a revealing exercise which merits much more study.

Contributions of forests to mankind in the Asia-Pacific area are relatively much less than in Canada and the United States. Northern North Americans individually consume roughly twenty times as much pulp and paper, lumber and plywood as do most of the people of the Asia-Pacific area. Where we are arguing how much recreation to finance, and how much wilderness to set aside, people in the developing nations are seeking food and shelter, often at a primitive level.

The Process of Forest Development

In parts of the Asia-Pacific Region there are vast forests which have not been fully developed, but most already are heavily committed to serve existing wood using industries. In several countries it has become obvious that when population pressures are large and social controls weak it is difficult to establish and maintain a firm boundary between farm and forest. Many lowland forests have been cut-over by tens of generations of villagers striving to wrest fuel, shelter, forage, and cash crops from the forest. Some upland areas still can be cleared to provide agricultural crops in perpetuity. Others will be cleared and then abandoned. Some will be clear felled, burned, planted to agricultural crops, then abandoned within a few years in an often aimless pattern of shifting cultivation. Others, even on very steep slopes, will be cleared, cultivated clean, and then cropped mercilessly to exploit for cash all the values that can be gleaned from the soil. A few forests have been turned into grasslands that are burned periodically to maintain wild or domestic animals. Illegal cultivation, illegal timber cutting, and squatting can build up to the point that seems impossible or at least impolitic to resist.

Often it takes a major calamity to concentrate attention and force action. Severe crop failures, drought or flooding by a major typhoon are needed to make both urban and rural populations look up into the hills. Sometimes their response is to take the line of least resistance and to prohibit all logging. Logging is most visible and concentrated as an easy target but the solution really should be found in control of cultivation and improved management of the whole watershed rather than in prohibition of one activity.

The process of commercial forest development usually involves harvesting of existing forest resources and transportation to points of manufacture or export to serve local needs, to serve regional needs, to gain cash in order to buy goods, or to

replace imports which require scarce capital. The forests involved commonly are remote, accessible only with difficulty, and their replacement expensive and hard to justify by conventional economic analyses. The rate at which stocks of mature forests should be drawn down, the extent to which they should be renewed in place, and the methods used for their extraction and manufacture deserve careful analysis. Often only a few tree species and only one or two trees among hundreds on an acre are commercially valuable. Growth of the commercially valuable trees often is slow.

Wealth released by harvesting of over-mature forests may be invested much more wisely in plantations of fast growing species in the lowlands, near to centres of population. Such plantations can provide shelter, amenity, and many kinds of wood products if they can be protected from fire and people.

Attitudes Toward Creation and Use of Forest Resources

A. General

There are major differences between afforestation which involves establishment of forests where none existed in recent times and reforestation which establishes the same or different kinds of forests following logging or disturbances such as fire.

Attractive opportunities for afforestation with fast growing species such as sub-tropical pines and eucalypts exist close to manufacturing centres and in some cases growing of wood can compete very well with more usual agricultural crops. Trees grown for shelterbelts, stabilization of dunes, and for improvement of urban environments enjoy many friends.

There is less support, however, for reforestation. In many cases too little is known to ensure success; there is a long delay between planting and harvesting; the risks of loss from fire, insects, disease, and animals are great; there is much uncertainty as to future markets. All factors may combine to justify only modest levels of re-investment of forest capital in timber production. On the other hand there usually is much more support for regulation of water supply or for maintenance of forage, which can provide prompt and widely appreciated returns on re-invested forest capital.

Most professional foresters think of themselves as managers of forest land who work efficiently to achieve the objectives set, in consultation with them, by the owners of the land. They are essentially neutral in the setting of objectives but very much aware of the need to work with rather than against nature and deeply concerned to maintain beauty in the landscape.

Most foresters advocate sustained yield and try to

practise multiple purpose forestry. Continuation of production at existing or higher levels is the essential element of "sustained yield", an idea which has associated with it the maintenance of productivity undiminished for the benefit of future generations. Advocates of multiple use believe that society is served best by a combination of uses. Uses are determined largely by the capability of the land to provide goods and services or to respond to inputs which have the objective of creating, maintaining or increasing production. Land use classification, land capability analysis, and zoning can reduce some conflicts. However, it is very difficult to satisfy the most enthusiastic of the ecologically or wilderness oriented groups.

One of the problems, or opportunities, for the developing nations is likely to arise from companies that will look to them as havens from strict pollution standards. As legal requirements increase and anti-pollution laws are applied more rigorously in the United States and in Canada, opportunities in the Asia-Pacific Region may appear more attractive. Already major investments have been made by American, Japanese, and Korean companies in the Philippines and in Southeast Asia with the objective of harvesting vast reserves of tropical hardwoods for plywood and other products. The conditions under which leases have been granted and the impacts of unregulated logging already have caused much concern to ecologists and forest land managers. It seems that the developing countries must impose appropriate pollution control obligations on forest based industries and insist upon maintenance of the productivity of the land.

In deciding what is appropriate action it is important to realize that capital formation may be absolutely essential now and that the best course of action is simply to draw down forest values by treating them as stock resource. Provided the soil has not been lost to erosion, new forest crops can be grown where and when needed. Although there will be a delay, in most of the Asia-Pacific Region new forests can be established relatively quickly.

B. United Kingdom

Many of the arguments involved in determining how much forest of what kind should be created are well illustrated in the current public debate about forest policy in the United Kingdom (Smith, 1973). Thorough cost/benefit analyses of forestry and hill farming have been made. It has been shown that few investments in forestry can earn more than 3%, which is much less than the test discount rate of 10% applied by government planners in the United Kingdom. Although the conclusion to restrict planting and revise stand management plans seems

obvious, there is understandable professional opposition to a cutback. Private woodlot owners also are fighting to maintain their favourable tax status and subsidies, and have raised some good arguments for improvement of integration and efficiency in industry (Rankin, 1973). A few outdoor recreation enthusiasts are trying to create support for intensive "resort oriented" forest land management. These debates focus on whether 8 or 11% of the United Kingdom should become forested by the year 2000.

C. Canada

With 70% of its provincial land surface forested Canada has little need for massive afforestation efforts but reforestation and forest land management should be improved greatly (Smith and Lessard, 1971). Canada has responded vigorously to newly recognized concerns for an improved environment. The Federal Government has established a Department of the Environment. The Science Council of Canada has sponsored a series of Special Studies and Reports among which No. 19, issued in January, 1973, provided a useful over-view of natural resource policy issues in Canada. New methods are needed and jurisdictional impediments must be diminished. The Canadian Council of Resource and Environment Ministers culminated two years of searching analysis of public ideas about resources in its Man and Resources Conference at Toronto November 18 - 22, 1973. The major objective of that program has been "to provide a national forum for debate concerning the formulation and recommendation of guidelines to achieve and sustain an optimum balance of social and economic benefits derived from the natural resource base". Task forces have tackled most aspects, and public participation is developing to the point where some individuals will be sufficiently informed that they can avoid being alarmed unduly by crisis oriented news media. Concern now is being expressed by many citizens about economic decisions made on the basis of short-term economic considerations to the exclusion of future, social, economic and environmental consequences. Also it is asserted that worries about the future survival of Canada's natural environment are so recent that no formula or mechanism yet exists for including or weighting environmental considerations in the decision process which leads to resource exploitation.

These research programs and public discussions of growth ethics and social values seem to be leading toward new insights. Alternatives are being examined, thoughtfully. Zero economic growth and continuation of uncontrolled growth have been rejected, as leading to stagnation or offering no useful remedies. Consideration is being given to alterna-

tives such as development of a steady-state objective, to incorporation of external effects in the pricing system, to continued growth with innovation, to concentration on social rather than economic development, and to a renaissance of individual values.

Increasing attention is being directed toward improvement of opportunities for development in the slowly growing regions of Canada but despite massive Federal investment there are few proven means for eliminating regional disparities in Canada.

D. British Columbia

In British Columbia the response has been moratoria on some developments, multiple use studies, establishment of logging guidelines, and development and imposition of much stronger standards for pollution control. An ecological reserves act was passed in 1971 and 100 areas are to be set aside by 1975. An environment and land use committee was established in 1971 to bring together all concerned resource management agencies. It is supported by a major secretariat reporting through an individual with Deputy Minister status.

E. United States of America

Nearly 600 million acres of the United States support commercial forests and there is a wide variety of outdoor recreation opportunities. The public clamour for more wilderness in the Western United States now is well known. The U.S. Forest Service has been subjected to a wide variety of pressures and considerable abuse in recent years.

Goals and decision making in the Forest Service of the United States have been analysed by Alston (1972). He reviewed the legislation and concluded that the U.S. Forest Service mandate was to maximize the sum of the weighted values of six resources: fish and wildlife (F), outdoor recreation (O), range or forage (R), environmental amenities (E), soil and watershed (S), and timber (T). He drew these together in a goal oriented decision model called FOREST which ought to help clarify how the priorities applied in land management should in future arise through public involvement and budgeting which set the actual accomplishments on any one National Forest. The implications of his model are that managers of National Forests should strive to provide a complex mix of goods and services constrained by the natural productivity of their lands, the funds allocated by Congress, and the public pressures which lead to shifting regional and resource priorities in response to needs and ideas about the future. In addition to broad models, rigorous analyses are needed to define goals and to clarify standards for land management. There still is much confusion in terms. Tysdal (1973) observed that

"multiple use" is not only a "phenomenon" of nature, but also a "concept" of management and at the same time a "system" of management. Despite the 1964 multiple use sustained yield act the argument ranges on in the U.S.A. between "dominant use" and "equal priority" systems for implementing the concept of multiple use.

Alston (1973) has continued his studies in a useful review of how to bring economic reasoning into public land and environmental decision making. He compared his FOREST model with Navon's Timber RAM model (Navon, 1971). Alston conceded the difficulty of quantifying the weights to be assigned to each element in his FOREST model but insisted that the effort was essential if the greatest net social benefits are to be obtained from the National Forests. He was critical of the Timber RAM approach which reduces the effects of non-timber values to their impacts on timber. Alston stressed the need to replace estimates of "dollar values" with "weighted social benefits". He drew attention to the implications of the Wilderness Act of 1964 which declared that the use and classification of certain portions of the National Forest system as wilderness areas, independent of their commercial value for timber and watershed protection, was within the original mandate of the U.S. Forest Service. The National Environmental Policy Act of 1969 added preservation of environmental values and amenities to the mandate of the U.S. Forest Service and implied that environmental considerations are to be given a higher weight or priority than are the other forest outputs in the final decision making process. Although all the implications of this Act are not yet clear, few would argue with its major purposes which are:

"To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation"

F. Need for Forest Development and Criteria to Guide It

With the United Kingdom, Canada, and the United States arguing so much about goals and professing lack of means to accomplish many of them, what hope have forest land managers in developing nations? Their capital resources are much less and population pressures immensely greater. To be honest I have much difficulty in maintaining my enthusiasm for continued involvement in the development process when I consider the challenges

that face most of the developing regions that I have seen. Creation of the conditions for take-off into sustained growth poses so many challenges that I sometimes despair of the possibility for success. Then when I consider what would happen if current North American demands for a high quality environment were super-imposed on the need to survive and to grow I become very pessimistic. I cannot see much hope for massive diversions of wealth from the well endowed nations at least until after we solve our own pollution and poverty problems and re-educate ourselves to new goals. By the time that occurs, populations in some developing countries may have doubled, their aspirations increased greatly, and their chances for successful change almost disappeared. When I think back over the attempts I have made so far during my career to improve land management I cannot be optimistic about what will be accomplished by my counterparts under the much more difficult circumstances in developing countries.

Still it is worthwhile to continue to hope, and to strive, for improvement in amounts as well as in methods of allocating the small supply of funds likely to be available for forest development. Good criteria are needed to make best use of scarce capital (Scott, 1973). Choice among conflicting land uses and skilful management to reduce impacts among competing uses also are needed. Information must be derived from the natural sciences and the study of economics then combined with an understanding of political and cultural factors to enable managers to make wiser decisions in multiple resource management.

Criteria for Decision Making

The problems involved in defining and measuring net social benefit are immense. Presumably, the politicians and technocrats responsible for budget making in Government do the job for us periodically. They reflect commonly held views about priorities by assigning resources in proportion to the "importance" of the missions recognized by planning, programming, and budgeting systems. The tools available for detailed study include benefit/cost analysis, and various financial appraisal techniques. Commonly, decision makers lack data on costs, have few sound ideas about future trends, and hold a variety of opinions about non-market benefits and the externalities of any situation. Nevertheless decisions are made and can have vast impacts. Probably the best that we can do now is assert that any investment in forestry which produces a net discounted revenue per unit of capital at the ruling rate of interest will not only be profitable but will also satisfy the ultimate criterion of the provision of positive net social benefit (Earl, 1973).

Conclusion

If it is difficult for one to understand the circumstances that lead to regional disparity within Canada and the United States, it will be many more times troublesome to adjust to problems of developing nations. Our solutions and our attitudes must be applied with much caution and a great deal of sympathy for local circumstances and cultures. People in developing nations now are much too aware of how others live in the affluent nations and are unwilling to wait, to save, and to change slowly. In their haste to convert forests and other kinds of natural wealth to usable forms they do not see short term changes and are difficult to persuade to an awareness of long-term problems. In many ways they cannot afford the "luxury" of good land management but without it at some future time there may be too little land left to manage. If persuaded to do a much better job, they often over-react by stopping development completely at a terrible cost in terms of wasted capital and abandoned plans and people. Chronically short of capital for even what we consider the "absolute" essentials, many developing nations do not have either the means or the knowledge to proceed toward improved management. Under these circumstances the best that we can do is help by providing some knowledge, a little capital, and much sympathetic understanding in these difficult times.

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JUSTIFICATION AND SOURCES FOR FUNDING OF FORESTRY OPERATIONS IN DEVELOPING ECONOMIES

By D. HALEY and J. H. G. SMITH

Faculty of Forestry, University of British Columbia, Vancouver, Canada

Introduction

The title of this paper is rather general and we have deliberately taken a broad view in presenting the topic in the hope that it will help set the stage for discussion. Inevitably we will touch briefly on several topics which will be dealt with in more detail by others. In the first part of the paper we will deal with the justification for funding forestry in developing economies, as presented in the literature of the last decade and, in the second part, we will discuss methods of financing and encouraging forestry operations. We make no apologies for the fact that many of our examples are drawn from Canadian experience. While many would argue that Canada cannot be truly described as an undeveloped country, the economic attributes of the forestry sector are not unlike those which exist in much of the less developed world and certainly the problems faced by our forest managers and administrators will not be unfamiliar to their counterparts in less developed nations. Throughout this paper the term "forestry operations" includes the management of forest and associated wildlands for the production of timber and other products plus the harvesting, manufacturing and marketing of such products.

Economic Development

There are as many definitions of economic underdevelopment as there are text books on the subject. Economic underdevelopment is a relative notion. Economies are regarded as underdeveloped compared to others which are more "developed". Underdeveloped countries according to Robinson (1960) are those which are dissatisfied with their present economic condition and have a desire to develop. To most people, economists and laymen alike, economic development implies something about a country's ability to produce goods and services. Specifically it implies something about the level of a country's per capita real income compared to the per capita real incomes of the highly industrialised countries of North America and Western Europe. Underdeveloped countries have been defined more specifically (Higgins, 1959) as those countries with a per capita real income of less than one quarter of that of the United States. The dangers of such arbitrary criteria are obvious.

Use of relative *per capita* real incomes to define whether or not a country is developed or underdeveloped leaves many economists with a sense of uneasiness however. Apart from the fact that per capita figures tell us nothing about the distribution of a country's income, many would question the implicit assumption in much of the economic development literature that the level of national income is the best measure of the quality of life enjoyed by the inhabitants of the countries concerned. Such doubts were expressed very eloquently by Galbraith (1962). Not only do conventional development plans usually subjugate the composition of output to the goal of maximum possible increase in the absolute level of output, but often such plans are seemingly based on the assumption that underdeveloped societies have value systems similar to those of the western industrialized nations. Galbraith suggested that a major goal of economic development should be the provision for all citizens of the consumption requirements, present and prospective, of the average citizen. Perhaps, in view of such considerations, an acceptable definition of economic development would be the increase in the ability of an economy to provide the goods and services its members desire.

While "underdeveloped" is usually regarded as being synonymous with poor, it need not necessarily be so. Schumpeter (1962) defined development in terms of the ability of an economy to generate endogenously economic changes resulting in improved productivity. By "development" he said, "we shall understand only such changes in economic life which are not forced upon it from without but arise by its own initiative from within". Appealing to Schumpeter's concept of development, Levitt (1970) described Canada today as the "world's richest underdeveloped nation" although it exhibits few of the conventional characteristics of underdeveloped areas as described by such writers as Leibenstein (1959), Viner (1963) or Bhagwati (1966).

Even in economically developed countries there may be regions exhibiting many of the characteristics of underdevelopment. Such regions differ from underdeveloped countries in that they have much more ready access to capital and technical resources but, nevertheless, many of the programs devised to

stimulate their development are analogous to the methods employed in underdeveloped nations. In Canada, as in many other regions of the world, forestry is frequently used as a vehicle for development in such depressed areas.

Justification for Funding Forestry Operations

The simplest justification for funding of forestry operations is the expectation of an adequate rate of return on investment (from 8 to 10 per cent [deflated] on equity capital after taxes), with reasonable assurances for preservation of the capital involved. Unfortunately, few forest management activities in North America offer rates that attract capital directly (Smith, 1968). In many other parts of the world which have potentially high rates of return from forestry, risks of capital loss through natural calamity, revolution, or nationalization are high. Even the financing of relatively safe investments in manufacturing using already grown timber resources encounters major difficulties in current markets. In the 1960's, average rates of return on capital invested in forest-based industries in North America eroded slowly from about 8 to about 4 per cent. The rates of return on equity capital were interesting for only a short period in the years 1973 and 1974 but since then have fallen rapidly. For about 18 months, rates were adequate to maintain investments but the uncertainties associated with the energy crisis and problems of inflation and the past decade of low returns meant that almost no new capital could be attracted to the industry. Only the expectations of better things to come from pent-up needs for housing and long-term boosts in demand as a result of population growth are sustaining confidence of investors in many forest-based industries. Most of these problems are found in much more serious forms in developing countries where central banks may expect 12 per cent and commercial banks 36 per cent rates of return per annum on relatively short term investments. Obviously the justification for funding forestry in such circumstances must be found principally in the indirect role forestry can be expected to play in the development process. Several economists have addressed themselves to this subject including Westoby (1962), Gregory (1965), Lewis (1966), Nautiyal (1966), Santa Cruz (1966), Zivnуска (1966), Sartorius and Henle (1968) and Algerve (1969).

In comparing investments in the forestry sector with alternative uses of capital, attention must be paid to the ability of such investments to achieve the overall objectives of development. Factors to be considered in an underdeveloped economy may be very different from those influencing the investment decision in a developed country. Demand and supply

situation for forest products, the nature of the production functions for forest products, and the impact of secondary and external effects resulting from forestry activity must be analysed.

One argument frequently put forward for investment in the forestry sector of underdeveloped countries is that of import substitution. Many countries, in spite of relatively low per capita consumption of forest products, already exhibit a trade deficit in such products, particularly pulp and paper. Forest products, especially pulp and paper products, exhibit high income elasticities of demand, particularly at low absolute levels of income and, therefore, trade deficits in these products can be expected to increase as development proceeds. Forest products often play important roles in meeting basic consumer demands. Lumber and panel products find their principal use in construction. Lumber, particularly, frequently provides a readily available raw material for house construction requiring only the simplest of tools and a minimum degree of skill for its use. However, these products have many substitutes and their wide-spread use is usually confined to those countries well endowed with forest resources. Investments in saw-milling capacity are only justifiable, as a rule, in those countries which have an existing supply of raw material. Rarely can the creation of a forest estate for sawmilling purposes be justified during the early stages of development.

Pulp is mainly used for the production of paper for industrial (packaging) and cultural purposes. During the early stages of development, cultural uses of paper are of overwhelming importance and in this use wood pulp has few substitutes. Not only is increasing use of paper a function of increasing per capita income, but availability of paper for educational purposes may help stimulate development. Under these circumstances investment in the creation of raw material supplies for a pulp and paper industry may be justifiable. In fact, few less developed nations have a sufficient supply of long fibred raw material for pulping purposes.

By increasing domestic supplies of wood products, it is argued, valuable foreign exchange will be released for other purposes, particularly for the purchase of capital equipment.

Westoby (1962) pointed out that the wider the range of the production function and the greater its flexibility relative to scale, the more suitable a sector is for development in the less developed countries. Forest industries are said to present many advantages in these respects. Many forest operations are very flexible in the relative proportions of their labour and capital requirements. Labour intensive harvesting methods, for example, can often compete favourably with more sophisticated capital intensive techniques and early mechanization is not a necessity.

Wood is a versatile raw material and its physical properties make it easily workable with simple tools to produce a wide variety of useful consumer goods. In the sawmilling industry, economies of scale are not too important and small units can function efficiently with a minimal capital investment. The production of panel products generally requires a greater capital investment than sawmilling but non-integrated veneer plants require small amounts of capital and can be operated as very small units. Of the major finished board products, particle board offers, perhaps, the most promise for underdeveloped countries. The manufacturing process is less capital intensive than for the other board products and raw material of practically any species and any quality can be used. Pulp and paper manufacture represent the most capital intensive wood conversion processes. Economies of scale are very important in this sector, technology is highly sophisticated and skilled labour is essential. Mechanical pulp production is the least capital intensive method; however, power requirements for this process are relatively high. Paper production is less capital intensive than pulp manufacture and non-integrated, speciality paper plants may operate successfully on a small scale.

Secondary and external effects of investments in forestry may be more important to developing economies than the more direct benefits. These effects are many and varied. The importance of forest industries to the whole economy can be partly determined by studying their ability to supply raw material and goods necessary for the functioning of other sectors (forward linkages) and their input requirements which stimulate productive activities in other sectors (backward linkages). Westoby (1962), after studying input-output tables for four developed countries (Japan, Italy, United States of America and Norway), concluded that the sector of forest products as a whole has a high degree of indirectness and of interdependence with other sectors, i.e. it exhibits strong forward and backward linkages. Nautiyal (1966) critically examined Westoby's interpretation of the available input-output statistics and suggested that wood and wood products industries in general have poor backward but strong forward linkages. The backward linkages for the paper and paper products sub-sector tend to be greater than for the rest of the forest products sector.

Forestry activities are said to give rise to important external economics arising from the fact that the location economies of the industry are such that manufacturing plants tend to be situated close to the supplies of raw material. Forest industrialization, therefore, usually gives rise to substantial infra-structural developments in the form of roads, power developments and service industries. Forestry played a significant role in the westward expansion of

American nations and today in Canada, forestry still is in the vanguard of expansion into hitherto underdeveloped regions. In British Columbia as many as 10,000 miles of forest road are constructed annually. Power developments on the Peace River were sited partly to meet the demands of the burgeoning interior pulp industry and many viable communities have grown up around forest industry developments.

As pointed out above, forestry operations can be very labour intensive and another indirect benefit often claimed for forestry is its ability to provide employment in rural areas where disguised unemployment and underemployment frequently are a problem. Because of the flexibility of many forestry operations, it is often possible to plan labour needs in a way which will complement the agricultural employment patterns and provide much needed jobs in periods of seasonal farm unemployment.

Finally, a whole set of indirect benefits are said to accrue to forests which stem from their ability to stabilize soils, modify microclimate, influence the quality and quantity of water in streams and rivers, create a suitable habitat for many species of wildlife, and provide a desirable environment for outdoor recreation. While no one could deny that such factors should be given consideration, there is a tendency for conservation-minded foresters to overstate their importance (Smith and Haley, 1972). Environmental objectives may have a place in a country's long term development plan. However, except in special circumstances, they cannot be expected to receive high priority in countries where the immediate problems are to seek ways of raising chronically low per capita incomes and to provide increasing populations with access to a supply of basic consumer goods. The current preoccupation with environmental management in North America and Western Europe is largely a product of affluence and a luxury no underdeveloped nation can afford (Smith and Haley, 1970). We cannot share the enthusiasm shown by Sartorius and Henle (1968) for the essential ecological role of forestry activities in less developed countries. On the contrary, there is some evidence that misguided "conservation" efforts may actually retard rather than advance the achievement of development goals. Commonly too much is expected of forest cover in watershed management and flood control, and too little attention given to reducing clean cultivation in the struggle for cash from agricultural crops on steep slopes (Smith, 1973). Arguments about the meaning of sustained yield are continuing.

Sources of Funding for Forestry Operations in Developing Economies

In considering sources of funds for financing forestry

operations, a distinction may first be drawn between internal (domestic) sources and external (foreign) sources.

Domestic Sources of Capital

In underdeveloped countries, domestic supplies of investment funds are generally severely limited, and directing these funds into their most beneficial use (Haley, 1969) is an important function of government development policy. In those countries which are well endowed with them, forest resources may present a ready source of capital if their utilization is properly planned. Forestry may be an important factor in what Higgins (1959) described as "up-by-the-bootstraps" development. The argument for this type of development is that the disguised unemployed in agriculture could be diverted into forestry projects at zero social opportunity cost. Farmers who had previously supplied their food to the unemployed would be able to sell their surplus to the same people who would now be wage earners. Farmers would be able to pay higher taxes which would be used to invest in improved agricultural production. Increased agricultural surpluses and forest products would be exported to earn foreign exchange for the purchase of scarce capital goods. Thus the process of economic development would be generated with little reliance on foreign capital. The forestry sector is particularly amenable to such arguments because it is said to be, to some extent, self propelling (Westoby, 1962; Zivnuska, 1966; Sartorius and Henle, 1968). That is, initial investments result in the expansion of complementary production within the sector and the strong forward linkages of the sector promote further expansion in other industries. Such arguments are persuasive but, perhaps, utopian. As Higgins (1959) pointed out, "up-by-the-bootstraps" development has succeeded only where severe sacrifices have been forced on the mass of the population to provide a basis for capital accumulation.

Forest exploitation may provide a surplus of capital for investment in other sectors of the economy. A country may well choose to exploit its forest resources with little thought for establishing a strong or permanent forestry sector. Rapid conversion of forest resources to more desirable forms of capital may take precedence above all else. In some cases, conservation policies which limit the rate of exploitation and demand high investments in reforestation may prevent the use of the resource at the optimum rate for maximum capital accumulation. Such policies, which are frequently a legacy of colonial administrations (Boateng, 1968) may render a disservice to the cause of economic development. In underdeveloped economies there are powerful

arguments for adopting the attitude that conservation is simply a means of transferring income from the present population which is poor, to future generations which, provided development plans are successful, will be much wealthier. While there will, inevitably, be certain costs attached to accelerated forest exploitation, such costs must be explicitly weighed against the advantages of increased capital availability. It may be argued that as incomes increase the less tangible benefits of the forest resource take on a new importance. The answer to this plea of course is that when that time is in sight society will, if it is deemed necessary, be in a position to reinvest in the forest resource except of course where there has been extreme and irreversible site deterioration. The Southern Pine Region of the United States is an excellent example of liquidation of timber values without regard for sustained yield. The rapid growth rates of residual trees, improved fire control and use, and changing utilization opportunities, have resulted in a highly productive forest industry. Even today when intensive land management is speeding growth of the "third forest" there is little concern for traditional forest regulation and market factors appear to prevail in determining the rates at which timber values are drawn down or accumulated.

If a decision is taken that forestry should play an important role in the development plan, it may be necessary to direct the limited supplies of domestic private capital in the economy into this sector. Even if, as already mentioned, forest industries once established are self propelling, initial capital inputs, often in substantial amounts, will be necessary. Governments may use various means to encourage capital to flow into a particular industry or region. The governments of developed countries are faced with similar problems when they attempt to induce capital inflows into favoured industries and depressed areas. Inducements may include such measures as tax incentives, stumpage concessions, ready access to credit, technical assistance and direct subsidies. Tax incentives may take many different forms. New industries may be exempted from taxes either partially or wholly, until well established. Such measures should be handled with care because there is a very real danger of fostering enterprises which depend entirely on tax shelter for their continued existence and will never be capable of independent operation. Once such an investment has been made it may be very difficult, both politically and socially, to withdraw support. Selective tax concessions such as profit averaging and accelerated depreciation allowances may be much more satisfactory. Special tax measures to promote forest management may include property taxes of a fixed annual sum based upon natural site potential rather than the conventional *ad valorem* basis, and higher tax rates on temporarily non-

productive forest lands. Abolition or reduction of estate duty on forest enterprises may be an important means of furthering forest investments in the private sector.

Where forest land is largely in the public sector, as it is in most of the Canadian provinces, then the granting of cutting rights to private industry becomes a very important function of public policy and can play a major role in bringing private objectives in line with public aspirations. Thus, the granting of exclusive long term timber licences large enough in size to support a lumber mill, pulp mill or integrated forest industry complex may induce much needed capital to flow into the sector in strategic locations. Such policy should of course be carefully administered in order to strike a desirable balance between the need to provide forestry industries with sufficiently secure supplies of raw material to justify high capital investments, and the need to encourage efficiency by allowing competition some influence in determining timber allocations. British Columbia forest administrators, particularly, have a very great deal of experience in designing forest tenures to meet specific management aims. The development of the forest industry in the Province since the Second World War has been closely tied to public forest land tenure and timber disposal policies. Stumpage charges for public timber may also be varied to provide incentives for industrial investments. Stumpage charges may be maintained at a low level or even eliminated where the less direct benefits of forestry activity are thought to justify such measures. There is merit in the argument that stumpage charges on public timber should be zero and that government should rely on income taxes to recoup a return from the resource base for the public purse, provided that this does not lead to neglect of forest lands.

During 1974, there was much effort to review tenures and to develop improved policies for the forest resources of British Columbia (Pearse, Backman, and Young, 1974). The Province moved to increase Royalties on old temporary tenures granted on two million acres to bring charges in line with current cutting permits. A Timber Products Marketing Act was established to maintain competition in the Coastal log market and to maintain a fair return to producers of Interior chips. The chip price was raised from about \$10 to \$35 a bone-dry unit (2,400 lb). Major revisions in methods of stumpage appraisal were recommended. Some of the planned changes have been delayed by the recession in all sectors of the forest based industry. The review of existing forest tenures is now being expanded by a Royal Commission analysis of rights and uses of timber and other forest resources under the 1974 Task Force Chairman, Dr. P. H. Pearse.

Access to normal bank credits may be denied to

would-be investors in forest resources because of the attendant risks of such ventures. Special credit institutions may be necessary to promote forestry if heavy reliance is placed on the private sector. Such institutions may be organized along the lines of agricultural banks or capital may be made available through national forestry funds, or government sponsored forest development corporations.

Direct subsidies may play an important role in fostering investment in the forestry sector. Such methods are widely favoured by developed countries. Most European countries provide direct subsidies to private forest owners for both investment in forest plantations and forest maintenance purposes. In Canada the Federal Department of Regional and Economic Expansion under the Regional Development Incentives Act provides direct capital incentives to a wide range of manufacturing and processing industries, including pulp and paper and sawmilling, which establish or expand plants in areas designated as regions of slow economic growth. Such regions include parts of every province. Up to 12 million dollars in cash grants would be made available depending upon the capital investment and the number of jobs created. For new plants, up to 25 per cent of capital costs, plus \$5,000 for every job created, could be made available.

Some of the provinces also give direct incentives to industry. A most remarkable example is that of the Prince Albert Pulp Company. This company is a partnership between the Province of Saskatchewan and Parsons and Whittemore. Parsons and Whittemore acquired 70% equity in the company at a cost of \$7 million and the Province was assigned 30% equity. The Province guaranteed a loan of \$U.S. 46 million floated by P. & W. in the United States. In addition, the Saskatchewan government built extensive all-weather forest main-haul roads and a natural gas line was installed to serve the mill. Saskatchewan Pulpwood Ltd. was established by the Province and P. & W. to supply timber to the pulp company during the first four years of operation at a basic price of \$18.50 per cord, f.o.b. at the mill. Location in Prince Albert was encouraged by a Federal Government capital subsidy of \$5 million and tax concessions were granted to the mill by the city of Prince Albert. Finally, the Saskatchewan government gave Prince Albert Pulp an 18,000 square mile forest management licence on a 50-year renewable basis, with low stumpage rates (Pulp and Paper Mag. of Can., Oct. 4, 1968). This pattern was to be continued with construction of a mill at Meadow or Dore Lakes in Northwestern Saskatchewan. If a pulp mill were constructed the federal government would be asked to provide a \$12 million industrial incentive grant. The province would guarantee a \$70 million loan for the project while the

remainder would come from the company and the province. As in the case of Prince Albert Pulp Company, 70% of the equity would be provided by the firm of Parsons & Whittemore and 30% by the Province of Saskatchewan.

Prince Albert Pulp Company has developed effectively. However, plans for a new mill in North-western Saskatchewan did not materialize. In fact, some claim that the controversy about the mill helped defeat the Provincial Liberal government. The New Democratic Party which succeeded the Liberals moved vigorously to assert the public interest in full and rationalized utilization of Saskatchewan's timber resources. Existing forest management agreements were revised to force utilization of the larger and better quality logs for dimension lumber and veneer and plywood. The Province has entered directly into manufacturing through its Timber Marketing Board and has substantially increased its investments through Saskatchewan Forest Products Ltd. Non-market resources, environmental and recreational values, and welfare and employment issues have been given much attention in plans for expansion and improvement of the wood-based industries in Saskatchewan.

The early development of Prince Albert Pulp Company and the first period of growth of Churchill Forest Industries at The Pas in Manitoba were described by Mathias (1971) in two provocative chapters. The aspirations of Saskatchewan and its difficulty of competing for capital through normal channels were described under the query of its Premier - "Wait a million years for another mill?". The Churchill Forest Industries project was introduced under the heading - "A good deal for Manitoba".

In Manitoba, the Provincial Government may end up contributing more than \$90 million for establishment of the pulp mill complex at The Pas.

On the other hand, Ontario, which must contribute, at least indirectly, to any federal subsidy to attract mills to economically depressed parts of Canada had not enjoyed the benefits associated with a new pulp mill for 21 years (Ont. Economic Council, 1970).

Foreign Sources of Capital

In most underdeveloped countries it is impossible to raise sufficient capital resources domestically and use must be made of external sources of finance. Foreign sources of capital include foreign private investors, foreign governments and international agencies. Most underdeveloped countries find it necessary to make use of all three sources. While policies may favour foreign aid over direct foreign investment there is little doubt that certain development projects can be more efficiently organized on a

private enterprise basis while others lend themselves to institutional forms of financing. In the forestry sector, the development of forest product manufacturing facilities may be best financed privately while investments in the forest resource are usually best handled by the public sector.

Foreign investment consists of two types, direct investment and portfolio investment. In most underdeveloped economies, foreign portfolio investments are of minor importance. In recent years, we have entered the era of the large multi-national corporation and an increasing number of companies, in the highly industrialized western countries particularly, are seeking to diversify their businesses through overseas investments. The most important source of private international capital is the United States which has in excess of \$100 billion dollars in direct private investment abroad (Green, 1970). Many forest companies are entering the international investment field including firms in the United States, Canada, United Kingdom, Germany, Sweden, Finland and Japan. Why do companies, particularly forest companies, decide to undertake overseas investments? Reasons commonly cited (Finnegan, 1970) include supply considerations, market demand, and avoidance of restrictive domestic legislation. In many of the developed forest regions of the world, especially the United States and Western Europe, forest resources are fully committed to existing plant capacity and can only be increased at considerable expense. Under such conditions there are strong incentives for companies interested in expansion to seek raw material supplies in other countries. Thus a great deal of foreign capital has been attracted to British Columbia in recent years by readily available supplies of relatively cheap pulpwood associated with lumber production in the interior and northern areas of the Province. Other attractions to would-be overseas investors may include cheaper supplies of power and labour than they could find in their home country. In many instances, the best way for a company to expand into a foreign market is to establish manufacturing capacity in the region concerned. This is particularly so if there are high tariff barriers against importing the product in question. Domestic anti-trust restrictions are increasingly forcing the forest industry giants in the United States and Canada to seek investment opportunities elsewhere in order to achieve continued growth. Repressive anti-pollution legislation in the economically advanced nations also will encourage forest companies to seek investment opportunities in the underdeveloped world.

In spite of the increasing volume of direct foreign investment, underdeveloped countries should not be deluded into thinking that private foreign capital can be easily attracted. The bulk of direct foreign

investment takes place between economically advanced nations. For example, direct United States foreign investment in Canada alone in 1965 amounted to \$14 billion. Private corporations are extremely cautious about foreign investment opportunities and are suspicious of countries with economic and political instability. Their reasons for investment are not altruistic; they are interested in making as high a profit as possible and may demand extremely high rates of return on invested capital to offset the risks generally associated with less developed economies. Most large companies have developed methods of assessing the relative desirability of overseas investment opportunities. Brune (1970) described the techniques employed by the Weyerhaeuser International Company. This organization has considered the investment potential of 140 foreign countries and graded them as desirable, marginal and undesirable for Weyerhaeuser investments. In ranking countries, fifteen factors are considered including such things as political stability, economic growth rate, attitude towards foreign investment and available incentives, position on U.S. foreign policy, conversion of currency to foreign exchange, rate of inflation, probability of expropriation or destruction, local labour supply and local management potential. Brune noted that most countries are rated as undesirable.

In order to attract foreign capital, underdeveloped countries must be prepared to offer incentives. In general, direct economic incentives are not as important as measures designed to reduce risk and uncertainty. For example, governments might make insurance against destruction of property and loss of life of personnel available to foreign investors. Guarantees may be made that no expropriation will take place for a certain number of years or until a reasonable return has been earned on the investment. Alternatively, a reasonable notice period of expropriation might be agreed upon plus guarantees of fair compensation to be decided, if necessary, by international arbitration. Some provision must be made for the investor to transfer profits to the home country and to withdraw depreciation allowances if a planned curtailment of the investment is deemed necessary. Domestic taxation laws should not discriminate against foreign investors and regulations and controls, which are not essential to the pursuit of the domestic government's policies, yet may be a major irritant to potential foreign investors, should be reviewed and, if necessary, dispensed with. In the case of forestry operations it will invariably be necessary to provide the foreign company with guaranteed supplies of timber in sufficient quantities to at least cover the amortization period of the planned capital project. Often enough wood to serve double the capacity of the first stage of a mill is

expected by investors in Canada. Economic incentives such as those described previously for the encouragement of domestic investment in the forestry sector might also play an important role in attracting foreign capital; however, no special policy to provide opportunities for profitable investment is usually necessary or wise.

What are the benefits and costs to the host country of direct foreign investment? Firstly, it does make capital available in sufficient quantities to carry out specific projects efficiently. If these projects are capital intensive they may never be undertaken otherwise. Secondly, direct investment largely solves the problem of transferring technical know-how and managerial ability to the underdeveloped economy. Even when sufficient supplies of capital from other sources are available, these factors often impose a serious constraint on the ability of an underdeveloped nation to use its resources efficiently. In addition, arrangements might be made to train technicians and managers within the host country. In fact, many overseas investors have a policy of replacing their own personnel with employees drawn from the local labour force at the earliest opportunity.

On the debit side are considerations of control over the actions of foreign investors and threats to the integrity of national sovereignty. It has been pointed out above that in order to attract foreign capital, the host country might have to offer foreign investors terms which may involve placing some restrictions on the government's freedom with respect to economic policy. A foreign company once established might be very difficult to control. Most multi-national corporations desire 100 per cent ownership in foreign subsidiaries and, if this is not possible, like to have a clear majority position. Equal partnerships and minority positions are totally unacceptable to most companies. In Canada at the moment there is a great deal of concern amongst some economists, politicians and members of the general public that national sovereignty is threatened by the country's heavy reliance on direct United States investment. Canada has been described as an "economic satellite" of the United States, and calls for restrictions on foreign ownership in the country have been made (Levitt, 1970). It is often claimed (Higgins, 1959) that foreign investment in a sovereign country with its own corporation taxes, monetary policy and foreign exchange controls is very different to investment in the colonies by citizens of a colonial power. Big business exerts influence on government policy in any country where it exists, whether it be domestic or foreign owned. However, the critics of direct foreign investment are not so much concerned about big business exercising control as they are about the governments of the

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countries in which the foreign capital originates influencing the domestic and foreign policies of the host country. These dangers are very real but can be mitigated by diversifying the sources of foreign investment funds. Certainly, any country planning to encourage direct foreign investment should consider carefully the costs and potential dangers of such a policy and do everything within its power to minimize them.

In most undeveloped countries a substantial role will be played by foreign aid. This takes two main forms, multilateral aid and bilateral aid. There are a large number of international development agencies which supply funds, mainly in the form of credits, for forestry development in less developed countries. These include the International Bank for Reconstruction and Development, the International Development Association, the International Finance Corporation, the Inter-American Development Bank and the Commonwealth Development Corporation, plus many regional organizations.

In addition to the international agencies, there are several bilateral capital assistance programs to underdeveloped areas which might be used to support forestry projects. Such support is usually in the form of loans but may be outright grants. One difficulty with bilateral aid is that it is frequently encumbered with conditions and restrictions which reduce its usefulness. For example, conditions frequently attached to United States assistance include: requirements to ship half the goods purchased on U.S. ships; provision that all imports be purchased in the United States regardless of relative cost; earmarking funds with little thought for a country's actual needs; and threats to withhold aid if a country does not support United States foreign policy, expropriates United States direct investments or purchases "sophisticated" armaments. Such practices were deplored by Governor Nelson Rockefeller in his controversial report to President Nixon on United States policy in the Western Hemisphere, on the grounds that such measures increase development costs, violate the sovereignty of other nations and weaken United States efforts to assist developing countries, "From the point of view of the recipient country, loading extraneous conditions on development loans amounts to waste and misuse of funds which they must repay with interest (Rockefeller, 1969).

One difficulty which may arise with international and bilateral loans is in the terms of repayment. Some countries, even when repayment terms are lenient and interest rates low, find themselves in a position where interest and amortization charges on outstanding development loans put a serious strain on foreign exchange reserves. Such situations may put such a severe constraint on development plans

that the original purpose of granting aid is defeated. This situation has frequently led to the suggestion that aid in the form of direct grants rather than loans would be better in the long run for everyone concerned. However, in the case of bilateral aid, it is doubtful whether direct grants would receive political support in the granting countries. In order to solve the repayment problem, many loans are now made in the form of "soft loans". These are loans which can be repaid in domestic currency. It is argued that such loans are easy to repay and, therefore, provide real assistance while "the fact that they must be repaid helps keep the development process realistic" (Rockefeller, 1969). As Higgins (1959) has pointed out, however, no country with a government controlled central bank will experience difficulty in raising domestic currency for repaying loans, and the psychological effect of a "soft loan" is very little different to that of a grant. Yet the overall effect of such repayment procedures might be inflationary.

Conclusion

The ways in which investments in forest resources and forest based industries can serve as a vehicle for economic development on a national or regional scale have been described. It has been shown that there may be excellent reasons for directing available funds from a variety of sources into the forestry sector. Yet it must never be forgotten that forestry is not an intrinsically desirable activity.

The primary purpose of any investment is the formation of capital. This is particularly so in an underdeveloped economy. When investible funds are in short supply relative to the available investment opportunities, the return to limited capital inputs must form the primary basis for choosing between investment opportunities. In some cases forestry will rank high in real productivity amongst the available alternatives. In many cases, on the other hand, it will be difficult to justify forestry using conventional criteria. In such cases, the indirect benefits of a forestry based investment program may be invoked to justify its implementation. Under such circumstances, planners must exercise caution and only proceed after careful analysis has shown that such investment will indeed contribute to the sustained social and economic well-being of the region and/or nation and that a favourable trade-off of direct for indirect returns truly exists. It is very easy, as experience has often shown, for planners and administrators to become over-enthusiastic about the indirect and intangible benefits of an otherwise inferior investment program.

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DISCUSSION OF PAPERS BY MESSRS HELLES, BLACKFORD, HALEY AND SMITH

CHAIRMAN: Dr. O. O. OLAWOYE

The paper by DR HELLES exemplified the use of post-evaluation exercises of which further examples from other countries were cited by members. Discussion concentrated on the estimation of multiplier effects and their usefulness in relation to the study of income redistribution.

The group welcomed the project data handbook of the British Overseas Development Ministry together with the introductory note by MR BLACKFORD. The handbook was a valuable aid to planners, especially non-foresters. The need was recognised for more work on the compilation of such handbooks including the provision of more complete bibliographies on relevant source material.

In considering PROFESSOR SMITH's paper, the meeting split into two camps on the vexed question of the importance to be attached to environmental effects, such as erosion and pollution, as opposed to income generation – indeed economic survival. In relation to the point of timing of exploitation raised in an earlier discussion, it was necessary to consider whether the price obtained for export material might not rise at some later period and thus justify postponement of cutting. The whole question of forest

removal had to be reviewed in relation to forest industry demand, barriers to trade and other commercial considerations. On the environmental side, a generally greater dependence on land in developing countries implied the need for an even greater concern over protection of the soil. No conclusion was reached although there was general agreement that the consequences of any particular course of action in both commercial and environmental terms should be stated. As PROFESSOR SMITH and DR HALEY pointed out in their paper the maximisation of net discounted revenue was a common though inadequate criterion of investment appraisal for forestry projects. Apart from environmental effects, the contribution of a forestry project to infra-structural development was often important. Some consideration should be given, when a private sector interest existed in forestry, to the sort of subsidy and tax arrangements commonly found in developed countries. The group considered that it was quite wrong to suggest that forestry was not generally desirable, although it was reasonable to ask whether intensive investment programmes were justifiable. In assessing the resource cost of labour, the costs incurred by workers moving from circumstances where they were unemployed or under-employed should not be ignored.

Paper 13

DYNAMIC SYSTEMS ANALYSIS AND FOREST
DEVELOPMENT PLANNING

By A. A. STRAIN

Department of Forestry and Wood Science, University College of North Wales, Bangor, Wales

The trend in Western technology seems to be towards the use of equipment incorporating ever larger amounts of capital investment and operated by fewer and more highly skilled workers, not least in the timber processing industries. Complaints are voiced frequently that this trend militates against the efforts of the developing countries to catch up with the West, as their resource endowments are rather different, with relatively plentiful unskilled labour and a scarcity of investment capital. There are too many examples of highly automated mills being introduced into the developing countries, based on the latest and most expensive equipment, where the economic scale of operations is too large for the available market and where the supply of skilled operatives and management is inadequate for the technology involved. Where makeshift attempts are made to promote the artificial labour intensification of capital intensive technology, these problems may well be compounded. The wastage of resources in such mills is especially serious as their opportunity cost is high. Regrettably it is true that some of these 'white elephants' have sprung from a politically motivated desire for autarky, but in most cases the blame can be attributed to inadequate overall planning (Sutcliffe, 1971).

The inadequacy of the planning has many causes but one of the more important and underrated factors has been the inept application of analytical techniques by people who should know better. The unsuitability of Western technology in terms of resource endowments is not confined to the production of goods but it is also evident in the service trades, and especially in the consultancy business. Since the war, the developing countries have been subjected to a barrage of well meaning advice from consultant (mainly Western) experts, sponsored by UNO and similar bodies. Often this advice has been unhelpful, as it has been based on the uncritical translation of analytical techniques, invented and applied in the West, to the development context, where the structural composition of the economy and the incentives to performance are radically different. Generally speaking, in the developing countries good statisticians are even scarcer than good economists, so that the data base is seldom suitable for the application of the more common OR techniques, such as linear or dynamic programming. Even where it is suitable, the local administrators, who are

charged with implementing the results, often experience difficulty in comprehending the rules governing the application of these techniques. Even in the West, the arcana of OR sometimes defeats the forester or industry planner, but in the developing countries, the lower educational base and the general lack of numeracy make the communication problem especially difficult. In particular, the justification and implications of the assumptions, which the consultants seem forced to make because of the poor data base, are rarely understood by the persons for whose benefit the analysis is undertaken (Maddison, 1964).

Fortunately, in systems theory, we now have an analytical tool with powerful planning capability, whose minimum information requirements are likely to be well within the capacity of the developing countries. Although there are many examples of mathematically complex and statistically exact systems studies (Colella, *et al*, 1974), the elaboration of the system is based primarily on the precision of logical relationships rather than the accuracy of statistical data, and the mathematical expression of the relationships can be based on nothing more complex than difference equations. Accordingly, the systems exercise can be both useful and informative even in situations where the initial data base is poor. Obviously, some hard data are required, and ideally all the data should be hard, but systems analysis can tolerate a substantial margin of error in the estimates for the component variables without seriously limiting its usefulness as a guide to planning. Moreover, it can capitalise in a meaningful way on the experience of the people on the spot. This not only improves the precision of the system representation, but it also contributes materially to their comprehension of the system results.

Not only are the minimum mathematical and statistical requirements of systems analysis comparatively low, but it avoids some of the major technical limitations of the commoner analytical techniques. All analytical exercises should start with a clear statement of objectives. In practice, this is seldom a simple matter, as the objectives tend to be multiple and frequently in conflict. In programming formulations, the resolution of such conflict takes the form of identifying one of the objectives as the over-riding one and expressing the others as constraints on the fulfilment of this. Such a procedure is inherently unsatisfactory, as the mathematical

optimisation of the overriding objective function often entails only the minimum tolerable achievement level for the others, without clearly indicating the tradeoffs which are possible at the suboptimisation levels. However, the development planner usually wishes to know, not only the mathematically optimal solution, but also the range of suboptimal alternatives, with their tradeoffs, which are open to him. Formulation of the problem in terms of a single objective function, while mathematically convenient, is likely to be limited usefulness when dealing with the complexities of economic reality (Hoag, 1973).

On the other hand, the primary objective of systems analysis is the understanding of the complexity of actual relationships. Only when these relationships have been fully defined and their interactions clearly exposed, is it proper to consider objectives of the resource allocation type in detail. By this time however, the tradeoffs have been elaborated for all feasible ranges of the data (and indeed plotted on a graph), so that the planner is fully aware of the consequences, both proximate and non-proximate, of his actions.

In any case, the horizon of relevant data for systems analysis is usually much wider than that available for mathematical optimisation problems. Most systems are very much time oriented; the analysis is based usually on non-linear data and there is no inherent limit to the number of variables which can be included. The formal statement of the situation can then be as realistic as we care to make it. Indeed, the drawback to systems formulation is seldom the lack of data but rather its superabundance. Most of the effort goes into the identification

of the relevant variables and their interrelationships rather than the collection of statistics relating to them.

From the above, the impression might have been given that systems modelling is a rather simple matter. While the principles are straightforward enough, their application in a real situation is not at all easy. The most important activity is the search for the fundamental linkages among the variables in the system. Few of these are likely to be apparent on first inspection and the searching process is a highly skilled one. In the development context, the simplest and most obvious systems model will probably be adequate to start with. By a process of iterative refinement, as the logical basis of the linkages becomes clearer, it will be possible to devise more realistic models.

Most economic systems models are based on the closed system type where the values of the variables are determined by their mutual interaction and where there is a continuous feedback and monitoring of system performance. For example, a model depicting timber harvesting and distribution would include not only the flow of roundwood from the harvester to the using mills but also a backward flow of orders from the mills to the harvester. Both flows in turn would be generated by the continuous two way flow of information, relating the current supply of roundwood to the anticipated needs of the mills on the one hand, and to the availability of harvestable timber on the other. A closed model of this type can be represented in its simplest form by a circular diagram as shown in Figure 3.

With the rapid growth of systems literature since the 1950's, several distinct techniques are now

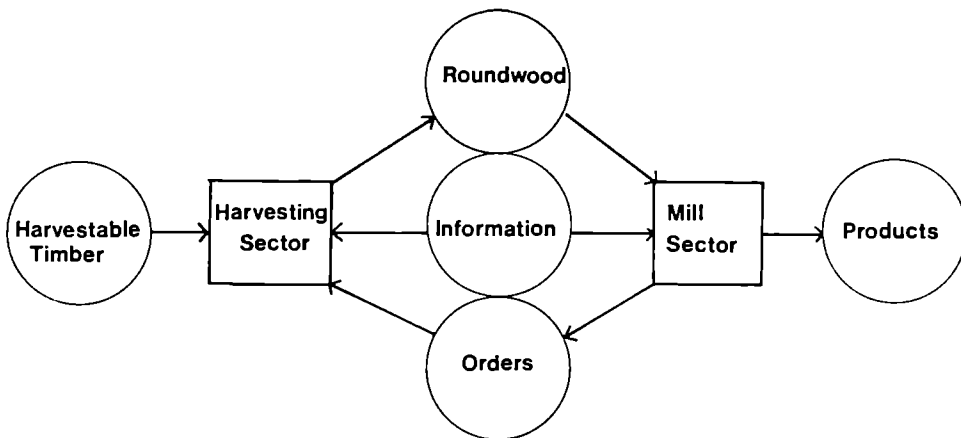


Fig. 3. A closed model representing the flow of round wood towards products and the corresponding flow of information in the reverse direction.

available for modelling. In my view, the technique which is most suitable for application to economic and planning problems in the forestry sector is the industrial dynamics method, which was first elaborated by Forrester (1961) in his book of the same title. In the remainder of this paper, an attempt will be made to illustrate some of the ways in which Forrester's methodology can be applied to forest sector planning problems in developing countries.

Industrial dynamics is based on the identification of stock levels at various parts of the system, together with their associated inflow and outflows. By carefully establishing the precise relationships between the stocks and flows, and by successively evaluating their levels and flow rates at very short time intervals, a continuously flowing system of interconnected equations can be built up. Using Forrester's notation, we can denote the current evaluation time as K , the previous evaluation time as J , and the interval between them as JK . This interval, when expressed in terms of so many time units, is called DT for delta time. Similarly, the next evaluation date and interval are labelled L and KL respectively. The current level in a given stock is defined as the sum of the previous level and the difference between the inflows and outflows during the time interval. In the same way, the outflow rate (in units per time period) from any stock level is defined as the stock level divided by the average length of time that the items are held or delayed in the stock. The two equations which form the basis of Forrester's industrial dynamics models can now be set down in general terms as follows:

LEV. $K = \text{LEV. } J + DT (\text{IN. } JK - \text{OUT. } JK)$
and

OUT. $KL = \text{LEV. } K / \text{DELAY}$

These two equations are self explanatory, except for the valuation of DT and DELAY . The solution interval, DT , should be short enough to permit the continuous smoothing of the flow rate changes and to prevent the reduction in the stock by more than a small fraction in any time period. The DELAY value is the average delay which is specific to the variable concerned. This may well be the summation of several distinct delays incurred at that stage in the system. As they are constants, delays have no time notation.

To illustrate the technique of model building using industrial dynamics, a simple descriptive model will now be developed for the operations in the forest economy of a 'typical' tropical developing country as shown in Figure 4. Here, it is assumed that the aim of planning is to utilise the forest resource as much as possible in the domestic processing industries, while continuing to export logs directly.

Timber of various species is grown at different

rates in a tropical forest. From the climatic, edaphic, financial and managerial inputs, a level or stock of standing timber is calculated. Some of this growing stock is cut, then skidded to the roadside and stacked. These roadside stocks in turn are collected and hauled to a central forest depot for sorting. From the sorted stocks, deliveries of suitable species and grades are made against orders to the ports for export, to the processing mills and to the fuelwood market. For simplicity, we shall assume that there is only one port in the country, one mechanical and one chemical processing mill. We now have five circular flows of roundwood, information and orders connecting the harvesting sector to the forest, the port, the processing mills, and the fuelwood market. Two further circular flows, this time of processed wood, information and orders, connect the two mills with the port, as they are likely to export some of their output. A similar pair of circular flows connect the mills with their respective domestic distribution networks, which in turn are connected to the sawnwood, panels and pulp and paper markets. A further circular flow, this time composed of residues, information and orders, connects the mechanical processing mill with the chemical processing mill. With the addition of the eight circular flows of processed wood information and orders and the one circular flow of residues information and orders, the total flows in the system are now fourteen. A schematic diagram is given overleaf where each of the connecting lines represents the circular flow of wood material, information and orders.

Each of the eleven sectors has a flow of wood material inwards, reflecting its purchases (or, in the case of the forest sector, reflecting its annual increment and a flow of wood material outwards, reflecting its sales. Between each of the inward and outward flows is a stock level. The outward flows from any stock level are increased, diminished or left unaltered in any time period by the decision taker and the flows decided upon become the inward flows to some other stock level. Thus, decisions can be thought of as valves regulating physical flows. But it is not just the physical flows of wood material which have stock levels associated with them. Order flows and information flows also have stock levels. For example, incoming orders can be accumulated on a stock of unfilled orders if the order processing rate is below the incoming order rate. Again, information relating to past sales experience and future estimates can be accumulated in a stock level before it is used for making decisions. Order flows are self explanatory, but the two way information flows include information about current and expected order, production and sales rates, the rate of capacity utilisation and stock accumulation.

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An essential ingredient in the information flow is the relationship of the actual flows to the planned flows. Differences between the planned and realised performance will determine the direction and extent of the corrective action decided on. For example, if at some stage roundwood stocks are considered to be too high, then a decision is likely to be taken to increase the outflow rate unless a previous decision reduced the inflow rate. It is the nature of the corrective action rather than its exact mathematical magnitude that is of interest here. It is a simple matter to test the effect of the various feasible reduction percentages, as the smaller the percentage the longer it will take for the full effects to become apparent. Accordingly, it is quite permissible to use simple mechanical decision rules in systems formulation, provided only that these simple rules have

some basis in experience. This is likely to be the case in the developing countries especially where the data base is poor and where the decision makers are relatively unsophisticated. Indeed, decision making according to simple mechanical rules seems to be much more common in the West than is generally supposed (Cyert and March, 1963).

It is obvious that the rate of flow between stock levels is not likely to be instantaneous. At each state in the model therefore, there will be delays. For example, at the harvesting stage, there will be a delay between the decision to fell and the actual felling. There will be further delays in skidding the felled wood, stacking it, collecting it, loading and unloading it on to lorries, sorting it at the depot, processing orders for it, and delivering it to the customer. Now delays are of two sorts. The obvious source of delay

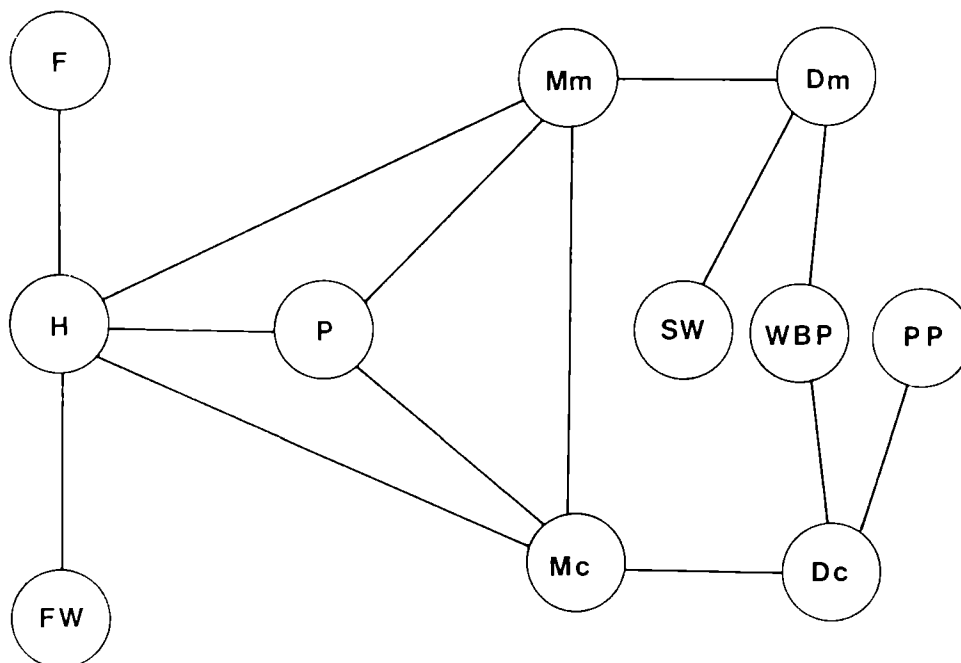


Fig. 4. Flow diagram for the forest economy

Legend

- F = Forestry sector
- FW = Fuelwood sector
- H = Harvesting sector
- P = Port sector
- Mc = Chemical Processing Mill sector
- Mm = Mechanical Processing Mill sector
- Dc = Domestic distributor sector for chemical process products
- Dm = Domestic distributor sector for mechanical process products
- SW = Domestic market sector for sawn wood
- WBP = Domestic market sector for wood based panels
- PP = Domestic market sector for pulp and paper

is the minimum operational time required to perform an activity. If it requires one day to sort a load of timber with the resources on hand, then there will be a minimum delay of one day between the arrival of the logs at the forest depot and the completion of the sorting process. However, a much more important source of delay is to be found in the accumulation of queueing type backlogs in the various levels of the system, because of its inability to adjust instantly to changes in the flow rates. Where resources are in critically short supply, the outflow rate from a level will be lower than the inflow rate into it, so that stock in that level rises continually until the two rates are equalised, and will only fall again when the resource ceases to be critical and the relative flow rates are reversed. Delays then are often destabilising, but they need not necessarily be so. Where a delay relates to some non-critical activity, its reduction is not likely to increase the stability of the system.

Frequently, the actual response of one part of the system to variations in the other part is greater than one would expect. For example, if sawnwood sales rise, the orders for roundwood placed by the sawmill may rise even faster in an attempt to adjust the mill's roundwood stocks to the new sales (and production) level. Again, if roundwood prices are rising, even if sawnwood sales are constant in volume terms, extra speculative purchases may be made in anticipation of further rises. Further, decisions made to reduce delays in some part of the system may indirectly result in even greater delays in some other part of the system.

Information flows are particularly susceptible to delays. A common source of information delay is the smoothing of statistical data in order to discern a trend. Another, is the reaction time required before the information is acted upon. If there is an upturn in sawnwood sales let us say, the decision taker will probably wait for some time to see whether this upturn will continue in subsequent periods before taking action to adjust his roundwood stocks.

We turn now to the development of the set of equations in the formal model. It is not my purpose to provide here a detailed model of the 11 sectors, but merely to indicate the process of reasoning on which such a model can be based. As already noted, each of these 11 sectors is characterised by one or more stock levels, with the corresponding inflows and outflows. Although the detailed considerations affecting each of the circular flows will vary markedly from sector to sector, in essence, the structure of the stock and flow equations is likely to be much the same for all sectors. If we can accept this assumption, at least as a first approximation, then the task of building the initial trial model is greatly simplified. Simulation of the feasible decisions and parameter values will indicate its correspondence with reality.

In the end, it may turn out that a radically different equation structure will be required for some of the circular flows, but in the absence of obvious grounds for varying the structure of equations between sectors, it is quite legitimate to adopt a uniform structure in the initial formulation. Naturally, even with identical equation structures, the circular flows will have different parameter values and coefficients and different delay and response rate characteristics.

Accordingly, the examination of one sector will serve to illustrate the pattern for the whole system. The logical place to start with is one of the final demand sectors, and for simplicity we will examine the circular flow between the harvesting sector and the port. At the port, the incoming lorries from the harvester are unloaded and their logs sorted and stacked into piles for shipment. Postulating a continuous flow inwards and outwards, we can derive the definitional equation given in the table (Equation 1). These flows, of course, relate to physical quantities. They are controlled by the decisions to order more or less and so we need to include the order flows also. We can define a stock or backlog of unfilled orders relating to the ships in port. Indeed, it is legitimate to regard the ships themselves, or rather their holds, as constituting the orders we are dealing with. This stock of unfilled orders is increased by the arrival of more ships and diminished by the volume of roundwood which has actually been loaded. Thus, we can define Equation 2.

The unfilled order or stowage space backlog simply reflects the situation where holds cannot be filled up instantly. A formal expression of this is given in Equation 3. Now, the delay involved in filling holds will consist of two elements. The first is the average time it takes to fill a hold and to deal with the necessary papers, on the assumption that adequate stocks are available at the dockside. Even if stocks were unlimited, given the average carrying capacity of the ships in the port, there would be a minimum delay before a hold could be filled, whatever the queueing arrangements adopted. However, with many species and grades being demanded, the stocks of some items will be exhausted before others. Obviously, the larger the average dockside stocks, the smaller will be the average length of the delay incurred while waiting for items which are currently out of stock, and so this second delay element will vary inversely with the size of the stock level. In order to provide some feedback, it is advisable to express this delay element not in terms of the actual stock level but in terms of the adequacy of the stock level in relation to current loading rates, i.e. in terms of the ratio of actual to planned stock levels (Equation 4).

By postulating a planned stock level (based on a

predetermined stocking policy) and relating the actual stock level to it, it is possible to generate a simple decision rule for corrective action. Following normal commercial practice, the planned stock level can be defined in terms of so many weeks endurance at the going loading rate, i.e., as a constant multiple of the average loaded volumes over the last so many weeks (Equation 5). The averaging process for recent loading statistics will also generate a delay which must be taken into account (Equation 6). Now, as dockside stocks are depleted, orders have to be placed with the harvester for new supplies. The purchasing order rate, which is the feedback, may be based on the current loading rate together with the differences between the planned and actual stock levels and between the level of unfilled stowage space (order backlog) and the desired or tolerable

level. An allowance should be made also for the volume of roundwood which is already in the process of being delivered to the port as a result of previous purchasing decisions. Finally, the psychological delay involved in reacting to changes in stock levels should be included. All these relationships are formally expressed in Equation 7 which also incorporates the purchasing decision rule.

Excluding CML and the five delay constants, whose values are selected on the basis of experience, we now have a simple sectoral model incorporating 11 variables. All of these can be defined in terms of each other by transposition, with the exception of UTP, PTP and RTP. The last, however, is clearly linked to the structure of the harvesting sector equations, while the values of UTP and PTP (along with PRP) are decided by policy.

EQUATIONS FOR THE PORT SECTOR

$$SRP.K = SRP.J + DT(RRP.JK - RLP.JK) \quad (1)$$

$$UOP.K = UOP.J + DT(NOP.JK - RLP.JK) \quad (2)$$

$$RLP.KL = \frac{UOP.K}{DFP} \quad (3)$$

$$DFP = DHP + DSP \left(\frac{PRP.K}{SRP.K} \right) \quad (4)$$

$$PRP.K = CML(ALP.K) \quad (5)$$

$$ALP.K = ALP.J + DT \left(\frac{1}{DAL} \right) (NOP.JK - ALP.J) \quad (6)$$

$$PDRP.KL = NOP.JK + \frac{1}{DRT} (PRP.K - SRP.K) + (UOP.K - UTP.K) + (PTP.K - RTP.K) \quad (7)$$

Where:

- SRP = Stocks of Roundwood at the Port (M³)
- RRP = Roundwood Received at the Port (M³ per week)
- RLP = Roundwood Loaded on to ships in the Port (M³ per week)
- UOP = Unfilled Orders or stowage space in the Port (M³)
- NOP = New Orders or stowage space arriving at the Port (M³ per week)
- DFP = Delay constant for Filling holds in the Port (weeks)
- DHP = Delay constant for the minimum Handling time at the Port (weeks)
- DSP = Delay constant for Stockouts at the Port (weeks)
- PRP = Planned stock of Roundwood at the Port (M³)
- CML = Constant Multiple of average Loadings (weeks)
- ALP = Average (moving or exponential) of the Loadings at the Port (M³ per week)
- DAL = Delay constant for the Averaging of the Loadings at the Port (weeks)
- PDRP = Purchase Decision for Roundwood at the Port (M³ per week)
- DRT = Delay constant for the Reaction Time (weeks)
- UTP = Unfilled order backlog Tolerated at the Port (M³)
- PTP = Planned volume of roundwood in Transit from the harvester to the Port (M³)
- RTP = Roundwood volume in Transit to the Port (M³)

The flow of purchasing orders from the port, in turn, goes in to the unfilled order backlog of the harvester at the forest depot. There it is joined by the purchasing order flows from the mill and fuelwood sectors, which can be derived on a similar basis. Proceeding iteratively, the order backlog in the harvesting sector then generates reductions in the depot stocks, which, in turn, are replenished by the

roundwood which is transported from the roadside stocks of felled timber. These, in turn, are increased by the roundwood which is skidded to the roadside out of the stock of felled timber in the forest. Of course, the stock of felled timber in the forest is augmented by the volume which is being felled, which is a decision function of the allowable cut, or annual increment, or whatever. Again, this is

functionally related in the usual way to the management regime being followed in the forest. In this way, the activities of all 11 sectors can be interrelated.

Having drawn up an integrated systems model in this way, the next step is to test it, both for its correspondence to reality and for the tradeoffs which will follow from planning decisions. Essentially, the procedure consists of devising a set of initial conditions which will produce a steady state and self perpetuating system, that is, one where the output from the end of the last circular flow is exactly matched by the inflow at the start of the first circular flow. Such a stable system has value in its own right, as it would indicate the time which elapses between the peaks and troughs of the variable values under neutral conditions. More importantly, experiments can then be carried out to evaluate the response of the system to planned changes. For example, the impact of once only changes on the magnitude of one or more variables can be calculated, as can the response of the system to regular or random variations. Of particular importance for the planner would be the assessment of the consequences of expanding or contracting capacity at various levels in the system; of changing the level of technology or the organisational structure and of policy changes affecting the decision making rules. To envisage more readily the tradeoffs and time horizons involved, the behaviour of the various parameters can be plotted on a graph.

Of course, the model outlined above is far too simple. By a narrower definition, the number of sectors involved can be increased sharply. It would be possible to distinguish between each of the mills making the various products, and even between each product type made in each mill. Distinction between the major species could also be attempted, as would the separation of the various forests, or even forest compartments. It would be possible to include some feedback from the export markets and some macro-economic variables affecting the domestic markets.

Forrester suggests that a complete system would also incorporate money, labour and capital goods networks in addition to the materials, and orders networks, while the information network would be expanded correspondingly. Incorporation of money flows, for example, would allow the planner to simulate the cash flow implications of his policies

over time, both as regards the effects of pricing policy on demand and supply, and as regards the flows of domestic currency and of foreign exchange. The effects of labour policies on employment (skilled, unskilled and expatriate), training and the multiplier effects of workers incomes could be simulated using the labour network, as well as the tradeoffs between labour intensive and capital intensive technology. This, in turn, could lead into a capital goods network, where the effects that various policies on maintenance and replacement would have on employment and cash flows as well as production could be simulated.

Where the developing countries are concerned to maximise the utilisation of their forest resources, planning provision will be made for the establishment or expansion of the domestic wood processing industries. By plotting the utilisation and availability of resources against time in a systems model, the planners will be able to forecast the bottlenecks and to estimate the consequences (and cost) of their removal. It is apparent then that a well conceived systems model can be of use to the forest industry planner. It should also be apparent that the information, which is required for the initial elaboration of the definitional difference equations of the type discussed, is likely to be available from existing sources, even in the developing countries.

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Paper 14

THE IMPACT OF POLICIES AND FISCAL MEASURES ON FOREST INVESTMENT

By M. S. PHILIP

Department of Forestry, University of Aberdeen, Scotland

Introduction

In Britain forestry is relatively unimportant in the eyes of our government. Unwisely, its value is deemed to be reflected by the proportion of our wood consumption that is home grown (8%) rather than the cost of imports (£1900 million in 1974 – NB I estimate that the annual Expenditure on forestry by both state and private enterprise was approximately £65 million in the same year). Consequently successive governments have given little attention to either forest policy, forest investment or forest taxation, all of which to a large extent have been determined by or derived from policies and legislation whose main purpose lies outwith forestry.

The pattern of planting, both new and regeneration, clearly reflects the pattern of investment simply and with less complication than when it is expressed in terms of money. Consequently this account uses areas planted as a measure of investment.

Ryle (1974) summarises succinctly successive policies from the viewpoint of one who served the Forestry Authority for a lifetime. However he does not set them in the context of other current policies for agriculture and the reform of land tenure and measures taxing income and capital.

Between the Wars, 1919-38

Ryle (*op. cit.*) cites POLICY 1 dating from the birth of the Forestry Authority in 1919 as “to grow timber as quickly as possible to build up a reserve for use during an emergency”. A Forestry Fund of £3.5 million was established but its release was by annual Parliamentary Vote.

The Forestry Act 1919 also empowered the Authority to make loans to private owners for planting and replanting. At this time the condition that accounts had to be kept throughout the rotation length deterred owners from taking the loans, but a temporary scheme introduced in 1922 to give outright grants where unemployed labour was used was eagerly supported.

At that time the only capital taxes on land or timber were:

- (1) *Legacy or Succession Duty* – a tax levied on the death of an individual, at rates that varied with

the relationship between the deceased and the beneficiary, the highest rate being 20%; and

- (2) *Estate Duty*, dating from the Finance Act of 1894. This tax was imposed at graduated rates on the principal value of estates passing upon death. In 1909 a concession was made separating the value of growing timber from the principal value of the estate and postponing payment of duty on the timber to the time of felling. The value on which duty was normally paid was that of the growing timber at the time of death. Unpaid duty was cancelled by a succeeding death so that duty was normally paid only once in a rotation. It has been claimed that this provision has delayed the felling of a lot of mature timber on which duty is payable but the extent of this effect is unknown and I am doubtful of its significance.

Land and timber was also taxed annually under schedules A and or B, or D. Schedule A tax was paid by the land owner. It was based on the annual value of the land or its rent, regardless of the crop. Schedule A was abolished in 1963 (HMSO 1963). It amounted to only a few pennies a hectare a year. Schedule B was and still is levied on the profit from the occupation of the land and is based on the same rental values as Schedule A. The task of separating the income from the capital in forestry is complex, and this fact lies behind the acceptance of simple if crude tax measures. In the Consolidated Income Tax Act of 1918 a woodland owner was given the option to elect in respect of each and every woodland or plantation when it is planted to be assessed under Schedule D. Tax is then paid in respect of the actual profit or, if there is a loss, this loss can be set off against other income. This concession has been of great advantage to surtax payers and enabled them to transfer savings to capital with only a low rate of income tax.

Hence in 1919, one can (with hindsight, perhaps) distinguish a real attempt on the part of the government to encourage afforestation in both the State and the private sectors. The attempt was not negated by the Legacy or Estate duty taxes as their rates of imposition were generally low.

In 1925 a series of statutes were enacted to reform

the Land Law to facilitate and cheapen the transfer of land and to render it, as circumstances permitted, as readily negotiable as other forms of property (Gordon, 1955). At the same time Ryle's policies II and III were being effected. Policy II was to create a settled force of woodsmen and their families whose livelihood would be enhanced from their own tenanted small holdings. Policy III (in 1935) visualised that special state afforestation programmes could significantly ease severe unemployment. But successive Finance Acts raised the rates of Legacy and Estate Duty and the effects were beginning to become obvious. (Lorrain-Smith, 1969). Large estates were sold or surrendered to the Crown in part settlement of duty – e.g. Glenlivet Estate of 20,000 hectares passed to the Crown Estate Commissioners in 1937 on the death of the Duke of Richmond and Gordon. Farming was badly off and hill land values fell to £6.25 per hectare in 1935. Timber prices were low, the rural areas were becoming depopulated and money was tight. The allocation to the Forestry Commission was cut from £840,000 in 1931 to £562,000 in 1933 before rising back to £1,000,000 in 1938. In 1934, the Forestry Commission reported that “no real progress had been made in maintaining the existing privately owned plantations on even the relatively low pre 1914–18 war standards”, and the State planting programme was 58,000 hectares (145,500 acres) in arrears of the targets set by the Acland Committee in 1916.

1939-1957

The Second World War altered much, although the direction of labour to forestry during war years ensured that as well as production some afforestation was done. After the war Policy I was re-affirmed, but a strategy of building forest villages replaced the small holdings because changes in agriculture towards higher capitalisation rendered small holdings uneconomic. In 1945 the post-war Labour government under Attlee, Gaitskell, Morrison and Bevan introduced social reforms (from the cradle to the grave, the Government will care for you), the railways and coal mines were nationalised and the decades of government intervention and the “planned economy” began. The nationalisation of land was proposed and government-owned land banks were postulated as an alternative means of achieving control and reform of land use and proprietary boundaries. In 1946, the Hill Farming Act and the emphasis on food production in agricultural policy “kept much land under agriculture which otherwise would have been offered to forestry”. (Forestry Commission, 1949). The drift to the urban areas accelerated (House, 1973).

Figure 5 shows the State and Private planting programmes from 1947 to 1974, Figure 6, the level of income from hill sheep farms and hill land prices over a similar period, and Figure 7, the progress of the Dedication Scheme. (See pages 81 and 83). In

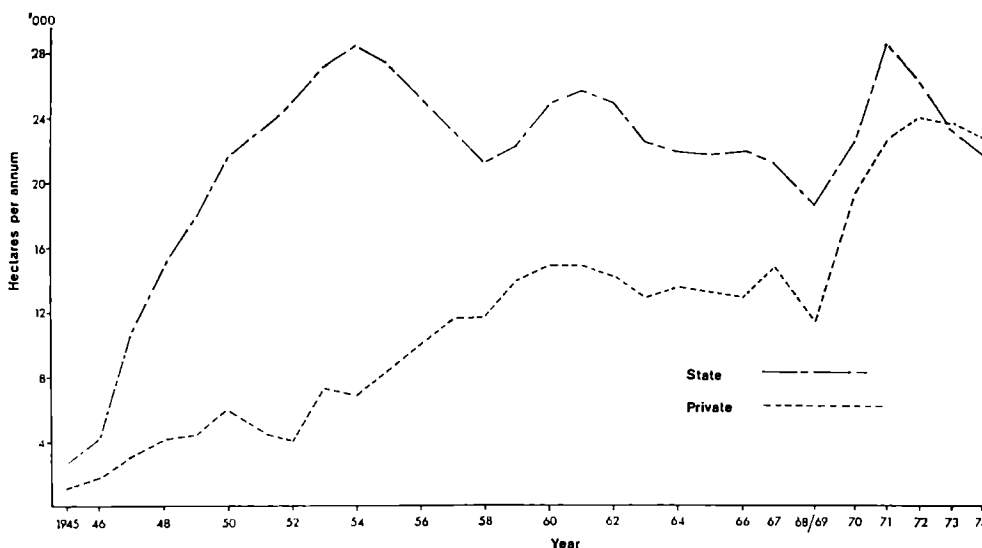


Fig. 5. Rate of planting (afforestation and replanting) on State and Private forests, 1945-1974. Under Private Forests only State-aided schemes are shown.

Source: *Forestry Commission Annual Reports*.

general the level of new investment in State forestry has been fairly constant since 1950 in spite of changes in the declared policies, although it must be recalled that the Forestry Commission was set and failed to reach the much higher annual planting programme of 50,000 hectares a year for the period for 1953-57.

The Dedication Scheme was introduced in 1947. This had two really revolutionary aspects. Firstly it envisaged land being dedicated to forestry in perpetuity. This was novel in Britain. Secondly, it introduced not only subsidies for afforestation, but also annual grants for woodland maintenance.

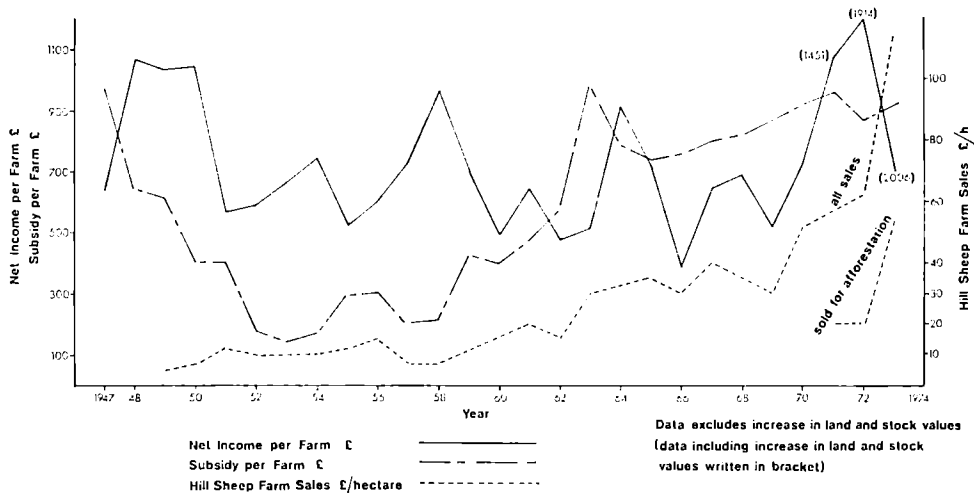


Fig. 6. Hill Sheep Farms in Scotland. Trends in net income subsidy and sale price, 1947-1974 (adjusted to 1947 values by the Retail Price Index).

Source: *Scottish Agricultural Economics*.

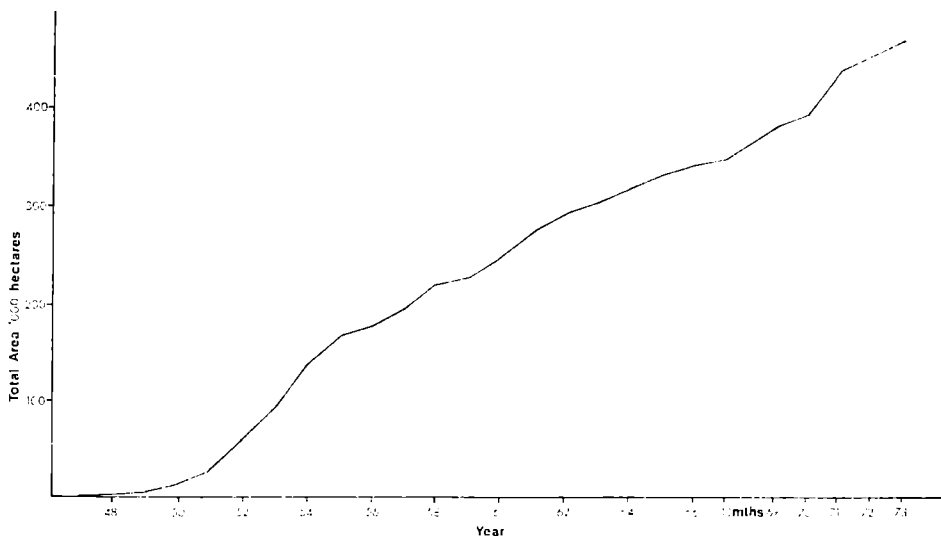


Fig. 7. The Dedication Scheme, 1947-1973.

The curve shows the cumulative area dedicated by owners of Private Woodlands under the Forestry Commission's Scheme. Areas in thousands of hectares.

Source: *Forestry Commission Annual Reports*.

There were also other schemes for subsidising the afforestation or re-afforestation of privately owned ground, but the area under the Dedication Scheme grew continuously until it was closed before revision in 1972.

In the draft of the 1948 Finance Bill (HMSO, 1948) the then Chancellor of the Exchequer, Sir Stafford Cripps, included the provision to tax all woods under Schedule D, and abolish Schedule B in which grants and sales of timber were free of tax, as tax had been paid annually in the form of land rent. To the late Duke of Buccleuch is attributed the success of persuading the Government to drop this clause in the Act. Nevertheless the fact of the proposal has undoubtedly affected investment in forestry ever since.

The Legacy and Succession duty was abolished in the Finance Act of 1949. In the latter half of the fifties sheep farming prospered and in fact no hill sheep subsidy was paid in 1957 or 1958, and although average farm rents fell and land prices (the average of all types of 'vacant possession' sales) fell to a nadir for recent times (Figure 6) forest interests were slow to invest in land. Throughout the 1950's, the Forestry Commission's programme was curtailed by its failure to acquire more than 22,000 hectares of plantable land a year, whereas the area of private planting rose steadily to 15,000 hectares a year by the early sixties. This rise was in part due to the acceptance and popularity of the Dedication Scheme, but this was linked with the advantage of the Schedule D option for young woods.

1960-71

In the early sixties the Forestry Commission's policies were reviewed and that of forming a reserve of mature timber was declared irrelevant, so POLICY I declined in importance. The planting target was reduced to the more feasible level of 18,000 hectares a year in line with the predicted rate of acquisition of land. Expansion was to be restricted to areas in Scotland and Wales where rural populations were declining, or to where the financial return was likely to be satisfactory, or to where planting was desirable on aesthetic grounds.

Throughout the sixties hill farming was in difficulties and hill land prices were relatively low (Figure 6). Then a new factor began to assume prominence and to influence the level of private planting. In 1957 Economic Forestry Limited was registered. It was the brain child of a Chartered Accountant who conceived the idea of forming an investment-orientated organisation to channel finance from the "City" into forestry. By 1974, the restructured group Economic Forestry (Holdings) Ltd., was responsible for a quarter of the private

forestry planting in Britain, and had nearly 100,000 hectares of land under forest management plans that they controlled. The influence of this group was supplemented by the growth of two older management organisations, Tilhill Forestry Ltd. and Fountain Forestry Ltd., both of whom offer management services to both land owners and investors. The latter became a member of the Matthew Wrightson Group associated with insurance, while in 1972 the former became associated through their Board of Directors with Scottish Timber Products Ltd., who opened the 200,000 ton/year particle board factory at Cowie in Scotland in 1973.

By the close of the sixties the main factors influencing the level of investment in private forestry were:

Firstly the activities of the investment advisers who advertised the possibilities of transferring an individual's taxable annual savings into capital and the advantages of forest investment with respect to Estate Duty and Capital Gains Tax.

Secondly the social changes and economic depression of hill farming that led to the closure of some hill sheep runs, relatively low land prices and a relatively abundant supply of land available to forestry. There were no controls on the use of privately owned land, although the Forestry Commission could only plant land if the Agricultural Departments made no objection. The National Farmers Union did not oppose the change in land use as it provided markets for the owner-occupied farms that were closing – especially in Wales and Southern Scotland.

Thirdly the increasing rate of inflation that encouraged investment in sectors where it was hoped that capital appreciation rather than depreciation would occur. Forestry, with the investment advantage resulting from the Schedule D option, and the relatively light income and capital tax burdens of Schedule B and the Estate Duty met this requirement.

Capital Gains Tax was imposed in 1965. After protracted appeals to and negotiations with the Treasury, sales of standing trees and felled timber were generally exempted; land sales however were and still are subject to Capital Gains Tax. This decision on timber sales is logical as an annual tax under Schedule A and/or B or D had already been paid on the ownership and use of the land. (NB. Schedule A tax was abolished in 1963: HMSO, 1963).

1971 to the present (1975)

The opening of the seventies heralded a burst of afforestation financed by private investment. At the

same time the environmental lobby had grown in noise and effect, forcing some concessions from the simple investment and wood producing sectors of forestry, and the determination of the Labour Party to achieve more even distribution of wealth and control of investment through state ownership or participation had grown stronger.

In 1972 the Treasury published an inter-departmental Cost/Benefit study concluding that afforestation – either state or privately owned, was unable to produce an adequate social rate of return. This conclusion was both resented and confuted (Wolfe and Caborn, 1973) but affected the confidence of investors and land owners and aroused suspicions of the Government's intent. The cost/benefit study was accompanied by a policy review by the Government with decisions that broadly maintained the previous level of State afforestation and replanting, with a target return of 3%. Priority was to be given to programmes in areas of declining rural population, and the recreational potential of the forests was to be developed. Amenity values and conservation considerations were to be given greater emphasis than in the past. No mention of wood as a raw material for industry nor the effect of rising world prices of raw materials was made. In contrast the role of private forestry in the national economy as the supplier of raw material to industry was stressed, but no targets were given. It noted that the resource costs and benefits of State and private forestry were broadly similar with some reservation about the provision of recreational facilities in the private sector, and left the investment decision to the interests concerned. The Dedication Scheme and other aids for afforestation were closed (Figure 7) and proposals made to replace them by a single new scheme aimed to reduce the costs of administration and to encourage private forestry to follow the wider social objectives for British forestry.

The publication of this review with its curious mixture of decisions and suggestions led to tenuous and protracted discussions between the Government and parties interested not only in privately owned forestry but the whole forest policy of the United Kingdom. Eventually, a Statement was made in Parliament in July 1974. This was brief and appeared to rely heavily on the previous review of policy. A revised Dedication Scheme was introduced. It required dedication of the land to forest production for one rotation only and the linking of provision of access for the public to the Objects of Management. The subsidy for conifer planting was slashed in order to provide a large additional subsidy for planting hardwoods. No planting targets for the privately

owned sector were given. However, without some assumption on this, the target for State afforestation is baseless. The assumption is unknown but it is known that the amount of money approved by the Treasury for allocation to private forestry by the Forest Authority was not changed, (£2 million in 1973-74, Forestry Commission, 1974). In the absence of other statements, it must be concluded that in so far as there was any conscious assumption, it was that the private sector would continue to invest at the same level (in terms of area) as previously.

The sudden closure of the 1947 Dedication Scheme without prior discussion was taken by the privately owned sector of forestry as a sign that in spite of the words of the policy review Government was reducing its support. From the moment of publication, the confidence of the private sector built up over the first fifteen years of the scheme and maintained thereafter was destroyed. It could be argued that the private sector of forestry has been living in a fool's paradise considering the political trends current since 1965, and that they should not have accepted the convenient dogma that forest policy was not subject to party politics.

Proposals to change the structure of capital taxation have overlapped and were independent of the discussions and proposals for the Forest Policy; they are still under discussion. There were two main provisions; one was the replacement of Estate Duty by a Capital Transfer Tax, the other was the adoption of a new annual Wealth Tax (HMSO 1974). A Capital Transfer Tax was introduced in the 1975 Finance Act (1975). As yet little tax of this type has been paid on timber but its weight is potentially extremely onerous at up to 75% of sale values (Hart, 1975). I estimate that sales from final fellings totalled £4 million in 1974. The legislation on the Wealth Tax has yet to be debated in Parliament. In 1970 I estimated the value of the privately owned woodlands in Britain to be £160 million* including the land. Thus an annual Wealth Tax averaging 1% would raise up to £1.6 million depending on the individual owner's assets. These two taxes together are likely to outweigh the annual subsidy to private forestry through its Schedule D option that I estimate was worth £2.5 million per year between 1970 and 1972. They also represent an extremely high proportion of the annual increase in value derived from the capital investment.

Also the implications of the Common Agricultural Policy, the draft Council Directive concerning forestry measures and assistance for Regional Development in the European Economic Community have to be assessed.

Meanwhile the area planted in Scotland by the private owners in Forest Year 1975 fell by some 50%

*A revaluation in 1972 raised this figure to £188 million and I guess that the current value exceeds £200 million.

(SWOA, 1975). While the new Dedication Scheme has been welcomed in some circles, the confidence of the private sector of forestry has been shaken still further by the recent changes in taxation.

The investment in the forest is only part of the total and is matched by a substantial level of investment in wood using industries. However the present level of this investment is reflected more by the area of forest producing saleable timber than by the level of planting. However, the supply of home grown wood is markedly affected by the owners' cutting policies (Philip, 1975). If the current tax situation forces sales of standing crops and premature fellings then the orderly marketing of produce and development of home grown wood using industries will be prejudiced. Then the investment in plantations by both the State and the private sectors will suffer. Fifty percent of the area of the forests in the United Kingdom are less than twenty years old and as yet unable to contribute to the supply of wood as a raw material. In future, markets will be needed for the produce from these young plantations. However industry needs a sustained supply. Violent fluctuations in the rate of planting and in the confidence of owners makes the task of planning the expansion of industry to provide the capacity to handle the produce from the plantations already established much more difficult. Therefore the secondary effects of the change in forest policy and forest taxation have to be considered along with the primary effects on the forest.

At the same time as the fortunes of forestry are so difficult to predict, agriculture seems to be set along firm lines, supported partly by the Common Agricultural Policy and partly by the Government's declaration to increase the proportion of home grown food in order to minimise the cost of imports (HMSO, 1975a).

In my opinion, the current situation is:

- (a) The forest policy records the value of private forestry.
- (b) The agricultural policy aims to increase the production of food grown in Britain.
- (c) The level and value of planting grants for conifers were reduced in 1974.
- (d) Capital Transfer Tax was introduced in 1975; while some measure of relief to agriculture was incorporated in the bill, there was little relief for forestry and the weight of the tax on forestry is extremely high.
- (e) The proposals for a Wealth Tax will add to the tax burden to the extent of destroying private forestry and severely injuring agriculture. It will almost certainly change the structure of land ownership.
- (f) The system of income tax, were it not for the

Wealth and Capital Transfer Taxes, would encourage investment in forestry.

- (g) The Common Agricultural Policy and the Mansholt Plan for the European Economic Community visualise land released by agriculture being afforested by the land owner with financial grants available to facilitate this change of use.

Conclusions

Up until 1972, Her Majesty's Government had a forest policy and strategies of taxation and subsidy that resulted in an expanding private sector. The more rapid rate of State afforestation ensured that the dominant position of the private timber owners would be short lived. However by the early seventies the Forestry Commission found itself unable to acquire sufficient land to meet its planting targets and for complex reasons that arose from without the forestry scene, the rate of investment in private forestry accelerated. This investment was not made by wood using industry but generally by individuals many of whom had high taxable incomes.

In the first half of the seventies, intentionally and as part of the programme to redistribute wealth and control the economy, the Government adopted strategies in taxation and subsidy that are certain to negate their declared policy of supporting privately owned forestry. To me, the words that "The Scottish Woodland Owners Association notes with approval the non-partisan approach to forestry indicated by the Minister's announcement" (SWOA Press Release 11.7.74) bring no consolation or confidence in the future of private forestry in Britain. Policy without fiscal measures that permit its execution is a hollow instrument of development in any industry, let alone one with a production period as long as a forest rotation. The outlook is daunting to more than just the private owners. The Forestry Commission have not announced any intention to expand their planting to make up for any shortfall in the results of the privately owned sector. Also the orderly expansion of wood based industry to utilise the production of the immature plantations already in existence may be prejudiced if the rate of planting is drastically curtailed.

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Paper 15

THE SOCIAL DISCOUNT RATE AND OPPORTUNITY COST OF CAPITAL IN FORESTRY DEVELOPMENT PROJECTS

by I. S. FERGUSON and J. J. REILLY

Department of Forestry, Australian National University, Canberra, Australia

Introduction

The long-standing controversy over the social rate of discount (Pigou, 1932, Scott, 1955) has important implications for economic analyses of public investment in wood production. Price (1973), for example, stressed the impact of a discount rate of 10% in rendering upland afforestation unattractive relative to agriculture in recent cost-benefit analyses by the United Kingdom Treasury. But the impact of the discount rate is not confined to comparisons between forestry and other land uses. It pervades all economic analyses of forest practices and planning which involve choices between alternative temporal strategies, whether just a simple choice of the optimum rotation length, or a constrained optimization problem typical of modern planning techniques.

A recent survey by Schleicher (1972) showed that discount rates ranging from 6.5 to 10% were being

used by various European countries in cost-benefit analyses of public investment. Baumol (1968) cited one example of a zero rate of discount; and others ranging from 3 to 9% used in the United States. This wide range of values probably only testifies to the predominance of projects with short investment horizons in the public sector, since choice between such projects is relatively insensitive to the choice of discount rate. However such a range of values is often extremely important to forestry projects, which typically involve long investment horizons.

This paper forms part of a larger study of the lower South Coast Region of New South Wales in which the choice of discount rate is likely to be critical. The aim of the larger study is to determine whether and to what extent society should invest in the conversion of marginal farmland to wood production by the establishment of plantations of radiata pine (*Pinus radiata* D. Don). The optimum set of strategies for regional wood production, both for the marginal farmlands and for the extensive areas of predominantly public forest in the region, is to be determined using a large linear programming model. The objective function of the linear programming model involves estimation of the present value⁽¹⁾ of the net social benefit per hectare for each strategy. While the constraints in the model are only specified

(1) Internal rates of return could be used instead but seem less robust (Henderson, 1965) and involve difficulties for much of the public forest. Market prices for this land are generally not available and opportunity costs must be imputed using the Faustmann approach. Calculation of the true internal rate of return would therefore involve prior calculation of the present value (see Bentley and Teeguarden, 1965).

over a 50 years planning horizon, the present values for each strategy are based on an infinite horizon (see Ferguson, 1974). The rate of discount will obviously play a critical role in determining the relative values for various strategies over such a long horizon.

The aim of this paper is therefore to examine the rate of discount and related parameters appropriate to this setting. While the values derived are to some extent specific to the setting, the issues and problems of estimation arise in many forestry projects in developing countries (e.g. Ferguson, 1973).

THE SOCIAL RATE OF DISCOUNT

The various approaches advocated for the social rate of discount can be classified into three broad groups based on the use of

- (1) a market rate of interest, or
- (2) a synthetic rate of interest, or
- (3) a separate time preference rate and shadow price for capital.

Before considering each of these groups the treatment of inflation and of uncertainty needs to be considered.

Except where otherwise indicated, all interest rates, and all costs and prices, are assumed to be measured in "real" magnitudes relative to the purchasing power of money at some specified date. Whilst this assumption is not essential to the arguments which follow, it obviates the necessity of trying to estimate future rates of inflation, an especially difficult task at present.

Uncertainty plays an important role in the arguments relating to the social rate of discount and cannot be dismissed so readily. Nevertheless, it greatly simplifies the exposition to assume a world of certainty in the initial review, even though the effect of uncertainty is not entirely independent of some of the issues raised.

Market Rate of Interest

Hirshleifer, *et al* (1960), Nichols (1969), Mishan (1967a and b), and others argue that the social rate of discount, d , should be set equal to the market

- (2) Dasgupta, *et al* (1972) stress a further argument that the intertemporal behaviour of individuals is not and cannot be rational and hence that the observed rates of time preference in the market have no normative significance. However, this comes dangerously close to throwing out the baby with the bathwater because the theory of welfare economics assumes rationality in behaviour. Moreover, since the empirical evidence on the rationality or otherwise of behaviour with respect to saving is the subject of debate, it would seem wiser not to stress this point.

rate of interest (more specifically, to the marginal rate of return before tax on private investment), r_p . In a perfectly competitive economy, free from externalities, such a solution would be Pareto optimal because it would ensure that the marginal rates of substitution and of transformation between goods over time were everywhere equal. The total amount of investment would thus be optimal as would its allocation between private and public sectors.

The source of funds for public investment matters not in this approach (Musgrave, 1969). If the funds were withdrawn from private investment, the alternative perpetual return foregone at the margin would be r_p dollar for each dollar of investment. The present value of this consumption stream foregone is thus one dollar per dollar of investment, discounting at t_p . Since present consumption is the numeraire in most cost-benefit analyses, the opportunity cost of a dollar withdrawn from present consumption is also one dollar.

The main objection to this approach is that it assumes perfect competition exists in the capital market and in related markets: yet imperfections are obvious and abound. The multiplicity of interest rates, differences between borrowing and lending rates and use of various rationing devices in the private capital market are glaring examples of imperfections, as is the pervasive influence of government through the financial institutions and through taxes and borrowing generally.

A further objection relates to the probable existence of interdependence between the utility functions of individuals over time (Marglin, 1963, Sen, 1976). An individual may be willing to save more than his personal time preference would suggest, in the interests of increasing the consumption of future generations, provided others are willing to do likewise. Thus a divergence between private and social rates of time preference may arise, the latter being lower. The likely magnitude of this divergence is difficult to assess but seems unlikely to be great (Arrow, 1966).

In our opinion these objections⁽²⁾ carry considerable weight. However, even if one rejects them in large measure, there seems to be an insurmountable practical objection to this approach. The changes needed to implement it are most unlikely to be instituted in the foreseeable future (Baumol, 1968).

To attain the Pareto optimal solution, private investment would have to be increased to drive the marginal rate of return on private investments down. This could be achieved making it easier for the private sector to borrow funds, either by reducing the borrowing rate (through an appropriate mixture of budgetary surplus and debt retirement) or by subsidy. In either event the corporate income tax would also have to be abolished. Such changes imply

a large increase in the direct or indirect financing of private investment by government, which is unlikely (Arrow and Kurz 1970). This leads us to seek a second-best solution.

Synthetic Rate of Interest

Baumol (1968), Drèze (1974), Harberger (1969), Ramsay (1969) and Usher (1969) have advocated second-best solutions in which the social rate of discount lies between the marginal rate of return on private investment and the social rate of time preference, i_g , i.e. $r_p > d > i_g$.

This solution arises because of the constraint which prevents government from ensuring that private investment is increased to the Pareto optimal level. Hence the social rate of time preference is likely to lie below the marginal rate of time preference in the private capital market. Under these circumstances, should not the social rate of discount reflect the differing opportunity costs of funds drawn partly from consumption and partly from private investment?

For example, at the margin a dollar of public investment drawn from consumption must earn a perpetual annual return of at least i_g in the future, otherwise it is better consumed now. Similarly a dollar withdrawn from private investment must yield a perpetual annual return of at least r_p otherwise it is better left for private investment. If the proportion of funds drawn from private investment is m , then the social rate of discount should be set at:

$$d = mr_p + (1-m)i_g \quad (1)$$

This is an excessively simple treatment of the approach: far more elaborate formal models have been developed.

Some of these models have yielded vastly different solutions for the appropriate value of the social rate of discount. The models of Arrow (1966), Kay (1972) and the earlier models of Arrow and Kurz (1970) assumed that consumption was unresponsive to the rate of interest, simply being proportional to disposable income. This extreme assumption of an imperfect capital market leads to a second-best solution where the social rate of discount is equal to the social rate of time preference. On the other hand, the models of Sandmo and Drèze (1971), Drèze (1974) and some other models of Arrow and Kurz (1970) assumed perfect capital markets where consumption was responsive to the rate of interest. These yielded a solution similar to equation (1). The model developed by Diamond and Mirrlees (1971) assumed perfect markets and the effective removal of the constraint on increasing private investment. It yielded a solution in which the social rate of discount equals the marginal rate of return on private investment.

This spectrum of results reflects the present difficulties of trying to develop an all-encompassing macro-level model yielding useful results for cost-benefit analysis at the micro-level. At the latter level "public investment" is not a homogeneous entity: the collective consumption characteristics, the sources of funding and the manner of charging for the goods and services vary from area to area within the public sector and often from project to project. It therefore seems more appropriate to examine what instrument or instruments are needed by the analyst dealing with a specific increment of public investment in order to achieve, or at least approach, the desirable targets for investment in the public sector.

There are two obvious targets to be considered (Baumol, 1968, Morawetz, 1972); the optimal allocation of resources over time and the efficient allocation of resources between the public and private sectors. At least two instruments are required to enable the analyst to approach these targets (Morawetz, 1972). Thus the social rate of time preference is one instrument whose use as a discount rate enables an optimal allocation of resources over time to be approached, while the efficient allocation of resources between the public and private sectors can be approached by using the opportunity cost of funds diverted from private investment as a second instrument.

Amalgamation of these two instruments as a synthetic rate of interest must distort the inter-temporal allocation of resources, since the selection of projects will be biased towards those whose benefits arise earlier (*cet. par.*) by the use of a higher discount rate. Moreover the use of a single synthetic rate of interest assumes that all benefits and all costs of a particular investment have the same opportunity costs, which is rarely true. There may be differences between the sources of some of the funds used in particular projects such that there are marked differences in the opportunity costs between different projects. Similar considerations hold for benefits, especially since in some cases these are unpriced and accrue directly to consumers, whereas others are priced and thus accrue to the government for re-allocation to investment or consumption. Feldstein (1972) provides some simple illustrations of projects where the use of a synthetic rate of interest would yield ridiculous results under various conditions.

Time Preference Rate and Shadow Prices

Separate recognition of the social rate of time preference as the discount rate and shadow prices for the opportunity costs seems essential. More than one shadow price is required because different sources (or sinks) of funds have different characteristics with

respect to their opportunity costs. As with the approach in the previous section, this is a second-best solution. While the use of these instruments may provide the best attainable allocation of resources between projects and over time in the public sector, it does nothing to change the level of private investment and is therefore unlikely to be Pareto optimal.

This approach stems from the earlier work of Steiner (1959), Marglin (1963), Feldstein (1964) and others. The derivation of a shadow price may be illustrated by extension of the argument used to derive equation (1) in the previous section. If, in our over-simplified setting, the perpetual annual returns forgone by undertaking public investment were as shown in equation (1), then the shadow price for the funds used, P , can be calculated by capitalizing that annual return at the appropriate discount rate, i_g :

$$P = (mr_p + (1-m)i_g)/i_g \\ = m(r_p/i_g) + (1-m) \quad (2)$$

This formulation was first derived by Marglin (1963). However it assumes a fixed division of funds into two categories, private investment and consumption. In this study three basic sources of, or sinks for, funds will be recognized. They are (1) consumption, (2) public investment and (3) private investment, after Dasgupta *et al* (1972). Basic shadow prices can be formulated for each of these categories and these will be further refined in a subsequent section to relate the shadow prices to functional costing categories.

The shadow price for funds drawn from (or going to) consumption, P_c , is equal to one, since consumption is the numeraire and no distinction is made made between public and private consumption.

At the margin the shadow price for funds drawn from (or going to) public investment will equal the capitalized value of the perpetual annual returns otherwise accruing from direct contributions to consumption and to investment. If the marginal propensity to save in the public sector is m_g , the direct contribution to consumption must equal $(1-m_g)r_g$, where r_g denotes the marginal rate of return on public investment. The direct contribution to investment is obviously $m_g r_g$. But each such dollar must be valued at its own opportunity cost or shadow price P_g . Hence the shadow price for public investment funds is given by

$$P_g = [(1-m_g)r_g + P_g m_g r_g]/i_g \\ \text{Or } P_g = (1-m_g)r_g/(i_g - m_g r_g) \quad (3)$$

At the margin funds drawn from (or going to) private investment can be similarly treated. However there is a further initial stage involved here because of the existence of taxes. If the marginal tax rate is

denoted by t , then the direct contributions is equal to $[(1-m_g)r_p + P_g m_g r_p]t$. The direct contribution to consumption and private investment from private income is $[(1-m_p)r_p + P_p m_p r_p](1-t)$, where m_p denotes the marginal propensity to save out of private income and P_p denotes the shadow price of private investment funds. Thus the complete formula for the shadow price of private investment funds is:

$$P_p = \frac{[(1-m_g)r_p + P_g m_g r_p]t + [(1-m_p)r_p + P_p m_p r_p](1-t)}{i_g} \quad (4)$$

This expression can be simplified by substituting equation (3) in it and transposing terms. However, because of assumptions made later regarding the empirical values of some of these variables, it is simpler to leave it in this form. This formulation follows that of Dasgupta, *et al*, (1972).

There are important assumptions involved in this approach (Dasgupta, *et al*, 1972). For example, in equations (3) and (4) it is assumed that the benefits from public investment at the margin are recaptured by the government as revenues. If this is not true, these equations may tend to overestimate the shadow prices somewhat. In fact this problem does not arise in the later refinements of these equations in this study, because of some further assumptions.

It is also apparent that this formulation assumed a stationary state in which the values of marginal propensities to save and rates of return remain constant over time. This seems appropriate for the larger study to which this paper is directed, since similar assumptions are involved there also. Moreover Dasgupta *et al* (1972) have shown that these formulae provide good approximations of the shadow prices over time provided r_p and i_g remain markedly different for a substantial period of time. However, this assumption may not be valid or safe for developing countries, where the difference between r_p and i_g may narrow substantially over the next two or three decades (Newberry, 1972, Ferguson, 1973).

Finally, this approach eschews consideration of distributional aspects of the costs and benefits of public investment (Azzi and Cox, 1974). This also seems justified in relation to the setting of the larger study to which this paper is directed. Consideration of the distributional aspects of this study can probably be safely left to a simple tabular analysis of the final results of the model (Ferguson, 1974). However such aspects may require explicit consideration for some projects in developing countries, either by way of the introduction of weights for merit wants (Dasgupta, *et al*, 1972) or application of the approach suggested by Azzi and Cox (1974).

RISK AND UNCERTAINTY

Since the traditional distinction between risk and uncertainty has little bearing on the issues raised in this paper, the two terms will be regarded as synonyms.

Relaxation of the earlier assumption of complete certainty raises complex issues. Most individuals are believed to be averse to risk. Should the criteria used in analyzing public investment be adjusted to reflect this aversion to risk? If so, how should the adjustment be made?

Hirshleifer and Shapiro (1970) argued that the criteria should reflect risk aversion and that the adjustment is best achieved by including an appropriate margin for risk in the social rate of discount. They held that there is a high correlation between private and social risk. Hence the rate of interest established for private investments of a comparable risk class can be used in analyzing public investments, since this rate incorporates an appropriate margin for risk.

Arrow and Lind (1970), however, have shown that the costs of risk-bearing become negligible in public investment provided benefits and costs are uniformly spread over a large population and are independent of social income. Under these circumstances a risk-neutral approach is appropriate for the analysis of public investment. Moreover, Arrow and Lind (1970) pointed out that the private markets for contingent claims (e.g. insurance) are markedly imperfect because of the existence of moral hazard and the high costs of transactions. The risk margins established in private markets therefore have little relevance for public investment (see also Zeckhauser 1970). In contrast to Hirshleifer and Shapiro (1970), they assumed complete independence between private and social risk. The larger study of regional wood production to which this paper is addressed seems to meet the conditions described by Arrow and Lind (1970) and a risk-neutral approach therefore seems appropriate. However there may well be other forestry projects where the costs of risk bearing are not negligible. Projects involving massive investment which are likely to have a substantial impact on national income are obvious examples. Some degree of risk-aversion would seem desirable under these circumstances, although how much is not clear.

Finally, this brief review has skirted the largely unresolved problem relating to uncertain consumer preferences. Recent work by Schmalensee (1972) suggested that risk-neutrality may still be justified but these results were not conclusive. This problem may be important where benefits are unpriced and an option demand is involved.

SOCIAL RATE OF TIME PREFERENCE

The range within which the social rate of time preference is likely to lie can be identified by refer-

ence to a formula derived from a simple theory of economic growth (Dasgupta *et al* 1972):

$$i_g = \lambda \theta \quad (5)$$

where i_g denotes the social rate of time preference,

λ denotes the absolute value of the elasticity of marginal utility with respect to per capita consumption

θ denotes the rate of growth of per capita consumption.

The rate of growth of per capita consumption in Australia was 2.5% per annum over the period 1959 to 1972. The elasticity of marginal utility with respect to per capita consumption seems to lie in the range 1 to 2.5 (Layard, 1972). Thus the social rate of time preference probably lies in the range 2.5 to 6.25%. This is still far too wide a range to provide a useful basis for analysis. Inevitably we are driven to look at existing rates of interest for guidance in attempting to narrow the range.

Interest rates in the private sector in Australia are patently unusable because they reflect risk and the other market imperfections. The rates in the public sector are relatively free of risk but are effectively controlled (Mathews, 1967) by the central bank. Moreover most financial institutions are *forced* investors in this market so the central bank has the ability to set or influence rates to levels which may differ markedly from considerations of time preference or rates of return.

There is, however, one class of security transaction which provides some guidance. The rate of interest payable on Australian securities sold in overseas markets is at least indicative of what the government, or more accurately the central bank, is willing to pay. Presumably then it should reflect the marginal rate of return on public investment. If the level of public investment is optimal, or nearly so, it will also be indicative of the social rate of time preference. Admittedly these assumptions are tenuous, but they are more credible than using any of the rates in the Australian market. The rate of interest on these loans is also relatively free of risk and is established in markets in which the Australian government has no direct leverage.

Using loans raised in the New York and London markets as a basis, the yield rates for the period 1966 to 1972 varied from 6.1 to 8.2% in New York and from 7.1 to 10.8% in London, according to the official statistics of the Reserve Bank of Australia. The average rates over this period were 7.2 and 8.7% for New York and London respectively. Modigliani and Shiller (1973), in a study of the long term rates in the securities market in the United States, have shown that the long term rates seem to

be determined by the average expected short-term rate and the *historical* average level of inflation. The yield rates for 1966 to 1973 were therefore deflated using the average rate of inflation from 1950 to the year in question. The "real" rates so calculated ranged from 4.3% to 5.9% for the New York market, and from 3.3% to 6.2% in the London market; the average rates being 5.1 and 4.7% respectively.

This exercise has narrowed the range down but still leaves the actual value to be chosen. The cost of computation in the linear programming model precludes complete recalculation for a range of rates, although sensitivity tests can be made. Moreover, we are suspicious of analyses which reproduce copious values for different discount rates leaving the final selection of the discount rate and optimal strategy to the central planner or other decision-maker (cf. Dasgupta, *et al*, 1972). This practice seems to shift the burden of responsibility to a point which invites personal bias and inconsistency in project selection, since decision-makers at this level are unlikely to have the time or interest to study the matter in depth. Decisions on the rate of discount need to be taken before the cost-benefit analysis is made (Mishan 1974) and the basis for these decisions made clear. The ultimate decision-maker can then weigh the results, the assumptions, and the sensitivity tests in a better-informed and, hopefully, more objective manner.

A value of 5% has been selected for use as the social rate of time preference in this study, corresponding roughly to the median value of the data prescribed earlier. No great precision can be imputed to this figure but it does seem likely that the true value lies between 4 and 6%.

SHADOW PRICES

The shadow prices outlined earlier require refinement to relate them directly to the accounting and budgeting categories used in Australian public enterprises. The following categories are generally used in public accounting and budgeting (Mathews, 1967):

- (i) Consolidated revenue funds
- (ii) Trust funds
- (iii) Loan funds.

These categories admittedly reflect historical accounting and budgeting methods rather than meaningful economic identities. However they do form the basis for costing, budgeting, and resource allocation within the public service. So long as this is the case it seems appropriate to apply different shadow prices to them.

Consolidated Revenue Funds

These funds are raised from taxes and from revenues

of public enterprises. Taxes fall largely on consumption, the main exceptions being the corporate income taxes and personal income taxes on the higher levels. Some arbitrary allowance for these exceptions has been made in dealing with loan funds. Thus for present purposes it may be assumed that the tax component of consolidated revenue funds is derived entirely from consumption and therefore has a shadow price of one.

Public enterprise revenues, however, may be identified with either consumption or with public investment since they may offset increases in taxes to some extent, but they may also represent a source of finance for public investment.

The marginal rate of return on public investment (r_g) has already been assumed to be equal to the social rate of time preference (i_g). Equation (3) therefore collapses so that the shadow price for public investment is also one. This somewhat fortuitous result means that a uniform shadow price of one applies to all costs in this category.

Trust Funds

These are generally derived from the revenues of the public enterprise concerned and are funds allocated to some specific use, generally under the control of the public enterprise concerned. Under Section 13 of the Forestry Act of New South Wales, 1961, for example, one-half of the gross receipts of the Forestry Commission is set aside in a Special Deposit Account for use in afforestation and other specified purposes under the control of the Forestry Commission. These funds are clearly related to public investment and hence have a shadow price of one.

Loan Funds

Loan Funds are raised either from the sale of government securities, mainly within Australia, or from the surplus on the current account of the Australian government (Mathews, 1967). The main purchasers of government securities are the financial and quasi-financial institutions, such as the banks, life assurance firms, and the like. The nature of their business is such that these funds would almost certainly flow to private investment but for the legal requirements that they invest a substantial portion of their funds in this manner.

It is difficult to identify funds from the Australian Government surplus on current account with a particular source, in terms of investment or consumption. Since loan funds are the main source of finance for new projects in the public sector, it seems appropriate to adopt a somewhat conservative approach to ensure their efficient use. Thus loan funds from this surplus have also been assumed to have been diverted from private investment, by way

SOCIAL DISCOUNT RATE

of corporate income taxes or personal income taxes on higher incomes.

Equation (4) is thus appropriate for the estimation of the opportunity costs of the *initial* transfer of loan funds to the public sector. However Feldstein (1972) pointed out that this treatment is incomplete in the case of debt because debt carries an obligation of repayment. The impact of these repayments should also be taken into account.

In Australia, interest payments on government securities are financed out of taxes but are re-financed at maturity by further debt issue. Under these circumstances Feldstein (1972) has shown that adjustments to the shadow price in equation (4) are necessary to reflect both the costs of the additional taxes required to finance interest payments, and the offsetting benefits stemming from the further use of these interest payments by the debt-holders.

The critical issue in this adjustment is whether the marginal propensity to save of the debt-holders is different to that of the marginal propensity to save of the private sector in general. While no data or evidence are available, it seems unlikely that any difference exists in Australia. If the two are equal, the adjustments will exactly offset one another and hence no adjustment has been made to equation (4) in this study.

Equation (4) involves the shadow price for funds diverted from public investment which, under the assumption outlined earlier, equals one. Equation (4) therefore simplifies to the following expression:

$$L = \frac{r_p [1 - m_p (1 - t)]}{i_g - r_p m_p (1 - t)} \quad (6)$$

where L denotes the shadow price of loan funds.

The marginal tax rate on corporate income is .475, this being the nominal rate of tax on corporate income. The composite marginal tax rate on personal income is not known but is likely to be similar to this value.

The marginal propensity to save was estimated by Haig (1971) to be .19, based on an analysis of national income statistics. This figure includes public sector saving which would be higher than the private sector. The marginal propensity to save in the private sector has therefore been set at .15.

While some data are available on the average real rates of return (Fairbairn and McShane 1969) they are of little value in gauging the marginal rate of return before tax in private investment. We have selected a figure of .12 because it seems to reflect the guiding rate used in business once allowance is made for risk and inflation.

Substituting these values in equation (6) the shadow price for funds in this category is equal to 2.73. Thus each dollar of loan funds used will be priced at \$2.73 in calculating net social benefit.

Since the choice of the values used is open to debate some examination of the sensitivity of the shadow price to changes in them is desirable. The values of shadow price corresponding to various values of the variables in equation (5) are shown in Table 37.

TABLE 37
ESTIMATED VALUES OF THE SHADOW PRICE
FOR LOAN FUNDS

Marginal rate of return r_p %	Marginal propensity to save m_p %	Social rate of time preference i_g		
		4 %	5 %	6 %
11	15	3.23	2.45	1.97
	16	3.28	2.47	1.98
12	15	3.62	2.73	2.19
	16	3.67	2.75	2.20
13	15	4.02	3.01	2.41
	16	4.09	3.05	2.43

The shadow price is relatively insensitive to changes in the value of the marginal propensity to save in the private sector, at least in the range which seems sensible, from the evidence available. As might be expected, the shadow price is more sensitive to changes in the marginal rate of return before tax on private investment, but not unduly so.

Changes in the social rate of time preference produce the largest changes in the shadow price. However these changes are mutually offsetting to some degree in their impact on net social benefit.

Revenues

A portion of the revenues of most, if not all, state forest services are returned by law to trust funds. Clearly these relate to public investment and have a shadow price of one. The remaining revenues go into the consolidated revenue fund and hence also have a shadow price of one, under the assumptions made earlier.

CONCLUSIONS

A Pareto optimal solution, letting both public and private sectors adjust to a common rate of interest, seems infeasible because of the existence of various market imperfections. Acceptance of a continuing difference between the social rate of time preference and the marginal rate of return on private investment involves acceptance of a second-best solution.

The suggested use of a synthetic discount rate to take account of the opportunity cost of funds diverted from private investment distorts the temporal allocation of the goods provided by the public

sector. Project selection is similarly biased towards short-lived projects or those whose main benefits accrue earlier in the life of the project.

Use of the social rate of time preference as a discount rate and of a separate shadow price (or prices) for scarce capital avoids these problems. At the same time, the principle of valuing scarce resources in terms of their opportunity cost is maintained. The distinction between this approach and that based on the use of a synthetic discount rate is likely to be especially significant in social cost-benefit analyses of long-lived projects, such as those involving investment in wood production.

Estimates of the social rate of time preference and of the shadow prices of the various sources of public investment funds have been made. The shadow prices have been further refined to enable them to be applied to the categories used for costing and budgeting public investment in Australia. While these estimates provide a starting point for social cost-benefit analyses, their shortcomings must also be acknowledged. Deficiencies in the data available necessitated sweeping assumptions at a number of important points. Further research is needed to clarify these points and to improve the basis of the estimates.

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DISCUSSION OF PAPERS BY MESSRS STRAIN, PHILIP, FERGUSON AND REILLY

CHAIRMAN: PROFESSOR F. JØRGENSEN

MR. STRAIN argued that systems analysis, or, more precisely, systems dynamics, which was geared towards the establishment of a logical structure of relationships between variables, called for much less detailed data than other operational research techniques or cost-benefit analysis. Apart from its value to analysts and planners, systems dynamics had an educational role for politicians in clarifying the effects of various options. The group concentrated attention on the point about the amount of information needed to make a systems model operational. In contrast to cost-benefit analysis, which required one to decide which effects were 'costs' and which 'benefits', systems analysis simply provides data about how variables develop as a consequence of particular actions. It was concluded that systems dynamics had a role which was complementary to that of cost-benefit analysis: it was not a substitute.

Although MR. PHILIP's paper dealt solely with the recent history of the U.K. private forestry sector, a

most important conclusion could be drawn from his review. This was that it appeared dangerous and wasteful of resources to create unnecessary confusion by carrying through drastic changes in policy. Nowhere was this more true than in long-term business where the maintenance of confidence was especially important.

DR. FERGUSON'S AND MR. REILLY'S valuable survey of theories on the selection of an appropriate discount rate for use in investment analysis of projects in the public sector concluded that the use of the social rate of time preference (STP) combined with a shadow price for capital was most likely to give the optimal allocation of resources. Discussion concentrated on the question of the relative magnitudes of the marginal rate of return and the STP rate and the desirability of showing the implications of choices of alternative possible rates and shadow prices in actual investment appraisals.

CONCLUSIONS

REPORT OF THE MEETING OF S4.05-01: EVALUATION OF FORESTRY'S CONTRIBUTION TO ECONOMIC DEVELOPMENT

The last session was devoted to consideration of the Working Party's conclusions.

General

1. The Working Party's central concern is with the objective and complete evaluation of the contribution of forestry to economic development. It is assumed that forest industries are also covered by the title. The group's concern with critical appraisal implies, where necessary and practicable, the development of guidelines and methods of appraisal. Such guidelines and methods are intended for use by foresters concerned with presentation and justification of proposals as well as by planners and decision makers. In assessing proposals for action in the forestry sphere it is desirable that multidisciplinary teams be used. By this means it is hoped to avoid overconcentration on one or a few measures to be used in appraisal.

2. While the main orientation of the Working Party's work is towards developing countries, work carried out in economically more advanced countries is of relevance both for policy purposes in the less developed regions of developed countries and for the possible application of methodology in developing countries.

Nature of the Measures

3. In the recent past a major feature of the economic assessment of projects, whether in the forest and forest industries sector or elsewhere, has been the concentration on one or other of a limited number of measures. In the field of investment appraisal attention has been concentrated on (i) *financial*

appraisal and (ii) *cost-benefit analysis*. Each of these results in the expression, indeed one might say, compression, of the consequences of a given course of action in one or two numbers only. In some instances attention has also been paid to net foreign exchange earnings per unit of investment.

4. It has become increasingly clear that since economic development is a many sided process and national objectives are often conflicting, evaluation of projects aimed at economic development requires multidimensional economic measures to be assessed.⁽¹⁾ In order that more informative guidance be given to decision makers it is necessary to make explicit reference to effects on (iii) *employment through time* and, closely related to this, (iv) *income distribution*.⁽²⁾ In both, rural/urban splits are useful.

5. In relation to all these measures efforts should be made to provide clear statements of the economic processes at work in a project and not simply to show the result of the calculation of the particular measure chosen for assessment. An example of the approach is provided by regional multiplier analysis. Here, a well-stated exposition helps the reader to understand how a given action of investment or exploitation of a resource brings about manifold effects on a region's income and employment. This educative process is likely to be at least as valuable as the final multiplier calculations.

6. Likewise (v) *the wider effects* of projects should be noted. Accordingly appraisals should record likely benefits, such as improved working conditions, or costs, such as downstream pollution effects, where the ascriptions of monetary values to such effects are either arbitrary or difficult and they are not, accordingly, included in the cost-benefit analysis.

7. Opportunity should be taken to test certain new techniques. In this connection further applications are needed of systems dynamics, the method developed by Soderbaum⁽³⁾ of Sweden and the technique of position analysis (a method of reviewing the possible courses of action required to move from an initial position in economic and social development to some desired future position). Apart from work on testing and improving evaluation techniques applicable to projects, further analysis of institutional arrangements such as commodity commissions for forest products should be pursued.

(1) A useful up-to-date reference to the subject is given in H. Schneider, *National Objectives and Project Appraisal in Developing Countries*, Development Centre of OECD, Paris 1975, \$3.50.

(2) See Deepak Lal, *Methods of Project Analysis: a review* (especially Chapter III), *World Bank Staff Occasional Paper* 16, 1974 for a discussion of distributional weights which provide for income distribution effects to be incorporated into the net present value calculation of a project's benefits.

(3) Söderbaum, P., (1975). *Multilevel computer model of world development system* in Proceedings of the symposium held at the International Institute for Applied Systems Analysis, Luxemburg, 29 April-3 May, 1974 (ed. M. Mesarovic and E. Pestel).

CONCLUSIONS

Applications

8. A major decision about the use of existing forest resources concerns the rate of exploitation. A rapid rate may appear desirable from the point of view of boosting employment and hence local income and, in many cases, foreign exchange earnings also, but a more deliberate approach may be less wasteful. Political considerations often favour rapid exploitation and while the arguments about timing must be considered, a high rate of exploitation can usefully stimulate the introduction of more intensive plantation practice.

Data Needs

9. The Working Party recognised the major difficulties connected with availability of data and the reliability of such data as were available. On the physical side, the need for adequate inventory of forest resources and for indicative data on environmental consequences, particularly in the field of physical influences of changes in forest cover, were emphasised. The work of other IUFRO groups such as P4.06-00 (Forests and the human environment) and P4.03-00 (Economics of recreation) were relevant here as well as FAO and UNESCO work (the latter in connection with the Man and the Biosphere project).

10. On the side of economic assumptions, and apart from the perennial argument about the choice of a social discount rate, more attention is required on costs in general and future marketing and price estimation both for products which are and those which are not supplied at present.

11. Compilations of guides to the sort of data required and sources of such data would be of great

use to those concerned with presentation of project evaluations.

Case Studies

12. International and national agencies concerned with aid-giving and other actions aimed at economic development in developing countries are often constrained not to publish analyses. Efforts should be made to relax these constraints and generally to widen the availability of completed studies of projects or strategies affecting the forest and forest industries sector. Wider circulation would be of assistance to those concerned with the preparation of project assessments and those who have to review them in illustrating data needs, problems of applying particular methodologies and might even be useful also in providing data relevant to a project under consideration elsewhere.

13. The potential usefulness of post-evaluation of ongoing or completed projects is considered important.

Financing

14. The Working Party did not consider financing since this is primarily the subject of Working Party S4.06-02 (Effectiveness of policy measures in encouraging investments in forestry in developing countries) whose Chairman, Dr. H-J von Maydell, was present at the meeting. It is however recognised that a number of financing points are relevant to the evaluation of projects. Among these are the degree of assurance of continuity of funds and, where private sector development is concerned, the risk of changes in fiscal policy having disturbing and potentially damaging effects.

A. J. GRAYSON

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