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The evolution of forestry

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The latest trends in thinking

BEFORE discussing what can be called the present evolution in forestry thought, it may be well to reiterate certain platitudes. Foresters all over the world and those concerned with planning economic development are always concerned, or should be, with two fundamental problems:

1. How is the growing need for wood in all its many forms to be met?
2. How best can trees and forests fulfil their protective role of safeguarding the basic resources of soil and water?

First, then, the supply of wood. The Timber Trends Studies which have now become a recognized and an important part of the functions of FAO's Forestry and Forest Products Division are already making a real and valuable contribution to the data needed by forest services and others when planning to ensure for the future adequate supplies of this essential raw material. For the first time regions and countries have a general indication of the likely future trends of wood consumption and can compare these with the apparent possibilities of meeting them. It can already be seen, for instance, that in Latin America there is the paradox of a region possessing one quarter of the world's forest resources and at the same time being a net importer of wood and wood products. Again, in the subcontinent of India, with its dense and growing population and with its mounting need for wood, the *Far East timber trends study* has put before governments clear evidence that, unless drastic steps are taken, the gap between consumption and production of wood will widen until in 15 or 20 years it can reach proportions which will be a major hindrance to the social and economic development of that area. North America, which is now one of the great exporting regions, will on its own showing probably by the year 2000 only just be able to supply its own wood-based industries with the raw material they need. It appears that Europe will run into a heavy deficit in the next 30 or 40 years. This very superficial summary of some of the findings of the studies on consumption and production trends is enough to show how formidable and varied are the problems brought to the fore.

On the other side of the picture is the generally accepted view that the forests of the world, many of them inaccessible as yet and untapped, can provide from their yield enough wood on a growing scale and yet on a sustained basis to meet the world's growing requirements for as far ahead as it is reasonable to look. It is probably also true to say that until recently it was the foresters' view that countries should indeed seek to meet their growing need for wood mainly through bringing into use more and more of these natural forests and managing them for increasing and sustained production, broadly along the lines of traditional forestry practices. Again speaking generally, at heart foresters are apt to consider almost all kinds of forests, from low producing tropical forests to the high yielding and intensively managed coniferous forests of Europe, as essentially areas whose function is the production of wood. They pay lip service, perhaps less reluctantly than in the past, to the concept of multiple use and concede that their forests may, for instance, be used by tourists or even by wild animals. Even where a forest is playing predominantly a protective role, foresters generally like to extract as much timber and wood as possible, so long as the protective function is not impaired.

> The fundamental problems facing foresters remain fundamental today – as does FAO's role in collecting and disseminating information towards their solution.

QUICK-GROWING TREE SPECIES

Two factors in particular seem to point to the need, and indeed to the existence of a radical change in this way of thinking.

First, it is becoming increasingly clear that the difficulties involved with bringing into use inaccessible or complex forests can make the wood extracted from them so expensive (if this is properly costed to take account of the massive injection of capital that is often required as well as the high recurrent expenditure) that the use of this wood becomes

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uneconomic. Although, therefore, on a yield basis the forest resources may be wholly adequate to meet world needs, in fact it looks as if great areas may well have to be discounted because of the high cost, both initial and recurring, involved in bringing them into use.

Fortunately, there is a second factor which offers a much brighter prospect of making secure and economic the future supply of wood. Did this second factor not exist, foresters would have to confess that wood as a raw material would have to be replaced on an ever-growing scale by other, perhaps less satisfactory, materials.

This second and cheerful factor is the great possibilities being opened up of depending more and more on man-made forests. There is nothing new, of course, in plantations. As was seen at the Second World Eucalyptus Conference in Brazil in 1961, the State of São Paulo depends for its wood supply almost entirely on Eucalyptus plantations established around 70 years ago to supply its railways with fuel. The 500,000 hectares of these plantations are one of the earliest and still the most ambitious, large-scale introductions of an exotic tree species for commercial purposes. In the southern part of Africa, exotic pine plantations have led to the development of a major industry over the last 20 or 30 years, and there are examples from all over the world of successful, man-made forests. But it is only comparatively recently that the science of genetics and plant breeding has been applied to forestry, and this opens up a great new horizon. Most, if not all, of the remarkable improvements in farming, the spectacular increase in production per unit of area, and the confidence with which agriculturists face the task of feeding the world's growing population, are based on or greatly influenced by the scientific breeding of animals and plants. Similar spectacular changes can surely be brought about in forestry. Already, for instance, breeding of poplars has enabled foresters to obtain yields undreamt of a few decades ago of good commercial timber from disease-free trees. But for most other species, breeding and selection, and all that goes with it, is merely in the stage of research and early trials. Yet there is sufficient evidence to show that yields from plantations can be 10 or 20 times as high as from many natural forests.

Tree breeding, however, is not the only new weapon in the hands of foresters. While the use of fertilizers is common practice in the cultivation of most agricultural and horticultural crops, its use in forestry is relatively new and the possibilities are only now beginning to be understood. With the judicious use of fertilizers the rate of growth of existing stands may be substantially stepped up, the huge yields of plantations may be increased still more, and land now considered incapable of carrying an economic forest crop may be made fit to do so. With the use of fertilizers must go the latest techniques of cultivation and irrigation, as they do in farming.

Another relatively modern forestry development which has almost limitless possibilities is the use of trees as a farm crop. There is perhaps a natural resistance by agriculturists to the use of good farm land for growing what are not generally accepted as farm crops; yet there is no logic in growing, for instance, a fibre crop such as cotton on good farm land and excluding a fibre crop such as poplar. Should not economic considerations be the main criterion on which to judge what crop to use, assuming, of course, that site is suitable for the alternatives under consideration? Similarly, why should not Europe, for instance, particularly in the circumstances of the expanding Common Market and of approximate sufficiency in food supplies at home or from abroad for many years to come, avoid what seems like an inevitable and serious shortage of wood by using on a much greater scale than at present farm land even of high quality for growing timber crops? Should not economic considerations, tempered as they always should be by social considerations, be the criterion for land-use planning in relation to farm or forest crops, rather than any preconceived concept of a "natural" distinction between farm and forest land?

This growing emphasis on plantations, which seems to be essential if the increasing need for wood is to be met economically, does not, of course, imply the abandonment of the many valuable and productive natural forests in many parts of the world, nor does it imply that plantations should be made only on land which is not now carrying a forest crop. In many countries much of the plantation work, if not all, can best be undertaken on land now under forest, though planting will probably cause a radical change in the composition of the tree cover.

The references made to exotic species and the frequent use of exotics in present-day plantation work, must on no account lead to neglect of valuable indigenous species, especially as the careful selection and breeding of these and other techniques can often substantially increase their yield. Nor does the emphasis on plantation imply the abandonment of natural regeneration. Whether one or the other practice is used or a combination, must depend mainly on economic considerations — which costs less in relation to outturns? — these considerations being influenced by the care that must be taken never to impair but, if possible, to improve site quality (and the fertility particularly of tropical soils is often only finely balanced), and by considerations of simplicity. In the highly developed forest countries, management and silvicultural practices, particularly in Europe, have become extremely complex and there are examples of even more complicated practices being used in tropical forests. Even if these can be shown to be satisfactory in the long run, it is open to question whether the subordinate staff and labor forces in less developed countries can achieve at all quickly the skills required to use these practices effectively and extensively: they may be sound but too complicated.

The really important implication arising from the widespread and growing use of plantations, with what can be an immensely increased yield per unit of area, is that, in

land-use planning, a substantially smaller area can be set aside specifically for timber production than was the case when countries felt they had to depend mainly on natural forests and their development. For some countries, particularly those with large forest areas, many of them at present unused and inaccessible, the second implication is that areas of existing forests can be "written off" — written off, that is, from the point of view of wood production.

The multiple-use concept

This brings us now to consider the second of the two roles of the forest referred to at the beginning of this paper. "Writing off" for wood production does not, of course, mean writing off for protection and the many other uses to which forests can be put. In discussing the protective role, the first point to make is that timber-producing plantations and man-made forests, while their role is first and foremost production of wood, can also have a protective role as shelter and to safeguard soil and water, especially in catchment areas, and they can have other secondary functions as well. It is the natural forests, however, not earmarked for wood production that are the main source of protection: they can now be allowed to exercise this role unhampered by the favorite objective of all foresters — to produce wood. It will be unimportant what shape the trees in these forests develop, whether they are bent and crooked or tall and straight, dense or scattered, whether the forests have many or few species — provided they perform the function of maintaining a suitable vegetative cover for the protection of soil and control of water-flow. Nor will the old argument need to be pursued acrimoniously as to whether forest or grass or other vegetation should be grown: any combination will be acceptable if the main objective is achieved. There are great areas too, where the natural forest has been destroyed and where a protective vegetative cover must be restored. The same consideration should apply here, and choice of species need not be influenced by thoughts of producing wood. The protective role of any vegetative cover is something extremely difficult to evaluate, though there is no doubt that this value, and sometimes a very high one, exists when, for instance, the vegetation safeguards costly reservoirs or irrigation works from silting or flooding.

Because these protective forests need not be called upon to produce wood (except incidentally) this does not mean they can have no productive function. Forests and scrubland, together with adjoining and merging rangeland, can be developed to the full for the grazing of domestic animals and wild animals as well; and the yield can be in terms of meat, hides and other animal products and as fodder. Grazing would obviously have to be carefully controlled but with the objective not of protecting the trees from damage by browsing or rubbing but only to the extent of ensuring that the protective role of the vegetation is fully safeguarded. These protective forests and rangelands can merge also with intensively managed pastures, these being devoted essentially to animal and fodder production. This use of forests for grazing is something repugnant to many foresters who have been brought up to look upon wild and domestic animals as almost always enemies of the forest. But this is an attitude which will have to change, even perhaps to the extent of welcoming goats, of course under controlled conditions, into certain forest and scrub areas if full use is to be made of forests and maquis not wanted for wood production, and their related range and pasture lands.

These protective forests and rangelands, as well as producing meat, etc., and harboring wild animals, can offer recreation on a growing scale, and the opening up of these areas for this purpose can relieve the pressure on the essentially productive forest areas. Recreation inevitably brings with it an increased risk of fire, but that is something that must be faced and, if the people of a country demand recreation facilities, they must surely be prepared to pay what is necessary for fire protection and other controls.

The concept of the "multiple use" of forests was readily accepted at the Fifth World Forestry Congress without perhaps much deep and careful thought as to what this really implied. Indeed, there is the risk that the concept may be interpreted to mean: a little of everything in every forest. The true interpretation of this concept is one which could perhaps better lead to the name "multiple role." There would be forests devoted essentially to wood production, mainly man-made or heavily influenced by silvicultural treatment designed to step up to the maximum the yield, both in quantity and quality, and always regulated by economic and social considerations. And there would be forests devoted essentially to a protective role but producing as much as possible of animal and fodder products, and these could also, together with rangelands, provide for recreation, tourism and for wild life. This planning in terms of a dual role does not imply the need to put into one category or the other all the forest areas in any country, for as far ahead as it is reasonable to look there will be vast forest areas which can be totally forgotten. One of the largest would be the great part of the Amazon forests which could be left undisturbed to grow and be the habitat for animals and primitive tribes as they have been for many thousands of years: and there are many similar, though smaller, forest areas elsewhere.

If this picture of the two distinct roles of forests is accepted, there must be a reorientation in much of the thinking and action on the many different aspects of forestry with which foresters are concerned. In policy, and in land-use planning which follows from it, there will need to be a much closer link with farming policy since the boundaries between the forest and the farm will in many instances entirely disappear. There will, of course, and always must be, great areas devoted to wood production where farming has little or no part to play. But there will be an expanding

area earmarked for tree farming and forest plots used as part of farm rotations where food and wood production are both part of a co-ordinated intensive agricultural enterprise — agricultural, that is, in its widest FAO sense. And there will be extensive protection areas — forest, rangelands and pastures — devoted, in conjunction with their protective role, to the production of animal products, fodder, recreation, and wild life. It then becames virtually impossible to evolve for a country a forest policy, as distinct from a farming policy. It follows from this that any new or existing forest law must be looked at with care to see that the distinction, which should be made to disappear, is not perpetuated by legislation.

Basic principles unchanged

In the light of the latest thinking on forestry, it is interesting to look back to the Principles of Forest Policy, approved by the FAO Conference in 1951. It would seem that none of the changing thoughts or practices — which are in many respects revolutionary — makes it necessary to vary at all these principles which were the result of farsighted thought and much discussion,

Perhaps one of the most difficult problems will be that of devising suitable administrative machinery. It might be argued that the close co-ordination of farming and forestry should lead to one omnibus service. That, however, does not seem a necessary or desirable solution; because of the very special skills which have to bear on managing trees and forests for either role, there must continue to be specialist forest services. Similarly, since production forests are essentially an industry or a business, they must be managed as such to yield a profit, and a different form of administration is necessary for them as compared with an agricultural administration concerned mainly with extension work and implementation of the law. Where control of land use is of fundamental importance is in catchment areas, particularly in steep mountain country, and for this reason there is much to be said for the Italian arrangement which puts under one authority forestry and the whole economy of the mountain regions.

This merging of forestry and farming, particularly in the protective areas, will considerably simplify the social problems which so often seem an insuperable barrier to proper management. When catchment areas have to be put under or kept under proper vegetative cover, the approach is often complete exclusion of grazing animals and, therefore, a drastic alteration in the peoples' way of life. If now the concept is that these forests and adjoining lands can be managed so as to carry a reasonable stocking of domestic and wild animals, the change will be not nearly so drastic and the full benefit can be achieved more simply by the co-ordinated use of range and protective forest instead of the separate use and management of the two.

Education and research

Education and training are rightly given a very high priority in FAO's work for less developed countries. Is it certain that the advice given is really sound for these countries? Changes in thinking and practice must be fully reflected in the curricula of new education and training institutes as they are set up. While it is difficult and perhaps unnecessary to change quickly or fundamentally the teaching of universities in the older forestry countries, it would be disastrous if these well-tried, intensely valuable ways of thought were transplanted without "spring cleaning" into the newly developing countries. Not only must the teaching and training incorporate the latest thinking and experience, but it must be adapted to the circumstances, and particularly the social circumstances, of the new countries. The objective for many years ahead should be, however heretical this may seem, teaching which is practical and simple rather than deeply scientific and theoretical. In saying this it is not implied that standards should be allowed to slip but rather that the standards, while set high, should be of a kind suitable to newly developing countries. These countries can have the advantage of the long years of thought and experience of the older forestry countries, but they need not perhaps go through the same processes of training and education evolved over many years, mainly in and suitable for Europe and North America.

A great responsibility rests upon research. In describing, inevitably superficially, the two complex roles of forestry, it might be thought that it has been assumed that the techniques and methods of the establishment and management of man-made forests, of tree cropping and the combination of protection forests and grazing, are all known. Far from it; there is a vast field of new research as well as the pursuit of old lines of investigation which need to be carefully thought out and followed. A basic aim in all the growing of trees for whatever purpose must be the assurance that the fertility of the site be maintained or, if possible, improved; but we know all too little about how to achieve this best and cheapest. Is the farmer right when he so often condemns tree crops as using too much water or reducing fertility? Or is the forester right in contending that in many instances a tree crop can be more profitable than a normal farm crop and at the same time maintain or improve the site quality? What is the level of grazing that can be tolerated in forests of different kinds and still maintain a satisfactory vegetative cover and a proper regeneration of grasses, herbs and trees? Much research and experimentation is needed on these and many other subjects, above all on the way tropical forests should be treated as simply and cheaply as possible to improve their productivity, while the delicate balance of their soil fertility is maintained. A difficult task is to determine which are the most important problems to be tackled and to settle this not necessarily by reference to the well-accepted lines of research but from the point of view of the unsolved

problems of each of the two main forest roles as they are adopted for the developing countries.

In the field of wood technology one of the problems frequently encountered in many parts of the world is how to put to good use the almost countless different species which grow in natural forests, especially in the tropics. If we accept the view that man-made forests will on a growing scale provide the wood that is needed, this problem of using many different species will become a lessening rather than a growing problem. The very complex structure will not be repeated after initial clearing; instead the composition of the forest will be chosen for maximum wood production of a kind which is most suitable for and needed by industry. Selection and breeding can be directed more specifically to developing types of tree whose wood is most suitable for a variety of industries, and to forests which will produce relatively uniform products. In this way the problems of industry will be considerably lessened. Agricultural crops are now being bred to produce, in conjunction with ever-improving techniques, higher and higher yields for various sites and for various end uses, and they maintain a remarkable uniformity. The same process will certainly be increasingly introduced with regard to forest crops especially for pulp and paper. But in thinking about simplifying and increasing the production of raw material for industry, it must not be forgotten that one of the most urgent needs is for wood for fuel, primitive houses, and general village purposes.

The Function of FAO

Finally, the growing importance of man-made forests emphasizes once more the highly important part that forestry economics must play. As in the case of genetics, the application of economic theory to forestry is of comparatively recent origin and even now the number of trained economists in this field is one of the main obstacles to practical planning of forest and forest industry development. Yet it is economic considerations, the aim of producing wood as cheaply as possible and the necessity of fitting forest and forest industry development into the general framework of a country's growth, that must be a weighty factor in settling the pattern of plantation forestry, of farm woodlots and tree cropping. But while cheapness and efficiency of production both in quantity and quality are essential, as they are in any business, it is important never to lose sight of the social aspect of forestry. Economic considerations may sometimes have to be largely disregarded so that the way of life of man and women, families and tribes, whose heritage lies in the forest and related lands, are not drastically disturbed; on the contrary, it is only by making full use of the inherent skills, characteristics, beliefs, and even prejudices of the local people that the effective improvement of the general productivity of land can be achieved, even if this is done by slow and costly procedures measured by purely economic considerations.

The task for which FAO was originally set up has been described in *So bold an aim* as the "collection and dissemination of information using a variety of media — international meetings, publications, visits" and "the acquiring of expertise principally by the less developed countries from the more developed." This was the basis of FAO's Regular Program, now greatly widened or extended by field or action programs. However large and important these field programs become — and the need for them is almost infinite — the Regular Program must always remain the foundation upon which they are built and sustained. But — at any rate so far as forestry and forest products are concerned and if we accept the existence of this evolution in our midst in thinking and practice — FAO has a further and more fundamental responsibility which should be fully recognized and implemented. Not only must FAO collect and disseminate information and knowledge of techniques, but it must play a role which no other organization or institution can do so effectively, that of shaping and guiding the thinking and practice of the older countries to fit the quite different circumstances of the new, so that they are applicable to the aspirations of the people of these new countries and are offered to them in a form in which they are able to take full advantage of them. The concept of the two great roles of forestry, merging with intensive cultivation on the one hand and extensive grazing on the other, and taking full account of the people for whom, after all, all this thinking and planning, education and research is undertaken, infringes in not the smallest degree the principles of ecology in its widest sense, "the study of the reciprocal relations of living organisms — plants, animals and men — and their environment," which should be the essential guide line for all the work undertaken by FAO.