Alf Leslie:
The Skeptical Forest Economist

Alf Leslie

Edited by
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EDITOR’S PREFACE

Alfred John Leslie was born in 1921 and attended the Victorian School of Forestry, at Creswick, Victoria from 1939 to 1941, graduating first in his class in 1941. He served with the Royal Australian Navy in submarines during World War II. After a field posting with the Forests Commission in the Otways, he was nominated to undertake the Bachelor of Science (Forestry) course at the University of Melbourne and graduated in 1949. He returned to field service with the Forests Commission after graduation but resigned to take up an appointment with APM Forests Pty. Ltd. in Gippsland, where he worked until being appointed Lecturer in Forest Management at the University of Melbourne in 1958. He was promoted to Senior Lecturer in 1962. He taught at the University of Ibadan from 1962 to 1964 and then joined the Forest Industries Division of the Food and Agricultural Organisation (FAO) of the United Nations. He was appointed Reader at the School of Forestry, University of Canterbury in 1974, leaving that post in 1977 to return to FAO as Director of the Forest Industries Division. His so-called retirement in 1981 marked another change in which he has extended his influence as an international forestry consultant and, more importantly perhaps, as a mentor to many younger foresters around the world.

‘Alf’, as he is universally known, is a bibliophile and, despite a very active professional career, has read across a prodigiously wide range of topics. But he is also a skeptic and delights in starting an argument, disputing conventional wisdom, deflating bureaucratic edicts, and savaging political correctness. Hence my choice of title for this book, with acknowledgement to Bjorn Lomborg, author of ‘The skeptical environmentalist’ – a book that Alf greatly enjoyed.

He has also been a much respected source of advice in shaping the careers of many of his contemporaries. In particular, he has been extremely influential among Australian and New Zealand foresters in encouraging them to lift their sights and engage in forestry at an international level, especially in developing countries. Many of us owe our first venture in international work to his urging and assistance.

Alf was elected a Fellow of the Institute of Foresters of Australia and is a past President of the International Union of Societies of Foresters. Among the many recognitions he has received, the University of Melbourne conferred an honorary Doctor of Forest Science on him in 1983.

Alf’s motivation for this book is explained in the pages that follow. Some years ago, I volunteered to edit it and get it into circulation in some form. Regrettably, that has taken
much longer than either of us would have wished. Thanks are due to Ros Shearer for straightening out much of the basic formatting and corrections because Alf, like me, is not a well-disciplined or proficient typist. Furthermore, as a result of various relocations and peregrinations, his library and records suffered, so that literature citations and references often did not match. Further delays ensued on my part until I found ways of checking the multitude of references to my satisfaction, thanks largely to the Library of Congress website. Having experienced some well-justified criticisms of references in my first formal publication from Alf some fifty years ago, I could hardly risk exposing this book to the same treatment.

As he would both expect and wish, I disagree with quite a few of his arguments. But my motivation in seeing this book into print is that his scholarship deserves to be preserved so that others may likewise ponder the arguments.

I know that I speak for many other foresters in presenting this book as a tribute to a much respected and admired teacher, scholar, mentor, friend and skeptic.

Ian Ferguson
Professor Emeritus of Forest Science
University of Melbourne
This book, if it is not too great an exaggeration to call it one, is not intended for publication and never was. It is meant for me alone. After playing around in the field of forest economics for the best part of sixty years, I wanted to sort out my ideas on the subject. This should have been easy. There are, after all, some very fine and now some very sophisticated books on the subject and, for the most part, they all tell the same story. So why should I feel the need to sort out my ideas? There could be only two possible reasons. The first and most obvious and possibly the correct one, is that I am not bright enough to understand them. To that charge I most willingly plead guilty, but only in respect of the latest highly mathematical works. The others I think I understand, if not fully, at least well enough to appreciate what they are getting at. So that leaves the second possibility, namely that for some reason or other, I felt they are wrong, in part at least. It is this possibility that led to the thinking aloud on paper that follows.

But nobody else, apparently, has expressed a similar concern that these texts are wrong, even in part let alone in whole. So why should I? Leaving aside the obvious explanation that the fault lies with me, there are, in fact, several reasons. One is that their prescriptions, often more implied than deliberately spelled out, did not seem to fit my experience of real life situations in forest management and policy. In the forest industry firms I worked for or with, profit maximisation did not seem to be given the prominence it has in economic theory. Profit definitely, but never its maximisation. More to the point was the satisfactory level of profit, which I later found out, was what Baumol had in mind. Of course, the managers, as many economists maintain, may have had the maximisation objective in mind without knowing it, but it never seemed to me to be anything like that. In fact, it was accountancy principles much more than those of economics that actually drove decisions and policy. Moreover it was apparent, painfully so at times, that the objective of a quiet life carried much more weight when things were going well enough, than any economic quest for greater profitability. Again I later found out that another eminent economist - Boulding - had already noted this tendency. But as I read on, it dawned on me that none of the adjustments to economic theory that such dissidents had proposed had found their way into standard economic theory.

Much of my experience has been with governmental forestry, in Australia at first and then, for the last thirty years or more, in other countries and with international agencies. These are notorious amongst economists for ignoring economic reality or even economic prudence.
Actually, they are not as guilty as accused, although they certainly handle economic matters in ways that economists do not like. The trouble is that they allow political and other non-economic factors to affect their decisions, practices and policies more than economists think that they should. In this they have an uncomfortable and uncanny resemblance to those private sector firms who sacrifice the rational goal of profit maximisation to non-economic considerations. Both, in behaving so contrary to the precepts of sound economics, must, by those precepts, be perversely wrong. Only after years of trying to change things in a number of these organisations did it strike me that sound economics may not be all that sound after all. The fault may, in other words, lie more with the economics than with the organisations. Mind you, the strictures from the economic point of view do have a lot going for them. Many of the organisations were not just as bungling, inconsistent, vacillating, inefficient and ineffective as they were accused of being; quite often they were worse. But all the same, what the economists said should be done did not seem likely to make things much better.

My attempts to resolve these observed discrepancies between the real world economic activity of my experience and the postulates of economics and why they persisted then led me to realise that there were other versions of economics than the ruling one I had learned and was trying to apply. Mostly relegated to the garbage tips of the history of economic theory and almost invariably derided, they have never been suppressed entirely. It is, in fact, surprising to find how many there are. A few are heretical in the extreme, but most depart from the orthodox at a few points rather than wholly. Even the Marxian version, despite its radical reputation, is a derivative of that same classical version from which the now dominant neo-classical version developed. On examination, some of these deviants appeared more closely aligned to the reality that the mainstream version ignored, discounted or neutralised.

The Austrian school, for example, shares with the mainstream neo-classical theory the firm belief that ‘‘capitalism offers the best guarantee of personal freedom and economic and social wellbeing’’, but is fundamentally different in methodology. It rejects the methodology of the physical sciences on which the neo-classical theory is modeled as inappropriate for social sciences. In this, its approach is more in keeping with the experience in business management, and similarly so with the institutional school in its recognition of law, culture, tradition, religion, habit and similar aspects of human behaviour as being just as influential in economic decision making as expectations of profit. But its attempts to incorporate the resulting complexities into a theoretical formulation are nowhere near as intellectually elegant or satisfying as the neo-classical theory. This, however, is a weakness only if it is the theory itself that is the criterion rather than the utility of the theory in a managerial or operational context. Schumpeter(1954), even though he does not appear to have inspired a school, also seemed to me to be come much closer to reality in his view of entrepreneurs and innovators in
economic dynamics and development. The early history of the Australian hardwood-based pulp and paper industry fitted the Schumpterian pattern like a glove.

Shackle’s deliberate and determined concentration on time in economics also seemed to be a much more appropriate approach to the problems of time dominated processes such as forestry than the implied timelessness of the neo-classical fabrications. But again, these innovations do not appear to have influenced mainstream theory to any significant extent. Nor, for that matter, did I find his specific incorporation of time into decision-making solutions all that applicable. Nevertheless, it was encouraging to find an eminent economic theorist taking time as an input of concern to management in real life so seriously. After that, the self-congratulatory, belated rediscovery in neo-classical economics of the Faustmann formula, a century after it had been introduced into forestry, could hardly be taken to be much of an advance.

At the same time, the possibility was becoming more and more plausible that the fault did not lie so much with the theory itself, but more at fault was the misuse and misapplication of the theory for purposes and in situations other than the limited ones that it was intended to describe or analyse. As a step in a general theory of value, it may well be a reasonable and adequate approximation. But it goes well beyond that limited scope to use it, even implicitly, as a description of how actual management decisions are made, or as prescriptions as to how they should be made. That, however, is hardly the fault of the theory.

Selective misuse of the orthodox theory reached its pinnacle, as far as I was concerned, in the push to privatisation that accompanied the takeover of economic and political affairs by economic rationalism, neo-liberalism or whatever euphemism is applied to modern laissez-faire. Although this has become the conventional wisdom from the 1980s onwards, not much privatisation of State forestry actually followed from the high-pressure propaganda. But that which did happen rarely made much sense to me. Perhaps this was more because of the way it was done and the spurious reasoning behind it, rather than for any great disagreement with the principle. I can see no reason why timber production, as an end in itself, should be a valid function of the State nowadays, although there may once have been a strong enough case for it. State forests established during the times when that applied may, because of the length of the rotations involved, persist long after the original justification for them has disappeared. Privatisation could, therefore, be a legitimate and necessary instrument for bringing State forestry into line with contemporary economic conditions.
Surely, then, neo-classical economics, which is a description of modern capitalism if not a hymn of praise for it, has been vindicated and its derivative, economic rationalism, fully justified. So why bother with something that, in those circumstances, can be little more than a historical anachronism? On the face of it, this is, certainly, a very apt question. Yet the victory for neo-classical economic theory is not as clear-cut as the sequence of successes might suggest. To show why would take another chapter or two and, while it might be worth doing some day, it is not a necessary part of the thesis explored here. But it may still be worth pointing out that many economists, some quite eminent, have also doubted, or have come to doubt, the validity of some or many and occasionally all of the claims made by or on behalf of the free market privateers. Not that they seem to have had much effect as yet, but it does show that all may not yet be lost to fanatic dogmatism.

But I am not trying to convince you. As I said at the start, I am only trying to work things out for my own benefit. If you cannot see the evidence that all is not as rosy as we are told, then that is your bad luck and, in the long run, your worry. For my part, I am now well satisfied that too much evidence, some of which has been mentioned above, and too many contradictions and inconsistencies have to be swept under the carpet for the triumph of the neo-classical economics of fairy land to be a credible proposition. But many people seem not only quite capable of doing just that, but delight in doing so. Obviously, they would deny that they believe in fairy tales, so it is hard to see any other reason than it is in their interest to accept and have accepted that raids on publicly owned assets are in the public interest. It certainly says a lot about them while saying nothing much for them.

So, in brief, the objection that this is all old hat is about as credible as the underlying neo-classical version of economics and its neo-laissez-faire offspring. There are public goods, there are external diseconomies and economies, and they do abound in forestry. For economic theory to be of any use in forest management, they have to be its starting point. To pretend otherwise gets close to exhibiting an ostrich-like stupidity. To claim that the market place can and will look after them perfectly well shows an impressive disdain for facts combined with a depressing ignorance of history. Both characteristics, however, exert too powerful an influence in human affairs for anything I say or believe to count. But that is no reason for me to toe the line with the party faithful or for me to worry about whether you want to rubbish the thesis of this book.
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1. BABES IN THE WOODS

Hardly anybody nowadays questions the need for the practicing forester to know something about economics. Whether the need is real or desirable is another question, but one which is apparently never raised. Even those who deplore the circumstances, which have led to the need, admit that, if only for self-defence, the forester has to know something about economics. All the same the need is accepted with more reluctance than enthusiasm. The reasons for this may include the possibility that neither the case for the subject nor its contents have been presented as well or as enthusiastically as they should have been.

Nobody has or is ever likely to query the need for knowledge of silviculture. In fact, the majority of foresters become, or want to be, silviculturalists. Their enthusiasm for the subject helps to overcome the dullness, the rigidity and the disjointed way in which the subject is sometimes presented. In essence, silviculture is concerned with how to grow a forest, so the interest is understandable. The more basic question of why the forest should be grown at all - the question with which the subject of forest economics is concerned - ought to be able to arouse just as much interest and enthusiasm. But it rarely does. Why?

No doubt there are all sorts of reasons for this situation. The structure of courses in forestry education probably has something to do with it. Forestry is taught and studied as an applied biological science. The basics are physical, chemical, biological and statistical sciences. From
these, knowledge of how trees and forests grow is built up. The orientation is technical. People have little to do with it other than as observers and manipulators. With such a start the definite bias to the biology of the process is inevitable. The bias is aptly summarised in the commonly expressed view that forestry is a biological science operating within economic limits.

Actually, there is a lot to be said for this view. The forest is, after all, what forestry is concerned with. It is only to be expected, therefore, that their management should require a detailed knowledge of the biology and dynamics of forests. So with forests universally recognized as a necessary component in human welfare, such a bias is almost inevitable.

In the last few decades, the realisation has crept into forestry education that foresters need to know more about those economic limits and how they operate. But on the whole it is still introduced as an addition rather than as a fundamental and often received by students without much enthusiasm. This latter attitude is not too hard to understand. Economics does not, on the whole, have a very good press. It is all too easily identifiable with big business, accountancy and finance and with speculation and peculation, none of which rate high for idealism or motivation.

The professional reluctance to admit economics has, however, a longer history. It dates, more or less, from the early 19th century when some foresters were trying to bring the infant discipline of economics
to bear on the long established practices of forestry. Martin Faustmann (1849) eventually condensed the whole of forest economics, as it then existed, into that single and singular formula which now carries his name. The formula, in essence, expresses the monetary profit to be expected from growing a forest for its timber, taking into the accounts the cost of the time involved, by accumulating all the costs and intermediate returns at compound interest. The results were shattering or they would have been had the management implications of applying Faustmann been followed. In effect, almost every principle and practice of what was then regarded as sound forestry could be shown to be uneconomic. Something had to be wrong. For the best part of 150 years, foresters, with the exception of forest economists, have been trying to show that and identify what it is that is wrong.

As far as the forest economists were concerned the attempts were completely unconvincing. But in fact neither side made much impression on the other, although they continued to argue. As a result the forest rent/soil rent controversy (Hiley, 1930) dominated forest economics until well into the 1950s. Since then the two sides have apparently agreed to go their separate ways. As Mutch (1962) pointed out, forest practice seems to be little affected by economic theory despite the constraints imposed on it by economic conditions. Forest economists on the other hand, continue to urge efficiency prescriptions derived from marginalist economic theory; but they preach largely to themselves.
Nevertheless, over the last thirty years or so, the protagonists of economics in forestry have been gaining ground. Plantation forestry as a more economically efficient means of utilising land and finance for timber production has, almost universally, become more favoured than natural management. Silvicultural regimes - thinning, pruning, spacing, weeding, fertiliser schedules - tend to be based on economic analyses more than they used to be. Amongst the reasons for this would almost certainly be the increasing influence of economists in government. Faced with a presumably adversely-minded scrutiny at the source of funding and even land use allocation, foresters have felt compelled to acquire enough economics to play the economists on their own ground. Thus has arisen the self-defence, or as Grant (1979) terms it, the advocacy role for economics in forestry.

But it has not been quite on the economists’ ground. Forest economics has been largely developed in micro-economic terms, and government economics is largely concerned with macro-economic considerations. With the position to be defended at the budgetary allocation level a micro-economic one, forest economists; with their deeper practical knowledge of the micro-economic characteristics of the forestry sector have had a slight edge over the macro-economists. This edge is not entirely negated by their relative unfamiliarity with macro-economics, nor, as yet, by an increasing tendency for forest economists to move into other arms of government and governments to set themselves up as authorities on micro-economic matters. In that respect, perhaps, the greater emphasis on economics in forestry could be held to have paid dividends.
All the same, it is hard to see that forest economics has greatly changed forestry practices. Even the examples in silviculture which were mentioned earlier, might be explained as responses to economic conditions rather than to economic theory. Thus a dual attitude to economics seems to have developed in forestry. On the one hand it is appreciated as a defence against treasuries, accountants and the like who would axe the resources going into forestry if they could get away with it. On the other hand, it is not seen as having much use or application in the realities of forestry in practice.

Three factors can be picked out as having contributed to the development of this ambivalence. Firstly the longstanding distrust of economics applied to forestry has not been noticeably diminished by the reasonably successful holding operation on the budgetary front. For most foresters there is still a big difference between the use of economics to disarm the philistines with their own weapons and the use of economics to dominate silviculture. This caution really reflects the misgiving foresters have about the short-term bias they see in economics and its practitioners.

The second factor is the emergence of the modern environmental movement. Although forestry has been one of the main targets of the movement so also has economics. The success of environmental campaigns to halt industrial projects has confirmed the belief of foresters that economics is not everything. It is by no means certain that economics was ever so dominant in forestry but to many foresters
it appeared often enough to be, so that any proof to the contrary would be most welcome.

Then thirdly there were, for a while, other indications that economics was declining in influence and power (e.g. Leontief, 1982). Particularly important in the development of this feeling was the disarray into which economics seemed to have fallen in the face of the global recessions, which began in the mid 1970s, and the spluttering recoveries and relapses over the following decade and a half. The inability of economists to foresee the recession or its intensity or its duration or to find solutions to the malaise, coming up with instead a multiplicity of contradictory explanations and prescriptions hardly justified the prestige which economists had enjoyed in the post Keynesian era. As Davidson (1978) put, ‘the corpus of orthodox theory now lies in shambles’.

As a by-product of that disarray, a number of other schools of economic thought, previously shunned, began to attract some unusual attention as alternatives to the failing orthodox version, especially at the macro-economic level. Although only the mainstream version remained as fully respectable, the other schools were at least heard of, derided by the orthodox but no longer successfully suppressed.

But by the beginning of the 1990s, the disarray seemed to have been overcome. The combination of high rates of inflation, persistent high unemployment and sluggish growth against which standard economic solutions had seemed so powerless are, except for unemployment, has
apparently turned out to be less intractable. The trade-off between unemployment and inflation, one of the Keynesian mechanisms that had been dismissed along with Keynesianism generally, is now, found to work after all (e.g. Krugman, 1994). But the feeling on the whole is that conventional prescriptions with much less governmental intervention have proved their effectiveness. This belief seems to be fully borne out by the collapse of the socialist economies and their almost unanimous rush to capitalism and privatisation.

An intriguing feature of this revival is how it has now extended to micro-economics. The wide acceptance of the free market philosophy and, hence, privatisation as a guaranteed cure for many of the macro-economic ills, has now made Treasury and Central Bank economists the experts also in micro-economics urging a near classical, laissez faire version of mainstream theory. Ignorance of the complexities of the mechanisms in the biological processes of forestry is not seen to represent any disadvantage. What goes on within the forestry ‘black box’ can be dismissed as no more relevant to the economic input-output relationships than any other transformation process. Such a gross over-simplification comes, as everyone involved in a growing, processing or manufacturing activity knows, close to being nonsense. Yet, at the level of economic management it prevails - proof again, if more proof is needed, that knowledge is often almost powerless in the face of ignorance. With this, whatever slight edge on the micro-economic front that forest economists may have, is now very much diminished.
Forest economics, however, shows virtually no sign of the confusion and turmoil, which afflicted economic theory during those fifteen or more years. And, perhaps this indifference is fully justified. After all, as it has turned out, the disarray in orthodox theory was apparently temporary only. Even then and perhaps more significantly, the disarray was one affecting macro-economics. In micro-economics, the dissatisfaction did not and has not yet led to a proliferation of schools, while few of the macro-economic schools have flowed on to micro-theory. Yet the economy is clearly the sum, in some way, of its micro-elements. Hence it is more than a little surprising that almost none of the different versions of macro-economic behaviour have corresponding, parallel or alternative explanations at the micro-economic level.

The only fully worked out version of micro-economic theory is still the neo-classical marginal analysis of perfect competition. It, together with the less completely developed but still substantial body of modifications to allow for imperfect competition, is the basis of forest economics as currently presented. The only other versions, which are in any way more than embryonic at the micro-economic level - institutionalism and the Austrian - are accorded little attention in that presentation. Institutions, if mentioned at all, tend to be taken as constraints rather than mechanisms.

At first sight it is hard to quarrel with this. None of the alternatives have been developed far enough to be useable in applied micro-economic analysis. It seems sensible, therefore, to base forest
economics on the only well established and well accepted theory of

economics. But is it really so sensible (e.g. Nove, 1983) It may be no
better than another instance of the dubious proposition that a wrong
theory is better than none.

Then there is the awkward fact of the almost total absence of an
effective link in mainstream economic theory between the micro and
the macro-economic levels (e.g. Rostow, 1990). As a result, any
vindication of the standard economic theory, which might be found
from contemporary macro-economic history, is not, at the same time,
automatic proof of the validity of neo-classical micro theory.

Some doubts about that theory as far as forestry is concerned, if not
generally, are obvious from a comparison of the production process in
forestry with the simple processes implied in neo-classical theory.
Some of the differences are associated with other forms of economic
activity, apparently without greatly undermining the credibility of
micro-economic theory applied to them. But in forestry a great
number of the differences are combined to a degree and intensity,
which is not found elsewhere (Leslie, 1971).

These doubts are then reinforced by the different institutional context
in which most of the world's forestry is practiced. Seventy per cent or
more of the world's forests are under State ownership or State
management. Neo-classical micro-economics, from which forest
economics is derived, is founded on private ownership. For this neo -
classical version of forest economics to be valid for forestry in general two propositions must therefore hold. They are that:

1) neo-classical micro-economic theory is a good enough approximation to the behaviour of private forest owners and
2) the behaviour of private forest owners is a good enough approximation to the behaviour of States as forest owners.

The first proposition does have some evidence to support it. Some forest estates in the United Kingdom, managed along lines laid down by Hiley (1954), are in that vein. However, the substantial degree of State subsidisation of private forestry in the United Kingdom until quite recently, makes it difficult to interpret evidence from there. Stronger support seems to come from the United States. Gaffney (1957) found that the almost unanimously condemned practices of the private forest owners were more rational, in the neo-classical economic sense, than those advocated by their critics. In fact, acceptance in the USA of the rightness of the neo-classical view of economic rationality is so well entrenched that most forest economists urge or imply that it should also be the basis of policy for the national forests.

The evidence from Western Europe is rather less supportive. Many private forests there are still managed on lines, which would be quite uneconomic in terms of the principles summarised in the Faustmann formula. That this is often done under State compulsion, as, in Sweden for example, could, however, be rather taken as supporting the first proposition. Actually the whole question of State regulation of private
forestry suggests that private forest owners, left to their own devices, would act just as implied by neo-classical economic theory.

Yet there are, on the other hand, enough privately owned forests in Western Europe and the United Kingdom where ‘uneconomic’ systems are applied voluntarily and defended vigorously, to indicate that the first proposition does not apply to all cases of private forestry. In fact, the list of reasons summarised in Jennings (1980) is almost fatal to the proposition.

The evidence regarding the behaviour of private forest owners is thus rather inconclusive. Some do behave as might be expected under neo-classical theory. Others do not. In all probability, of course, the category ‘private forest owners’ is too heterogeneous for it to allow a valid test of the proposition. Nevertheless enough forest owners do, apparently, behave rationally, (Gaffney, 1957) in the sense of rational in mainstream economic theory, for it to be taken that the first proposition does hold in some circumstances.

Forest economics as currently expounded is appropriate then, but only for rather less than one quarter of the world's forests. The second proposition - that the behaviour of private forest owners is a good approximation to the behaviour of States as forest owners - is almost automatically refuted by some of the evidence drawn from the first. Gaffney (1957) concluded that the practices advocated by State foresters for private forests and applied in State owned forests were uneconomic. This view seems to be fairly generally held amongst
North American forest economists who urge or imply that State forests ought to be managed in accordance with the efficiency criteria drawn from neo-classical, micro-economic theory (e.g. Hyde, 1980). The implication that, presently they are not, disproves the second proposition.

It can, of course, be argued that the performance of State forestry would be much better were it conducted more in accordance with those efficiency criteria. Apart from the issue of what actually constitutes ‘better’, this argument really undermines itself. Economic theory is supposed to describe things as they are; not as in this argument as to how somebody thinks they should be. At present the reality is that State forestry is rarely governed by the criteria that applies to some private forestry. The second proposition cannot, therefore, be taken as holding.

Thus, neither evidence nor logic provides much justification for an automatic extension to forestry in general of a forest economics based on mainstream neo-classical theory. The value of a theory of forest economics in forestry education and practice, which has so little relevance to most situations in forestry, is certainly in some doubt but is there any alternative?

This last question raises several others including the one from which this book started. Why bother with forest economics at all? The self-defence case calls for macro-economics. This still leaves the question of which form of macro-economics but the micro-economics of
forestry is not, apparently, involved. If there is a wider case than self-defence for forest economics then either:

i) the form of economics at the micro level has to be more appropriate to the most common institutional setting of forestry or

ii) it has to be shown that the errors of logic in applying the present form of forest economics outside its limited zone of validity are of no great practical significance.

If the latter is the case then the answer is obvious and easy - forest economics as it stands will serve the purpose. If, however, there is some practical risk, then the question of which economics has to be faced. The implications could be drastic. With little in the way of ready-made micro-theory other than the neo-classical version, it might then be necessary to build up an economic theory appropriate to State forestry virtually from scratch.

The practical significance of an erroneous theoretical foundation for present day forest economics thus becomes a matter of more than theoretical interest. It cannot, however, be assessed unless there are alternative theoretical versions whose performance in dealing with problems in the micro-economics of forestry can be compared with the orthodox version. In the absence, as yet, of alternative theories advanced enough to allow the issue to be so tested there are only two options. One is to accept the orthodox version because there is no other, despite the rather dubious logic, but to treat its prescriptions for management in State forestry with a marked degree of caution. The
second is to assess whether the known shortcomings are likely to lead to serious misdirection of management in practice in State forestry. The second of these is the one adopted here.

The need for knowledge of economics in forestry was accepted earlier almost without question. The doubt raised by the reservation “whether that need is real or desirable” was set aside in view of the almost unanimous acceptance of the need. It can, however, be no longer avoided. Self-defence involves one aspect of economics, self-analysis another. Is economics needed in State forestry for either, for both or for other reasons?

State forestry, being by definition a governmental activity, must have some involvement in the government’s 9budgetary processes. The self-defence case for economics in forestry derives from this fact. It seems to be self-evident that in dealing with government departments and other government agencies such as treasury, finance and the central bank, concerned with national economic management and the allocation of State revenues and resources, some knowledge of the concepts, models and relationships underlying their views about such matters would be an advantage.

But even that could be too little. The budget formulation process in government is very much a continuing adversarial one as much, if not more than, a deliberate exercise in optimal resource allocation in the national interest (e.g. Wildavsky, 1964). In such a process, knowledge of economics may not be decisive but it is still unlikely to be a
handicap, if it is of the right sort and quality. For a State forestry department or authority as governmental body engaged in commercial operations, this requires knowledge of economics at both the macro and the micro levels. It is hardly likely that a State forest authority would be able to accumulate and develop or even hire the expertise which could match that of the teams of specialists in government, working full time on macro-economics applied to national economic problems and having access to information which others are not allowed to see. Nor is there any need for it. All that is needed is enough knowledge and understanding of macro-economic theory as to be able to follow the arguments of treasury and similar officials, to see their implications for forestry and to refute, when necessary, false or inaccurate claims against forestry.

With micro-economics, the requirement is different. The need for foresters to know more about the production processes of forestry refers, by definition, to the technical aspects. It is not so obvious that it also applies to the economic aspects. In fact, the indications referred to earlier, that forest economics does not play a greatly significant role in forest management in State forestry suggests otherwise. In a way this is quite surprising because economic matters such as costs, prices and funding certainly do. This seems to mean that State foresters either know too little forest economics to be able to use it or recognize its value, or that they believe it has little to offer.

Thirty years or so ago, it may have been true enough that few foresters, especially in State forestry, were knowledgeable enough in
forest economics to use it or recognize its potential. The possibility now, however, that forest economics is little used because it is little understood, is almost non-existent. It is much more likely that it is little used because it is of little use.

In that respect, State forestry in its operational aspects would bear some resemblance to business management. Despite the common claim that the neo-classical micro-economic theory of the firm is good enough as an approximation to the behaviour of firms in real life, as most famously argued by Friedman (1953), there is little evidence that it has any more influence on business management (e.g. Simon, 1966; Galbraith, 1987) than it does on forest management. Clearly economists or people with a considerable background in economics are employed in increasing numbers in industry and commerce. On the whole, however, they are concerned more with analysing and monitoring the economic environment facing their industry or as company or industrial advocates in negotiations with government or government agencies or trade unions than in running the business. In other words their main value is, as it is with State forestry, in self-defence on the macro-economic front.

The possibility that neo-classical micro-economics is wrong as a theory of the behaviour of individual economic units is not new but it is not popular either. Nobody would go nowadays as far as Hicks (1973) did in rejecting the evidence because it threatened the theory. All the same the bulk of the work in micro-economic theory accepts the basic validity of the neo-classical version and attempts to make
any evidence to the contrary fit into a supporting or confirmatory role. And according to Williamson (1975) the attempts have been fairly successful, at least to the theorists' satisfaction. Business is not, however, impressed; micro-economic theory at the level of the firm is still largely irrelevant in real world management decisions and operations.

The paradox is actually easily explained. The theory is a general theory and thus not necessarily applicable to any specific, individual firm. On the other hand, forest economics and business economics are very much concerned with the behaviour of the individual firm or forest owner. If neo-classical micro-economics is not intended to apply to the individual case then it would be almost pure chance if it turned out to be appropriate.

As an explanation of the paradox, this is almost the same thing as saying that forest economics is so little used in State forestry because it is wrong. Incidentally, it is worth noting at this point that the separation of micro-economics from macro-economics described by Galbraith (1987), as ‘one of the intellectually suffocating errors of modern economics’ does not apply here. The micro-economics referred to by Galbraith is the general theory of value and distribution not the decision making aspects of management at the level of the firm.

In a way, this still leaves unanswered the question of whether economics has a role in the management of forests. If the underlying theory is wrong then economics should not have a role. But from the
management point of view economics should have a role since forestry does involve the use of resources - physical, human and financial - that could be used for other purposes while some, if not all, are relatively scarce in most societies. How they are combined and for what purposes are the subjects, inter alia, of economic inquiry. Deciding on how to combine them for specific purposes is a management function, so there is enough common ground for economics to be useful if it is relevant.

In this chapter then, two inter-dependent questions have been considered - why is economics needed in State forestry and what sort of economics is it that it is needed? And a set of conclusions of varying degrees of sharpness has emerged. First there is a definite need for economics in State forestry in a defensive or advocacy role. Secondly economics may be needed in State forestry in a self-analysis role to assist managerial efficiency and effectiveness. For effective self-defence, a better than working knowledge is needed of the main macro-economic schools. It may not be so obvious, but it is no less definite, that it also requires knowledge of the micro-economic theory applied to the forestry sector by treasury and other officials. Nevertheless no matter how important that knowledge of neo-classical micro-economics might be for self-defence it is of little value for managerial purposes. So if economics has or is to have a managerial role in State forestry it needs another micro-economic base.

This conclusion rests, of course, on the evidence that forest economics, as it is, plays little part in managerial decision making in
State forestry. If this is not true, then the whole argument collapses. As evidence in support of the belief, Mutch's (1962) finding for the United Kingdom dating from 1962 could be well out of date. The intervening 30 years or so cover the time in which the importance of the role of economics in forestry has become generally accepted and forest economists in State forestry departments have become more numerous. Hence what may have been true about the irrelevance of economics in management then would not necessarily be true today. However, the observation that ‘the policy prescriptions which are favoured by economists are almost universally ignored in real world policy formulation’ (Convery, 1977) suggests that things did not change much for fifteen years at least. Publications tend to confirm that this is still so. Most of those from work in forest economics still analyse or refer to State forestry in terms of criteria drawn from neo-classical economics (e.g. Fenton & Tennent, 1976; Hyde, 1980; Byron & Douglas, 1981; Barbier et al., 1993). On the other hand, the many more numerous publications on silviculture and forest management rarely mention economic analysis except in terms of costs as constraints. This would suggest that either the managerial use of forest economics is now such standard practice as to warrant no special mention or that, in practice, such a role is neither seen nor appreciated. The continuing urging of forest economists clearly indicates that economics is not yet standard practice. The greater likelihood seems to be that in State forestry, forest managers still find little use for economic theory.
This suggests a corollary - that economics is of little use in the practice of forest management because it is the wrong version of theory. But this immediately raises another question - whether there is or could be a more useful base in micro-economic theory for the managerial economics of forestry than the neo-classical one. It is to this that the discussion must now turn.
Before beginning a search for something, it helps to have some idea of what that something is. The search for a more appropriate theoretical basis for the managerial economics of State forestry has therefore to start with some idea of what managerial economics and State forestry are and how they relate to each other.

Definitions and descriptions of 'management' are almost as numerous as they are different. However, they all have at least one element in common: that management, whatever else it might include, is concerned with the making and taking of decisions. What the field of economics covers is not quite so easy to isolate. The famous and influential definition of Robbins (1932) in terms of how to best use the available resources or formally, resource allocation, although now recognized as less than adequate, does cover an important part of the field, especially at the micro-economic level.

Part of economics is thus concerned with choices between alternative courses of action within the limits of available resources. Whether all choice situations that formulation could cover are actually amenable to the economic calculus is questionable. Walsh (1970) tends to define economics as the theory of choice. His predecessor in that line - von Mises (1949) - did, by changing the name of the subject, recognize better than Walsh and those who follow the all-encompassing line (see e.g. Schwartz, 1986) just what is entailed in such a broadening.
Marshall (1924) was much less Napoleonic. His version restricted economic choice to situations that could be measured in monetary terms. However, judging by the trend exemplified in benefit-cost analysis whereby a monetary value can be given to almost everything through its opportunity cost, the modern view seems to favour the view of Walsh.

To choose is, of course, to decide. Leaving aside for the moment the vexed question of the status of economics as a science, in terms of resource use, economics can be seen as a science of decision-making. Economics and management, with their common interest in decision, are thus, closely linked. Management is involved in the making of decisions relating to the use of resources, economics in analysis for the making of optimal decisions. Managerial economics is then the application of economics in the decision phase of management. But what economics is still a question?

Neo-classical micro-economics ought to be it. After all, it is specifically concerned with the optimal allocation of resources. The theory of the firm as the branch of it concerned with production is commonly termed is virtually a claim to that effect. But, as seen in Chapter I, it has little relevance to State forestry. One of the few places where it may have had more than a peripheral influence in State forestry is New Zealand, where the dominance of Pinus radiata and the clearwood regime are clearly traceable to analyses consistent with the neo-classical style (Fenton & Sutton, 1968). And it is yet to be seen whether this is not a mistaken application.
The fault, however, does not lie with neo-classical economics. In that tradition, the theory of the firm is not an end in itself and it certainly does not include any claim to provide guidelines for the management of specific, individual firms. On the contrary, it is a step towards a general theory of value, being the step associated with the determination of a generalised market supply curve. The fault with applying the theory to the managerial problems of specific firms, for which it was neither intended nor appropriate, lies with those who do that rather than with the theory.

Managerial economics is, by definition, concerned with the specific firm. Most of the controversy over the theory of the firm in neo-classical economic theory centres on making the theory more realistic in its representation of the firm. For the purposes of a managerial economics this would seem to be essential; for the purposes of the theory itself, it hardly seems to matter. Shackle disagrees. Throughout his work, Shackle (e.g. 1961, 1967) has argued that the failure in micro-economics to consider realistically the situation of the individual undermines a great deal of its structure. For managerial economics, however, there is no need to go as far as that. It is enough that neo-classical micro-economics is not intended to be true of or necessarily apply to any specific firm.

This waiver is especially pertinent in forestry. The firm of economic theory is, as Boulding (1952) puts it, a very anaemic version of the real life firm, even in the simplest line of business. Compared to the
modern business corporation or State forestry, there is almost no resemblance. Some of the discrepancies are summarised in Table 2.1.

TABLE 2.1 Characteristics of the firm in neo-classical economics and in State forestry.

<table>
<thead>
<tr>
<th>Neo-classical</th>
<th>State Forestry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instantaneous production process</td>
<td>Time the major input in production</td>
</tr>
<tr>
<td>Managed and operated by the owner</td>
<td>Managed and operated by agents for owners</td>
</tr>
<tr>
<td>Complete and perfect knowledge and foresight by all owners</td>
<td>Limited, imperfect knowledge under great uncertainty</td>
</tr>
<tr>
<td>Many owners all with equally negligible power in the market</td>
<td>Large scale ownerships tending to monopsony</td>
</tr>
<tr>
<td>Single final consumer good product</td>
<td>Multiple products mostly intermediate goods</td>
</tr>
</tbody>
</table>

The logic of the neo-classical firm is thoroughly worked out in the case of the perfectly competitive market only. This is such an abstraction that it is an open question whether it is of any relevance at all to management. Its fatal weakness is the assumption that the decision maker in each firm has the same perfect, complete knowledge and foresight relevant to the industry and the market. This is so contradictory to reality that there is hardly any need to look at other simplifying conditions in order to dismiss it as a base for managerial economics in State forestry.

This does not mean, however, that other schools of economic thought automatically provide a more appropriate base. One of the things to be
done, therefore, in searching for a base for managerial economics in State forestry, is to assess the applicability of alternatives to the neo-classical school. But first it is necessary to have a look at the special characteristics of forestry as an economic activity and of the institution of State forestry so as to be clear about what it is that economic theory has to explain.

**Forestry, the State and society**

There is no shortage of definitions of forestry. In general they add up to this. Forestry is the manipulation of the forest cover on land in order to provide an uninterrupted flow of the services and goods which forests are capable of producing in such quantities and qualities and combinations that society needs, at the times they are needed, for as long as society needs. This definition, in spite of its inelegance, does bring out the point, which Westoby (1987) for many years urged on foresters that forestry begins with people. It is the needs of people, the goods and services that they collectively want and need, which motivate both the idea and the practice of forestry.

In this respect, forestry is no different from any other form of economic activity. The differences, and hence, the difficulties, arise when the attempt is made to put that simple precept into practice. The first difficulty is a result of the time required for trees to grow to the stage at which they can either individually or en masse provide the goods and services that society needs. At the initiation of a forest, it is the needs of a society quite some distance into the future, which have
to be identified. But present society also has needs that have to be considered. These needs may conflict with those of the future. Thus, it is society as a continuum, but one, which as history shows, will be continually changing, whose present needs have to be identified, and whose future needs must be anticipated and reconciled all along the continuum.

Fortunately, forests have two characteristics as production units, which allow the needs of present and future societies to be reconciled to some degree, if not perfectly. For one thing, once a tree or forest reaches a stage of productive maturity for any given good or service, it can be held for very long periods at that stage and often with improvement. The second characteristic is that a forest is a renewable resource and even a multiple resource. It can thus be cut where and when necessary, or expedient to meet the needs of an earlier generation of the relevant society and replaced or expanded to meet those of a later one.

The second difficulty met is giving effect to the simple precept lies in identifying the people. So far, referring to them in the collective “society” has dodged this difficulty. But society is a very mixed bag. So much so that it is virtually impossible to identify with much accuracy or confidence what it is that society needs from forests. Like that close relative, the “public interest,” there is little doubt that such a thing as “society's needs” does exist, but no way of agreeing with much unanimity, what they are.
The trouble is that any society is made up of a large number of more or less discrete but fluid groups. The interests of some groups may at times coincide while conflicting with others. Yet, the groups that coincide may switch around completely on another issue. At other times, a group can be quite indifferent on an issue about which an erstwhile ally can be almost fanatic. As far as forestry is concerned, it is impossible to identify, even roughly, which group or which alliance of groups at which time speaks for or represents society in specifying what it is that society needs from forestry.

Westoby (1987) offers one answer. He argues, very convincingly, that the main beneficiaries of forestry have always been the ruling classes rather than society as a whole, and that this is still the situation. This means that it is the ruling class that says what society needs from forestry, regardless of the morality of such a situation, or even its reality. In medieval England, for instance, the Royal forests were reserved for the King's hunting and protected by the King's foresters against hunting or grazing by the common people, regardless of how desperate their needs. In modern India (and plenty of other places), the State's forests are protected by the Forest Services against the common people helping themselves to wood, game, grazing or land, no matter how desperate their need. Things have obviously not changed much over the last thousand years. In developing countries, at least, the ruling class, apparently, still imposes its view of what society needs regardless of what those needs really are.
One obvious inference from this is that the Marxian version of economics would be an appropriate base for an economic theory of State forestry. After all, in the Marxian view, the class struggle is the motive force of the economy and State forestry is, by definition, a socialistic enterprise consistent with the Marxian solution.

The neo-classical school has a clear-cut answer as well: being that there is no distinction between wants and needs, the price system reveals what society wants. But, as has been indicated, the conditions required for the price system to do that job are so fanciful that this view is almost irrelevant for State forestry.

Other schools of economic theory do not give anywhere near such clear-cut answers. The Keynesian, the Institutional and, to a lesser degree, the Austrian schools, allow a more active role for governments than the neo-classical school, which suggests that they imply that the government speaks for society. Possibly because these schools accept that an economy is driven more by social forces than monetary exchange relationships, their analytical systems are more complex and as a result, much less complete and definitive than those of neo-classical micro-economics.

Hence, while there is some inherent logic in seeing them as offering better bases for the economics of State forestry, the complexity which their, as yet embryonic analytic frameworks, have not successfully incorporated, limits their practical value. But there are other conceptual difficulties as well.
One of these is the ambiguity of the term ‘government’. For one thing, the government could be regarded as synonymous for the ruling classes. In this sense, the schools that try specifically to allow for the government as an active operator in the economy, could be taken as recognizing the Westoby or even the Marxian position. Apart from this, however, the political arm of government, in a representative democracy at least, is virtually forced to take a relatively short-term view (e.g. Hutchinson, 1977). This means that if any arm of government speaks for society in the long term, it must be the governmental bureaucracy. But even the bureaucracy, while imposing its views of what it sees as society's needs, in what it sees as society's best long term interests, will not necessarily place any social welfare view it may have above its own interests (Hutchinson, 1977). As bureaucracy can be fairly easily and accurately identified with the ruling classes in developing countries and less easily but still conceivably in other countries, the Marxian version could accommodate this complexity and ambiguity of the term “government”; the government is the ruling classes that include the bureaucracy.

This convenient way out of the difficulty is not available to other alternatives to the neo-classical school. They still have to face up to the difficulty of identifying whom, if anybody, speaks for society - present and future.
A second part of the difficulty in regarding the government as the spokesman or the representative of future society; is the distance into the future with which forestry is unavoidably concerned. Decisions must be made now about what society will need from forests over a period that can extend more than a century into the future. If, as it is said, a week in politics is a very long time, then the political arm of government is, almost by definition, ruled out as today's spokesman for future society. This is, however, neither always nor entirely true. There are, in fact, plenty of examples in forestry, as in other fields, where governments have taken action in the interests of the long distance future society, at some expense to present day society as well as its own electoral standing. And subsequent governments, even of quite different ideologies, do not always revoke such actions.

Closer examination of such instances often reveals, however, that behind these long-term decisions is the forceful and persistent influence of some visionary, determined individual or group. Sometimes, it is one of the bureaucracies, as with Gifford Pinchot in the USA or Entrican in New Zealand. Occasionally, it is a politician and sometimes, it is a private individual or group leading or forming public opinion as with the modern environmental movements. Often, however, it is the bureaucracy itself at the departmental level, which convinces its Minister to push through legislation giving effect to its views of future society's needs. This is especially so in State forestry where the forestry bureaucracy is frequently composed of people with a strong
common professional tradition of their duty to future generations (Kaufmann, 1960).

But in any case, wherever the idea originates, it is the political arm of government that must give it a legislative basis. So long as it becomes government policy, no great error is likely to be made by regarding the government as the spokesman for future society. Of course, it does not always anticipate correctly, nor does everybody in present society agree with its choices. However, as long as it does make decisions in favour of future generations and sees that they are implemented, then at least it has acted as representative for the society of the future.

In principle, therefore, State forestry is an institutional device through which the government compensates for the tendency, observed or suspected, for private interests to over-exploit forest to extinction. Duby (1962) shows that the realisation by the end of the 12th century in Western Europe that forests were “a precious possession well worth special protection” was a realisation by the ruling classes largely in terms of wood supplies, and they then had to impose it on the rest of their society. This might suggest that Marx and Westoby are right after all.

With economic development and the associated technological advances in materials, transport and communications, the need for State intervention to ensure local or even national wood production is less compelling. In fact, it is virtually imaginary. In these circumstances, wood is no different from any other commodity or raw
material. That it should be a responsibility of the State to make sure that it is produced locally is more a matter of political ideology than economic advantage, let alone necessity.

In developed countries, therefore, the case for State forestry depends solely on the extent to which non-wood services:

a) are essential for economic and social well-being or even survival,

b) cannot be imported or provided in any other way, and

c) cannot be safely left to privately owned and managed forests to provide in quantities, qualities, locations combinations, and timing in an appropriate pattern of social distribution.

The point is that, without direct State intervention, it is felt that these necessary services would be not be provided adequately so that neither present nor future society would suffer seriously. There is plenty of evidence and experience to support this view, despite the fact that in some circumstances, private ownership has been equally or even more effective than the State in providing these services. These circumstances favouring family and institutional estates are tending, in developed countries especially, to decline in significance and reliability under the combined impact of rising taxation, costs and governmental intervention. The idea that the State will therefore have to provide for the management of forests for their non-revenue producing essential services probably holds as a general rule for developed countries.
For developing countries or those parts of them where the ‘benefits’ of development have not reached all levels of society, the original argument based on wood as an indispensable, locally available necessity could still apply. A particularly urgent and pertinent example of this is fuelwood. However, in many of these cases, State ownership or control of the forests has failed to meet or anticipate these needs and has even made the situation worse under the policies and management applied (e.g. Fernandez & Kulkarni, 1983). Again, this could be taken as evidence for the view that the government does not represent society as a whole, but only serves to advance the interests of the ruling classes. But without going that far, these examples show at best an inability in the bureaucratic arm of government to make choices on behalf of society consistent with the real needs of the present and future society, which, in theory, it represents.

The point, once again, is that the government, while perhaps the de facto representative and spokesman for future society, is a long way from infallible. Furthermore, it is often not particularly adept - in developed as well as developing countries - at learning from its or anybody else’s mistakes. Thus it continues to apply policies, which may have represented correct earlier choices, long after changing circumstances have made them wrong and even detrimental. This tendency to show a form of institutional inertia is something that any theory of the economics of State forestry will have to take into account.
At this stage, however, it is enough to recognize that State forestry is a justifiable institution if it exists for social purposes, which would otherwise be ignored, or suffer to an unacceptable extent and the government can be taken as an adequate, if only just, agent for society future as well as present.

To the extent that these two conditions can be taken to hold, then neo-classical economics is clearly a very poor base from which to analyse decision-making in such an institution. Unfortunately, other schools of economic thought, while more philosophically appropriate, have no well-developed theories at the micro-economic level to apply or adapt in its stead. As far as an economic theory of State forestry is concerned, it is back to first principles. But those two conditions show that there is one thing to clear up first - do those conditions still apply? In other words, is State forestry now an anachronism?

Perhaps it is all a waste of effort?

If State forestry is an anachronism, then the search for an appropriate economic theory for it is just a waste of effort, except, perhaps, as an historical oddity. And this could well be so if the two conditions listed towards the end of the preceding section no longer hold. There are, as indicated earlier in this chapter, alternatives to mainstream economic theory or modifications to it, which might offer a more appropriate base for an economic theory of State forestry. But they are only worth turning to if State forestry has some appreciable present-day relevance.
in the light of the implications for economic theory of the recent political developments referred to in Chapter 1. In other words, in view of the apparent triumph of market capitalism, it could be doubted that State forestry is any longer an option worth serious study, except as an historical oddity.

Under the resurgent and now prevailing market driven system, the appropriate economic role of the State is restricted to little more than the refereeing role that Adam Smith identified over 200 years ago. This, presumably, rules out the State as a necessary forest owner, or even manager. It could, however, leave it a role in setting the rules of the game for the conduct of private forestry and, perhaps, as a residual role as owner and manager for forests that the private sector did not want to own or manage. If there were no such residual forests, the functions of the State in forestry would then be confined to setting the social limits, within which private forest owners and users would have to operate, umpiring the play and arbitrating in disputes between individual owners or users. Although the term “regulation” is almost outlawed in the modern context, State forestry would, in effect, amount to and be restricted to the regulation of private forestry. The only difference between the economics of State forestry and the economics of private forestry would be that it would also include analyses of the possible effects of alternatives in regulation on the profitability of private forest management.

All of this could be true enough if it were not for several points that throw doubt on the logic. First of all, the legitimate functions of
government, recognized by Adam Smith, include a category of things that need to be done or provided, but which are not profitable enough to attract private investment. That this category includes forestry is, in fact, the whole essence of the case for State forestry. Privatisation, as an alternative, implies that forestry does not fall within this category. If, as seems possible, this is so only for certain parts or functions of forestry, then the economics of State forestry is still a relevant topic. And if wood production is the main function to be left to the private sector, then the economics of State forestry is likely to be very different from the economics of private forestry and mainstream economic theory.

The second doubt about the validity of the contemporary trend as applied to forestry comes from the very strong body of opinion, which opposes the trend on general economic grounds (e.g. Fitzgerald, 1991). In other words, not all schools of economic thought accept the findings and policies based on neo-classical theorising about the failures of government and the near universal superiority of free market solutions, nor that the circumstantial evidence from the failure of the socialist economies is convincing proof. State forestry is not necessarily invalid because it is unfashionable.

The third problem with this view of the undesirability of State forestry is that empirical rather than theoretical ought, if evidence counts, to be more compelling. The awkward fact is that, despite all of the propaganda about the superiority of the private sector, comparatively little privatisation of State forests has actually taken place. It could, of
course, be argued that this only shows that it will take a much longer time for such a dramatic change in political philosophy to be effective, when public activities such as State forestry are deeply entrenched. This might well be so, although in New Zealand, where an almost complete transfer has taken place, the whole process from the initial idea of privatising the State plantations to completion, as far as private buyers were interested, was over in no more than four years. And it would be hard to find many countries where State forestry was more deeply entrenched and, in a technical sense, better performed. Other transfers have been made in other countries such as the U.K. and (for plantations) in the States of Victoria and Tasmania in Australia. There are, of course, all sorts of reasons why words have not been so far matched by deeds, and some of these may, in time, be overcome so that privatisation may eventually proceed much further. But until that does happen, and on a major scale, then the economics of State forestry is still a valid concern.

Then, fourthly, there is the fact that many of the weaknesses of the neo-classical, mainstream version of economic theory as a basis for the economic theory of forestry applies to forestry generally, regardless of ownership. They may be more pronounced under State forestry, but they do not and cannot disappear with private ownership.

It is likely then that a substantial proportion of forests will remain in most countries under State ownership and management for some time yet. That time could, in fact, be very long indeed. Forests are one of the sectors to which privatisation will not, it has been said, apply in
Russia, while it has been hardly raised at all as an option for the U.S.A. On that evidence, the economics of State forestry is not yet a dead enough subject to be dismissed as ancient history.
3. BUT WHERE IS SQUARE ONE?

It is much easier to say that the search for an appropriate basis for an economic theory of State forestry has to start virtually at the beginning than to say just where the beginning actually is. Two of the possible candidates for a beginning are obvious: one is to start with the beginnings of economics as a field of inquiry; the other is to start with what a manager in State forestry might want to get from economics.

Back to the origins

To start with the origins of economics would mean going back a very long way in history. Economic theorising presumably began when somebody started to wonder how the economy in which he or she happened to be living managed to function and keep functioning. In recorded European history, that can be traced, according to Schumpeter (1954), at least as far back as Plato and Aristotle.

Going back to those origins means introducing the idea of an economy as an identifiable and conceptually separable part of a given society. As with many concepts on or around which theories are built, that of an economy is perhaps best left undefined on the grounds that everybody knows what it means. Certainly to inquire more deeply runs the risk of opening a real Pandora's box. Just consider the set of questions that could be raised, for instance, in trying to pin down one apparently accepted definition of the economy as ‘that part of society concerned with exchange and exchange relationships’.
Exchange of what? Goods, services, ideas, favours, opinions, obligations, affection and rights are all exchanged in any society. Few would, however, claim that all of these exchanged relationships are within the domain of economics, although, as mentioned in Chapter 2, some economists go close to that. It is complications like this which enabled Parsons & Smelser (1965) to devote a fairly lengthy book to trying to delineate the boundaries of the ‘economy as a sub-system differentiated from other sub-systems of a society’ and, incidentally, from the society itself. Some economists, especially of the Austrian school, virtually deny, on the other hand, the concept of the economy altogether (Shand, 1984), while a few politicians, such as Lady Thatcher, are quoted as denying even the existence of society.

All the same, the delineation of the economy as that part of society with which economics is concerned seems fundamental to having a subject of economics. Uncertainty as to the location of the boundary could account for some of the disagreements and ambiguities, which characterise economics, and for the many opposed schools of economic thought. This point is not, however, all that critical for forest economics. The focus of interest in forest economics is only a part of the economy. The possibility that the boundaries of the economy are not known or knowable or may even be non-existent is not, in itself, a necessary inconvenience in forest economics.

Leaving these difficulties aside thus has the advantage of allowing the search for a starting point to concentrate on something less nebulous –
‘the economic problem’. This problem of how to make the best use of the resources available to an individual, a family, a tribe, a company, a government department, a nation and now mankind in general is universal. That there are many more desirable things that could be done with those resources than they can, in fact, cater for is and always has been at the core of mankind's activities. Every society faces the problem; some almost constantly, others periodically or at irregular intervals. Hence, societies have devised a variety of sets of rules and institutions to give automatic answers to the repetitive forms in which the economic problem recurs. In effect, the differences between societies referred to as cultural, largely reflect different solutions to the economic problem as it has arisen in each society. This implies that the while the problem is unquestionably universal, the solution certainly is not. Many of the conflicts within a given society could therefore simply reflect disagreements about the accepted or conventional cultural solutions in the face of changing relationships between resources and the uses to which they can be put.

Some differences arise from the further complication that the economic problem can be solved in several ways. One solution limits demand to the capacity of the available resources. Measures of population control, such as migration, which siphons off the pressure of increasing population on fixed resources, is in accordance with this strategy. Other solutions let demand grow, but match it by increasing the resources available. For most of human history, the standard way of doing this has been, at the society level, to take the resources from another society by war or swindle, methods that most societies outlaw
for their own individual members. This is not, however, the only way of increasing the resource base. Methods just as ancient as warfare are traded with other societies to increase and widen the range and stock of resources available and technological development to squeeze more and a wider range of uses out of a given stock of resources.

These ways of solving the economic problem are not independent. War and technological development are closely linked (Winter, 1975). The slogan “Trade follows the flag” also shows a well-recognised link between wars of conquest and trade. Colonisation links population control to conquest and trade while often forcing the colonists into technological improvisation and adaptations and thence development. In general, societies use combinations of these strategies. Since there are many possible combinations, it is hard to see how an explanation of how a society solves the economic problem can apply any more widely than at a given time in a given society. The idea of a universally, and invariably valid economic theory based on the universality of the economic problem, is therefore quite fanciful. Hence, if, as the approach through the economic problem might suggest, is the description and analysis of how individuals and societies solve that problem, then an economic theory that applies everywhere and at all times is an impossibility.

This is, of course, no new finding, but as it is a matter of great practical as well as theoretical significance, it is worth repetition. It runs counter to the implicit assumption underlying much of the teaching and practice of conventional, mainstream economics. It is not
surprising, therefore, that the mainstream literature rarely raises the issue. Hence, it might be important to make sure of its validity before going any further. It is re-assuring that some economic theorists, such as Myrdal, have long pointed out the limited range of any one version, but it is not proof. In fact, if the strength of support for a theory were accepted as proof, then the universal validity of the mainstream version would be almost beyond dispute.

Empirical proof, or falsification, in the more rigorous standard set by Popper (1935), is not conclusive either way. The history of economic thought shows a procession of the accepted theory of the day being superseded by another, which in turn is replaced another. This might appear to support the idea that a theory is likely to apply for a specific time only. ‘‘The End of The Keynesian Era’’ (Skidelsky, 1977), could thus simply signal the demise of yet one more theory that has had its day.

On the other hand, the fact that one theory eventually replaces another, does not necessarily mean that the original theory has been overtaken by economic and social change. It could just as easily mean that it has been wrong all the time with its deficiencies being exposed, not by economic progress, but by progress in economic research and then corrected in the theory replacing it.

This is certainly a possibility, but it can hardly be the full explanation. After all, economies obviously change quite markedly over time. The Britain whose economy Adam Smith analysed 200 years ago has few
surviving resemblances to the Britain of today. The industrialised economies of today are different in many fundamental respects from the depressed economies, which were the subject of Keynes' analysis in the 1930s. Even the differences between national economies before and after the 1973 oil shock are clear enough to warrant some doubts about accepting an explanation of economic behaviour, which implies that the mechanisms remain essentially unchanged. Parts of the mechanisms may be constant, but not the system as a whole.

It is equally hard to confirm empirically the other proposition that different societies will develop different economic structures and systems, and hence will need different theories to explain their working. There are indeed many books on Islamic economics which suggest that western economic theory has been found wanting in some respects outside its own cultural base. Then, further doubts are raised by thinking about how the openly individualistic bias in mainstream economics can apply to such community-oriented societies as those of Polynesia and Melanesia. The answer is, of course, that it cannot. This does not, however, stop its practitioners insisting that it does, and those types of societies must change their ways so that it does. As Thurlow (1983) says, ‘instead of theory adjusting to reality, reality must adjust to theory’.

Bell (1981) neatly summarises the deficiencies in the view that there is but one universal economic theory, constant throughout time. ‘There is no single underlying structure to a society...there are only different patterns of historical behaviour’. And the economic problem
itself - the very foundation of the mainstream micro-economic shows why this must be so.

**A dissection of the economic problem of scarcity**

A solution to the economic problem, wherever and whenever it is encountered, takes place in two stages: the first step is to calculate the results expected from each of the options identified as available, and the second is then to choose, by comparing the expected results, the one to be put into effect. Social and cultural considerations enter into both stages, but they tend to dominate the second.

The first step is, in turn, made up of a series of separate but interacting elements. At the outset, however, it may be worth pointing out the obvious - that the existence of a problem implies that the present situation is in some way unsatisfactory. If there is no dissatisfaction with the way present resources are being used, with the results, or with the way those results are distributed socially or geographically, then there is no economic problem. Such a happy state is no doubt rare but it could apply to some individuals. There is, however, a fundamental difference between individuals and collectives in their assessments of what they might consider being satisfactory distributions. An individual may be dissatisfied with the resources available to him or her, but, by definition, an individual cannot be dissatisfied with the results of the allocation of those resources. By contrast, the individuals who make up a society or a group within a society could disagree violently with the distribution of the proceeds from any given
allocation of the resources collectively available to them or the individual allocation which the collective one forces on them.

This potential discord with collective solutions to the economic problem leads to the two aspects of the economic problem referred to as efficiency and equity (Hirshliefer et al., 1960). But even individual solutions are not altogether free of equity considerations. Questions of distribution within an individual's immediate family could have some influence on his or her decisions about resource allocation. The efficiency and the equity aspects are, however, usually treated separately, partly, but not entirely, for analytical convenience.

For one thing, it is much simpler and straightforward to analyse resource allocation as a problem in efficiency and, on the face of it, more objective. Secondly, as Arrow's impossibility theorem (Arrow, 1951) shows, a social choice cannot be determined simply as the sum of the choices of the individuals concerned. In other words, equity effects cannot be assessed objectively. Thus, to put the two effects into the one analytical procedure only makes for a more complicated system, which cannot then provide a determinate answer. From an analytical point of view, nothing could be less elegant and more unsatisfactory. Almost inevitability then, equity considerations have come to be disregarded so that the efficiency conditions can, in principle, be determined unambiguously. As far as determinate results are concerned, the simplification is not merely convenient. It is indispensable.
All of this is, however, harmless enough. It may even, within limits, be useful, provided that deductions drawn from the analysis are not taken beyond the special case for which it happens to be appropriate - the individual in isolation. On the whole, theorists who have helped to build the impressive structure of mainstream economics are careful to point out the nature of this analytical device, and to a lesser extent, its limitations. In practice, however, the warnings are all but ignored.

Thus what may have appeared to be an irrelevant digression in respect of the economics of State forestry turns out to be of the utmost importance. State forestry is clearly a collective activity at a very high level of aggregation. Therefore, economic decisions in it should be taken in the light of efficiency and equity considerations jointly. In the mainstream economic theory underlying standard forest economics, efficiency is analysed separately and firstly. Equity issues are then grafted on so as to give the minimum departure from the efficiency solution.

Convenience would again seem to be the excuse, but in the case of State forestry, with much less justification. For a start, the economics of forestry is applied economics. The economic problem of scarce resources with which it is concerned is in terms of real things, real people and real quantities, rather than the abstractions of theory. The gap between these two situations is enormous. The wide range of types and conditions of ownership, from the individual, small-scale owner of a few hectares to the multi-national conglomerate industrial forest owner in the private sector and from local government to state
and national governments in the public sector, indicates the magnitude of variability in real life in this aspect alone.

The individual in isolation may not be too unrealistic as an approximation for small-scale owner-managed forests, but it takes a big stretch of imagination to say the same for the large-scale corporate forest owners. Yet this is exactly how standard forest economics proceeds.

One reason for this could be that no inherent contradiction can be seen in doing so. There could be something in this explanation. After all, none of the standard texts in forest economics make any reference to the possible difficulty, which may, in turn, stem from other sources. The teaching of economics, as many have pointed out, is almost monopolised by the neo-classical version. If alternative versions are mentioned at all, it is usually to dismiss them. Even if this were not so, there are no ready-made alternative versions to apply or adapt to forestry.

The reasons are understandable but far from convincing. The logic rests on three implicit but indefensible assumptions. The first is that ignorance of the alternatives is no handicap since there is only one valid version, which is the neo-classically based version being used. This may well be the majority view, but there are too many dissenters and too much evidence to support the dissent for this assumption to hold. The second assumption is that the validity of a theory can be established by the weaknesses in alternatives, while remaining
immune to its own. This is too clear a fallacy for it to be taken seriously. The third is that any theory, even a wrong one, is better than no theory at all. This assumption may not be so clear a fallacy, but is certainly open to question.

The extension to large collectives of an economic theory built around the behaviour in economic matters of an isolated individual therefore stands on rather shaky ground. It may be taken simply as an act of faith in the spirit that Ferguson (1973) applies in placing ‘reliance on neo-classical economic theory’. Or it may be that, in practice, the differences between the individual of the theory and the collectives of real life are negligible. This seems to be a reasonable enough possibility. Collectives have, after all, no minds of their own. Individuals who are members of the collective make the decisions for and on behalf of the collective and individuals put those decisions into effect. It seems plausible, therefore, to assume that individuals will act in the same way in matters of collective interest as they would in matters involving their own interests. Hence, a collective will act in much the same way as an individual. However, as Olson (1965) has shown, this is not so and cannot be so. Large groups, especially, tend to fall far short of the optimal behaviour credited to the rational self-interested individual of neo-classical economics.

From the point of view of State forestry, there is not much to be said in favour of the standard approach in forest economics. But this conclusion does not help the State with the economic problem arising from relative resource scarcity involving its forests. All this seems to
do is to eliminate the one theory that is fully worked through on the subject of resource allocation. Those managers who have to solve the problem are left with no guide as to how to work out the optimal purposes and ways for using the forests the State owns in its own right. And even less basis for deciding how, as some feel it should, the forests owned by its subjects are to be used and managed in the public interest.

This does not mean that the whole structure has to be adopted because there is nothing else, or discarded because it is wrong. Some of the basic steps in solving the economic problem are common to any approach. The options would still have to be identified and their expected results estimated in order to choose one as the course of action to be adopted, regardless of the theory underlying the process.

The big differences between theories seem to lie in:

a) the factors taken into account in identifying the feasible options and

b) the criterion by which one of those feasible options is selected over the others.

The options in resource use are obviously limited by the nature and extent of the resources available and the things that can be made from them or for which they can be used. The purely physical and chemical relationships between resources and products are unaffected by society or culture and are constant throughout time. However, the extent to which a society can take advantage of those relationships is
governed not only by its knowledge of them, but equally by the ways in which its social and cultural structures allow that knowledge to be used and expanded. With technological transfer and the mobility of capital and expertise, the social factors limiting the capacity to use resources to their full physical potential are becoming less binding, but the same cannot be said so confidently about the cultural limits. Some are quite rigid and impervious to other views. Many societies still reserve certain species of trees, other plants and animals or individual specimens of them and even inanimate objects for specific spiritual purposes and uses. These cultural limits on resource use are not confined to the so-called primitive societies. Many of the claims for the reservation of forests or other resources in more economically advanced countries have exactly the same foundation.

Institutional factors limiting the set of feasible options go well beyond these obvious and directly cultural ones. Most societies, even the thoroughly modernised ones, are far from homogeneous in the structure or operation of their most highly formalised institutions, such as legal, property, accounting, education or political systems. It is illogical, therefore, to assume or expect that two societies, even with identical stocks of resources, will decide on the same set of feasible options for using them. That, social and cultural differences can, even at this first step towards solving the economic problem, force different solutions on different societies, rules out the possibility of a universal answer as implied by the mainstream approach.
The most telling argument against the jump taken in mainstream economic theorising from the universal economic problem of resource allocation to a universal solution lies in the criterion for choosing one option over all other available ones. This criterion is very much a social and cultural matter institutionalised in the informal as well as the formal rules and standards of behaviour prevailing in a given society at a given time. In the mainstream neo-classical theory, the criterion is that the rational individual will choose in such a way as to maximise his or her expected personal satisfaction. But there is no reason to accept this as a universal criterion. On the contrary, there is plenty for rejecting it, even in the narrowest definition of the domain of economics. Community oriented societies such as those of Polynesia, mentioned earlier, are operating examples of where choice is guided by non-individualistic criteria. Moreover, there is, as Schwartz (1986) argues, an element of logical inconsistency in the maximisation criterion in general. Still, it is undeniable that the community-based norms do tend to loosen once contact with western societies becomes well established, so that individual self-interest probably tends, in time, to dominate.

It might, therefore, be concluded that the neo-classical assumption of individual self-interest is based on a fundamental and universal characteristic. It may be suppressed in certain cultures, but only until these cultures are over-run or modified by the more powerful economies eventually generated by individualism. The evidence that points in this direction may, however, be no than circumstantial. For instance, it is hardly supported by the well-documented tendency for
collectives such as firms to depart from the maximisation principle as a matter of deliberate policy. Firms in real life do not have the maximisation of profit as their dominant criterion to anything like the exclusive extent assumed in neo-classical economic theory. Sometimes, as Baumol (1967) found, they try to maximise something else, such as revenue from sales. Often, firms do not aim to maximise anything, but rather aim just to maintain or expand their market share or position, or simply to have a quiet life (Boulding, 1952) or to achieve a target satisfactory level of profit (Simon, 1966).

Such deviations from the maximisation of individual, pecuniary self-interest are hard to reconcile with the implicit assumption of its universal and invariable validity, which is made in the application of mainstream economic theory to management in practice. Yet the only apparent impact these awkward facts seem to have had on the theory is to bring forth ingenious explanations of why they do not matter (e.g. Friedman, 1953), or that they really amount to approximations to profit maximisation. This tendency to ignore contradictory evidence, or to twist it to fit the gospel, is a commonly remarked upon feature of neo-classical economics. It is also a feature of religions and the Marxian school of economic thought.

In fact, a fictional view of the nature of philosophy in 15th century Florence could have been written with modern mainstream economics in mind: ‘when we come across a system of thought which is both harmonious and consistent then you may depend on it that the facts will eventually found to agree with it’ (Woodward & Ross, 1974). The
key lies in the phrase ‘harmonious and consistent’. The trouble with many of these non-maximising criteria is that they play havoc with the harmony and consistency of the neo-classical structure. Any one of a number of resource allocations could satisfy a criterion that accepts an adequate level of profit or provides a quiet life, or even a given share of the market. Deprived of the ability to provide determinate solutions to the resource allocation problem, standard or neo-classical theory has to resort to devices that fall far short of the scientific standards it claims to emulate.

It is now easy to summarise why mainstream economic theory has so little to offer in the management of State forestry. In the first place, its individualistic orientation is neither directly nor readily transferable to large collectives such as the State. Secondly, cultural (and hence institutional) factors limit its extension beyond societies that correspond fairly closely to the institutional structures, which are implicitly incorporated in the theory. This definitely excludes many societies in which State forestry operates. Then thirdly, the firm of the theory bears little resemblance to any real life firm, let alone the complex governmental bodies responsible for State forestry.

This latter weakness is, however, irrelevant to the purposes of the theory. The theory of the firm in neo-classical economics is only a step in a general theory of value. Provided it serves that purpose well enough, then, as far as the theory is concerned, it is of no account whatsoever whether it is of any use to firms in real life.
It is hardly surprising, therefore, that it is not an adequate basis on which to analyse managerial economics in general and of State forestry in particular. The theory has, as many critics have repeatedly argued (e.g. Bell & Kristol, 1981; Thurlow, 1983; Wiles & Routh, 1984), more than enough weaknesses on its own grounds without bringing in other matters with which it is not concerned.

It thus appears that the search for a starting point for the economics of State forestry by going back to the origins of economic theory leads only to a dead end. It might therefore be better to start with what it is that a manager in State forestry expects or wants to get from economy theory. However, before turning in that direction, there are a couple of questions worth consideration. The first is the possibility, introduced earlier, that some other version of economic theory might have been a more productive starting point. There are at least five or six candidates, and the fact that none of them can match the mainstream neo-classical theory in a fully worked through theory of production is no handicap. The neo-classical version has so little to offer that the others could hardly be less helpful. However, that they may be no worse as a basis, does not mean that they could be all that better. This possibility has already been introduced and will be examined in more detail in following chapters.

The second question relates to the fact that the problem of resource scarcity is not the only form of economic problem concerned with resource use. What to do with surplus, excess, unused or no longer wanted resources also constitutes an economic problem. It was this
form of the resource problem, in the apparently intractable unemployment of the 1930s, which Keynes (1936) analysed, leading to the revision of economic theory known as the Keynesian revolution. Since the problem of useable but unused resources often bedevils forestry, it may be worth some consideration at this point.

**The economic problem of surplus resources**

In the mainstream version, the economic problem cannot take this form. A resource, it is argued, is not a resource unless there is an effective demand for it. Resources cannot, therefore, lie unused or be in excess or surplus supply since, by definition they are not resources.

This convenient form of casuistry could well go uncontested but for the awkward social problem generated by surplus, excess unused or unwanted labour. Unemployment cannot be disposed of by definition, although the reported levels can be increased or reduced slightly by adjusting the statistical definition. Nor can it be disposed of by arguing that all that unemployment shows is that the price of labour is higher than its equilibrium or free market price so that labour would not be in surplus if wages were allowed to find their own equilibrium level. For many societies, this is now, institutionally, almost impossible. But in some developing countries where, ipso facto, the market for labour is completely free. Surplus, excess and unwanted labour abounds at prices near or below bare subsistence levels. The real life situation is clearly at variance with the theory.
Unemployment may, however, be a special case. Labour is, after all, a human resource, and societies are human creations, presumably for the mutual benefit of the people of whom they are composed. In most modern societies, the unemployed do not lose their votes with their jobs. Even in those very poor economies where the free market for labour rules, there are humanitarian systems that do not allow the logic of the free market to bring about equilibrium by mass starvation as a matter of deliberate policy. Unemployed non-human resources do not bring out similar political or social response. Furthermore, people are the only resource that generate demand resulting in consumption. They thus play a dual role in the functioning of an economy. On the one hand, they provide one of the factors of production, but on the other, they are the only reason for the production to occur at all. This dual role is one element in production, but the only element in consumption poses a real quandary in economic management.

Labour is very often a major item in the cost of production. When conditions seem to require producers to lower their costs, reducing the labour force, therefore, seems an obvious way of doing it. However, unemployment reduces the effective demand, and this, if sustained for long enough, tends to lead to more unemployment. None of these complicating feedbacks and interactions are, however, associated with non-human resources left unused.

It is no wonder, then, that unemployment is an issue of great concern in applied economics, while unemployed non-human resources are, with one exception, virtually ignored. The exception is agriculture, in
which excess production leads, at times, to policies aimed to leave land deliberately unused and to destroy or dump the surplus products. Yet in many countries, and not just developing ones, unused resources are an equal perennial problem in forest management, State or private alike. The problem of secondary species in tropical forestry, or the question of finding markets for thinnings, are evidence enough to that effect. Yet in forest economics, no special line has been developed to deal with unused resources analogous to those in labour economics or in agricultural economics. Unlike those two special cases, the explanation that resources are not resources until there is a use for them seems to be good enough for forestry. The reason is simple - any threat to human welfare is not seen to be politically dangerous.

The implication is nevertheless clear: mainstream theory can accommodate institutional aspects relating to human dissatisfactions arising from unused or surplus resources as special cases, provided they are on a large enough scale, but not otherwise. It is hard to see any theoretical grounds for discriminating against some rather than all-institutional aspects. If some are valid, why not all? If some are not valid, why not all? Political expedience may be a good practical reason, but it cannot be convincingly turned into being a valid theoretical one as well. The institutional school of economic thought could, after all, be worth more serious attention than the neo-classicists would admit.
4. SO, WHERE TO FROM HERE?

Although the neo-classical economic theory is acknowledged as being at variance with a number of the facts of economic reality, it still remains the dominant version. How can this be? After all, one of the hallmarks of the scientific method is a substantial degree of respect for the facts and accordance between theory and the facts. Some doubt might, therefore, be justifiably expressed about the validity of claims for economics to the status of a science. And indeed there is fairly extensive and growing literature disputing those claims on this and other grounds (e.g. Eichner, 1983). Much of that argument is quite convincing and the analysis in the preceding chapters has drawn heavily on it.

No doubt there are many reasons for the apparent paradox and no doubt, too, some of them are valid. But the valid ones do not include, as his subsequent repudiation (Hicks, 1977) confirmed, the case he had earlier advanced (Hicks, 1946) to the effect that the facts are too destructive of economic theory. Nor is the tradition in economics that ‘it takes a theory to kill a theory’ any better.

More credible, however, is the argument that the evidence, which seems to undermine the neo-classical theory of the firm, is irrelevant. The strength of this argument lies in the fact that micro-economic behaviour can be examined from several points of view. It can, for example, be considered in terms of the conditions required for market equilibrium. This is the purpose in the neo-classical version, and from
this point of view, the theory of the firm could, therefore, be perfectly valid. But it can also be considered from the point of view of the processes in the market or the behaviour of an individual participant in the market. There is no reason to assume the neo-classical theory of the firm, despite the claim implicit in the name, is equally appropriate for these purposes. On the contrary, it could well be more appropriate to work with the Austrian school of economic theory, which, at least, starts from these very different viewpoints (Kirzner, 1973; Lachmann, 1986).

It does not, however, follow that the conditions found to be required for market equilibrium would be changed if the participants do not behave exactly in the way assumed for the purpose of the theory. They may or may not change, but for the economics of forestry, it hardly matters. The economics of State forestry is concerned with the State as a producer of non-market services from the forests, and a possible participant in the markets for forest products rather than the equilibrium conditions in those markets. Then, from the perspective of managerial economics, it is the normative rather than the positive mode of analysis that matters. That is, the concern is with what the State ought to do in managing its forests rather than simply with what it has done and trying to explain how that came about. Again, the point emerges that any error arising from adopting the neo-classical version of micro-economics as the theoretical base for forest economics when State forestry is the dominant form is not necessarily inherent in the theory itself. Any errors that arise do so from
attempting to apply it for purposes other than analysis of market equilibrium and to use it as a guide to normative action.

It is time, therefore, to look more closely at State forestry in its managerial context. That three propositions at least are implied in turning in this direction ought to be obvious. The first is that forestry is such a special form of economic activity that it warrants a special branch of economic theory to itself. The second is that State forestry is so different to other forms of forest ownership that it, too, requires special consideration. The third is that managerial economics is so different from economic theory in general that it also warrants special treatment.

The argument in the preceding chapters has really assumed that all three of these propositions hold. Only those relating to forestry as an economic activity and the State as a firm were actually made at any length. However, that managerial economics is different from the theory of the firm as treated in neo-classical economics is implicit in saying that managerial economics is normative rather than positive. The distinction is worth examining in a little more detail.

**Nature of management and managerial economics**

Neo-classical economics is characterised, so it is claimed, by being value free. In other words, judgements are not made or implied about what a firm ought to do; it only describes what firms do and attempts to explain why they act in the way described. In essence, this is the
distinction between normative and positive economics, and it is clearly a substantial difference in approach. If it is true that neo-classical micro-economics is not normative, then the normative stance in managerial economics would call for a different theory.

In fact, there is some doubt as to whether the distinction really holds in the neo-classical version, since the assumption in that theory of profit maximisation as the objective the firm can be construed and, according to some critics, often is, as a judgement of how a firm should act. That is the basic assumption in the neo-classical theory of the firm is itself a normative rule. This could, however, easily be seen as just another example of misapplication of the theory, rather than as an error in the theory itself. So many have been found, as the earlier discussions suggest, that another would come as no surprise.

But in this instance, it is not misapplication alone; the theory itself is flawed in that the maximisation criterion, as Emmer (1966) shows, is intrinsically and unavoidably normative.

This would seem to weaken the case for a different theoretical base for managerial economics on account of its normative stance. It is, however, not quite so devastating. In the neo-classical theory, the object of analysis is described as a step to explanation. In other words, it is focussed on the present situation as explained by the past. But management is concerned with what to do in the future.
While it may in that be interesting in what has happened in the past, but it is only as basis for better deciding what to do in the future. Beyond that, and for the reporting purposes required by convention or by law, the positive mode in applied economics is much less significant than the normative.

This big difference in orientation for managerial economics - the future as constrained by the past - suggests that neo-classical theory directed at the present as explained by the past could be of limited direct use in managerial economics. But there is another reason why this could be so: management is, in reality, much more complex than is assumed in the neo-classical theory.

In any organisation, those responsible for its management have to find answers to a seemingly endless, wide-ranging and changing series of questions and problems. In fact, management is, to a large degree, a matter of giving timely, clear and decisive answers to such questions and, at the same time, coming up with solutions to problems arising out of and in the course of the business. But more than that, the task of management, it could be argued, is to anticipate problems and take action to avoid them before they become problems.

The individual managers themselves may work out the answers and solutions, or they may get somebody else to give the answers, help them find the answers, or they may dodge the responsibility by passing it on to somebody else in the organisation. This latter course is a standard management strategy, especially tempting and relatively
easy in the hierarchical structures typical of large organisations, such as many in the governmental sector. The organisation as a whole, and the management collectively, however, does not have this escape route. The awkward questions and problems can always be deferred, but only for so long. Eventually, the organisation and those responsible at the time for its management will have to face up to them and the additional problems brought on by the postponements.

There are many descriptions and definitions of management and, to some degree they all differ. On one thing, however, they all agree. This is that management, whatever else it might entail, is certainly, if not and pre-eminently, concerned with decisions - first with the taking of decisions and then, but equally, with making sure they are put into effect.

Now a decision has two essential characteristics: it involves choice, and it refers to the future. To be in the position of having to make a decision means that there is at least one available alternative to continuing to do what is now being or in the way it is being done.

As decision-making thus involves choosing between the alternatives in this situation, then economics as the science of choice ought to be indispensable in management. But, as the argument so far suggests, it is largely irrelevant if not downright misleading, and for reasons which are almost indisputable. The economic theory of the firm is not concerned with the decision making process of any specific firm. It is but a step in establishing the equilibrium conditions in the market for
the good of some general nature. Sometimes the good is a specified commodity, but the framework is always the same - the market for that good is equilibrium. This is rarely a matter of any concern in the management of a specific firm.

The management of a firm in real life is almost continually involved in a series of decisions about its markets, starting with which market to enter. From there, the decision sequence runs more or less along the following lines:

1. what to produce,
2. how to produce it,
3. how much to produce,
4. where to produce,
5. when to produce,
6. what prices to pay for the various inputs needed,
7. what prices to accept or set for its products, and then
8. whether to enter or stay in that market.

Even this very simplified outline of the decision sequence on the production and marketing side is enough to show that management is a much more active and complex function than that assigned to it in the neo-classical theory of the firm. It is also enough to show that the decision making process is a highly circular sequence of mutually dependent and inter-acting decisions. Moreover, except in a completely static economy, it is a repeating cycle. None of the items in the list, or the factors affecting them, stays constant long enough for
the production decisions ever to be safely taken as settled with any great degree of permanence.

All of this adds up to a strong case for admitting managerial economics as a special branch of economics. Given this, then the case for forest economics should hold even more strongly. In fact, forestry, as Duerr (1949, 1960) so effectively shows, is such an atypical process in a production sense that it is virtually unique from an economic point of view. The characteristics of the production process, which make forestry so markedly different, are therefore worth summarising. They are as follows:

1. the extremely long production period,
2. the physical inseparability of many of the products from the equipment which produces them,
3. the very high degree of joint production,
4. the derived nature of the demand for nearly all of its products, and
5. the high proportion of its output which does not and cannot go through the commercial markets.

None of these is, of course, unique to forestry. Most production systems or industries have one or two of these features. In meat production, for instance, the product and the equipment producing it are physically inseparable. Many agricultural production systems are based on joint production as with wool and mutton. Some such as rubber fruit growing also involve production periods of several years
duration. A great deal of the manufacturing industry is engaged in the production of intermediate goods in response to a derived demand.

What is unique about forestry is the occurrence of all of these characteristics together. Those parts of economic theory that deal with these sorts of departures from what is assumed in it to be the norm, consider no more than one or occasionally two of them. They do not, therefore, have much to offer forest economics in which the basic production process is a combination of all.

In fact, from the point of view of the managerial function in forestry, the firm of neo-classical theory seems almost ludicrously oversimplified. Yet, in spite of the very limited scope allowed in it for an active management role, the theory does cover a great deal of what arises in production. So much so that the production aspects of agricultural economics are widely accepted as adequately representing the application of economic theory in farm management decisions (e.g. Heady, 1952).

A reason is not hard to find. Production is simply the process of transforming certain goods and services – (inputs) into other outputs differing in shape, form, nature, place or time. In a general way, the economics of production can be analysed in terms of the three possible relationships between inputs and outputs, i.e. the relationship between inputs and outputs: that between inputs and inputs and that between outputs and outputs. The fundamental form in which those relationships are expressed is purely physical - the quantity of output,
for instance, produced by using a given quantity of input. This input/output relationship is termed the production function in economics, familiar in forestry as the yield curve or function relating wood production to time.

The economics of production involves, firstly, converting these physical relationships into some common measuring standard. The most common and appropriate standard is money expressed in relative prices. Hence, in economics, the production function becomes the relationship of the value of output resulting from the use of a given value of a given input and similarly for the input/input and the output/output relationships. Then the economics of production is simply a matter of finding the combinations of the values of inputs and outputs that satisfy the objectives of the firm.

So why is this system of economic analysis not equally applicable to forestry as it apparently is in agriculture? Are the peculiarities of forestry as an economic activity and the real life complexities of management really enough to invalidate the theory of the firm? After all, its simple model does contain all the essential decision problems of production that can arise in forestry. Multiple use management, for example, is a matter of decisions about output/output relationships; thinning involves input/input relationships in shortening rotations, i.e. the time input by increased investment in silviculture; fertiliser applications to increase growth rates involve an input/output relationship.
The whole argument, in fact, seems to have done no more than lead right back to where it began. Either there is a very big flaw in the argument, or something is still missing. Actually, it may be the latter as little has been said about the nature of problems that force decisions to be taken, nor about the nature of problem analysis, which presumably precedes a decision.

**Problems and problem analysis**

A problem arises when there is something unsatisfactory about the present situation and there is a chance of doing something to correct or improve it. From the point of view of management, both are inherent in a problem. Otherwise, if there were no prospect of doing anything about the present situation, no matter how unsatisfactory it may be, nothing can be done but to accept it and its consequences. This calls for no conscious decision, unless the meaning of the word can be stretched to cover resignation to the inevitable. The first step in problem analysis is therefore to recognize that the present situation is unsatisfactory and that it does not have to be accepted as unchangeable. The second step is to identify exactly where it is that the situation is unsatisfactory. Then the feasible alternatives have to be identified and specified in fairly precise detail. The fourth step is to then work out the consequences of each of the alternatives, and the fifth step is to compare the expected results of each with each other relative to some criterion of satisfactory or better, or an improvement or best.
The key to the puzzle lies in the fifth step - the criterion by which the alternatives are compared and the decision taken. In the neo-classical theory, the criterion is given in the assumption that the firm will choose the option that seems most likely to maximise its profit. There is, however, no reason for this criterion to be taken as necessary or as universal. Profit maximisation, as Emmer (1966) has shown, is actually a normative rule masquerading as a positive one. In fact, the positive criterion would be the observed practice and in this respect, the evidence does not support profit maximisation as having any marked dominance over the several mentioned in Chapter V as in actual use.

A number of studies from a neo-classical stance claim to show that firms act as if they were profit maximisers, whether they know it or not. In the strict sense, this is not, of course, evidence that their criterion is, therefore, profit maximisation. The most that it can mean is that economic theorising based on it can carry on, regardless of the criteria actually used in practice. It is hard to avoid the conclusion that the motive for retaining profit maximisation as the criterion in neo-classical theory lies in its mathematical convenience of enabling single valued solutions to be reached. In contrast with other criteria, several to many solutions can be equally satisfactory. Multiple input, output, or price decisions by firms would play havoc with the market equilibrium calculus.

For the purposes of the analysis of market equilibrium, such a simplifying device may be adequate, but it cannot be equally so for
managerial economics. Here, the criterion is what the specific firm regards as satisfying its objectives. Rational decisions in managerial economics are, in other words, those that are consistent with the firm's objectives and not necessarily those that are convenient for economic theorising.

The mistake in forest economics has been to assume that any firm acts, irrespective of its structure, solely to maximise the expected profit from its operations. This may be so for the owner-operated, private forestry firm, although it is doubtful if this criterion applies universally, even in this category. In all other forms of ownership, forest economics should start with the objectives of the firm rather than with the economic theory of the firm, as in standard present practice. To these it is now worth turning.
5. THE PURPOSES OF STATE FORESTRY

An economic theory of State forestry has to start with the objectives of the State for its own forests and those of its subjects if it chooses to regulate them. It might, therefore, be useful now to try to be more specific about the nature of State forestry. However, several prior questions arise before the matter can be sensibly addressed. For a start, what is the State? Is it the government, and if so, which government? If it is the government, then the national government might be taken to represent the State in unitary governmental systems, but what about in federal systems? Is the State then the federal government alone, or the constituent state or provincial governments separately, or some combination of them all? Where do local and municipal governments or other forms of public ownership and management come in? And, perhaps more fundamental, can the government at whatever level is admitted be safely taken as identical with the State or as coinciding closely enough for them to be taken as more or less identical?

These are straightforward enough questions, but they are far from simple. Nor are they easily answered. As Whynes & Bowles (1981) point out, ‘the net result of several millennia of social enquiry has been…complete and utter disagreement about the concept of the State’. A situation that is perhaps reflected in Young's statement that he is ‘a confirmed sceptic concerning most claims made on behalf of the state’ (Young, 1981). It is hardly likely, therefore, that further
discussion here would go far to correct that situation. But it is worth remembering that any discussion of State forestry presupposes that these and similar questions have been answered. Rather than leave the answers as implicit, the view taken here is that State forestry covers any form of public ownership or management of forests on a wider scale than the communal or clan level. This interpretation does dodge the issue, not only in relation to federal systems, but also in respect of the government/State relationship. However, it does allow the focus of attention to move to the reasons for State forestry and hence its objectives. In other words, why is it necessary or considered to be necessary or advantageous for the State to own and manage forests rather than leave forestry to the private sector?

With 70 to 75% of the world's forests under some form of public ownership and much of the rest under fairly tight State control, the reasons would seem to have been identified long ago. State forestry is, after all, almost as old as forestry itself. The need for the State to take over forest ownership and management must therefore have become evident very early in the history of forestry. The reasons for State forestry are apparently founded on a solid base of experience because for a long time it seemed that there was a widespread consensus in favour of State forestry.

The use of the past tense suggests, however, that the consensus is starting to crumble and the extent to which privatisation is coming into vogue tends to confirm that. The reasons for State forestry could therefore bear re-examination in terms of their contemporary
relevance before trying to establish an economic theory applicable in the management of State forests.

The reasons for State forestry

The rationale for State forestry is a specific application of the principle summarised by Baumol (1965). ‘The reason a government must provide certain types of goods and services is that the private sector cannot be depended upon to offer them in appropriate amounts’. The justification for State forestry must therefore be that some of the products and services from forests are in this category. Hiley (1930) confirms this by pointing out that ‘…it may be accepted as a generalisation that private or commercial ownership of forests, when unfettered by legislative restriction, generally leads to devastation’. He does not, however, go as far as saying that State ownership is the necessary alternative. Young (1981) points out that the State can adopt any of three broad types of strategies for the use of natural resources, which he terms devolution, operation and regulation. State forestry is operation. State regulation of private forestry is the regulation strategy, and the one that Hiley (1930) would appear to prefer given the list of disadvantages he cites against the operation option. Devolution, or privatisation as the process is more commonly termed now, is the transfer of public forests to private ownership ‘relying primarily’, in Young's words, ‘on the operation of competitive markets in arriving at social choices’ for their use. This suggests that he would prefer State regulation to direct ownership and management.
The privatisation option would not, however, seem to be an option on its own. Given that real life markets, especially for the services of forests, bear little resemblance to competitive markets, some degree of regulation would be needed to direct the social choices in the public interest.

The argument for State intervention, either to provide the goods and services or to force the private sector to provide them, rests therefore on the proposition that the devastation, which Hiley says is virtually inevitable under unregulated private ownership, would also be disastrous. Whether it is inevitable or not is something which, in principle, is capable of being put to the empirical test. In that respect, it is hard to deny that the weight of the historical evidence supports the claim, despite the many impressive examples of private sector forestry, which are exceptions to the general rule. The part of the proposition that relates to inevitability of devastation under private ownership is not the near certainty implied in most statements of the case for State forestry. Nevertheless, there is enough evidence to justify acceptance of it as a matter of fairly high probability in general.

The extent to which the devastation would be disastrous or, at the very least, socially undesirable, depends on the extent to which the social benefits of forestry are real, substantial and essential for human welfare and, perhaps, even for survival. Much of the disputation over the tropical forests takes the line that this is beyond question. Yet, it is quite likely that empirical testing would only be definitive after the
deforestation is virtually complete. That knowledge, if the claims were true, would, however, then come too late to be of any use. So at the global level, it is probably better to err on the side of caution and presume, at this stage of knowledge, the consequences from near total deforestation could be globally disastrous.

At the local level the evidence is less doubtful. Deforestation has, without question, been accompanied or followed by quite devastating physical, environmental, economic and social effects at too many times and in too many places for it to be dismissed. The evidence goes well back into antiquity, and much of the deforestation still going on continues to add to it. All the same, the evidence should not be accepted as entirely definitive. Some quite significant reservations have to be applied to it.

Firstly, where the effects have been physically devastating, the clearing or very heavy cutting or careless logging responsible has usually taken place on steep land. The effects are not necessarily devastating where the forests have been on land of gentle topography or with soils that are not readily erodable. Secondly, whether the environmental, economic or social effects of devastation are disastrous also depends on site or location, but these effects are not so limited to steep topography. In other words, the broad generalities of devastation linked to deforestation have limited validity without clear specification of the forms the effects take as well as their location and timing. Then thirdly, State ownership alone offers no automatic protection against these effects or the actions that apparently cause
them. After all, most of the deforestation now occurring at the global
scale takes place on State-owned land in the tropics, and much of it is
associated with devastating consequences. But fourthly, the fact that
devastating effects accompany or follow deforestation does not, in
itself, prove that deforestation is the cause or even a primary cause.
The fallacy that ‘association implies causation’ bedevils much of the
conventional wisdom on all sides in respect of deforestation. The
cause/effect link may be true, but association alone is not sufficient
proof of it.

An implication that State forestry or state regulation of forestry is
necessary to protect the continuity of wood and timber supplies also
often underlies the argument for it, but the generality of the case for
State forestry on these grounds is even less well founded. In spite of
the extent to which the claim is advanced and often accepted, it is hard
to see that commercial and traded forest products come into the same
category as the environmental services of forests as being goods
which the private sector, left to itself, ‘would not provide in
appropriate amounts’. To qualify, wood or timber must have a greater
social value than the monetary exchange system accords them. This
could well be so in those economically under-developed countries
where the great bulk of the population cannot afford anything but
locally available wood for fuel or for buildings. However, it has very
little validity in any other circumstances.

A higher social value for an indigenous wood supply than its direct
monetary value then has to lie in its strategic importance and its
infrastructural underpinning of the economy. Why wood should have these values rather than or in greater measure than other materials and resources is not as obvious as the case for State intervention implies. The reasons, if they exist, are rarely spelled out or asked for. Until they are forthcoming and they are also found to be convincing, this line of argument deserves to be treated with more scepticism than respect.

On the whole, therefore, the reasons for State forestry are far from being as self-evident as its widespread general endorsement might suggest. Nevertheless, judging by its performance, private forestry has not been a particularly reliable provider or protector of all the non-monetary and social services forests can supply where and when they have been needed. Even if private forestry has changed in modern times, the record is hardly good enough yet to entrust the whole of forest policy to private forest owners. The alternative of State forestry is probably better but only, and this must be emphasised, because the balance of probabilities leans a little more in its favour. But the other alternative of State regulation may actually be even better. This, as mentioned earlier, seems to be how Hiley (1930) and many others feel about it although there is not a lot in the evidence to suggest that State regulatory authorities are any more efficient than State production authorities.
State forestry and public goods

This means then that the reasons for State forestry derive from the services that forests provide in the form of public goods i.e. goods or services that cannot be sufficiently well rationed out to consumers through the price system. On that reasoning, the economics of State forestry is a specific instance of the economics of public goods.

At this point, however, a qualification must be mentioned. This refers to the question raised and dodged at the outset of this chapter about the extent to which the State and the government can be taken as identical. That the provision of public goods is a legitimate function of State does not necessarily mean that the government of the day is bound by or accepts that principle. The government to the extent that it takes account of the public interest tends to regard it as coinciding with what it sees as its own interests. The ambiguity of the term the public interest (e.g. Held, 1970) certainly aids this piece of deception, but it cannot completely hide the fact that the political element of government has one over-riding objective - to stay in power. Although the development of this theme since Downes (1957) based an economic theory of democracy on it has revealed many reservations (Whynes & Bowles, 1981), the primacy of the objective, while perhaps denied, has not be refuted nor can it be. Hence, anything that promises to strengthen the political arm's hold on power has a good chance of being adopted as policy and being retained as policy for as long as it serves the over-riding objective. Anything that threatens the
hold will not be actively pressed, although it may be expedient to proclaim a commitment to it.

The administrative or bureaucratic arm of government may be less concerned with the politics of gaining or holding on to power, but as Tullock (1965), Niskanen (1971) or Jackson (1982) show, it still has its own objectives, including power seeking, holding and expansion. The popular term for it of ‘empire building’ is not fiction. Whether these objectives coincide with the public interest any more than they are interpreted or presented, doing so is as likely with the bureaucratic arm as it is with the political. The only form in which the public interest may be served by government in either of those arms is whether the issue is judged to be neutral in its effect on power or, in effect, that is, where it is not an issue. The environmental movement has shown that if this ever applied to forestry it does so no longer and especially for State forestry.

Now, however, another qualification has to be considered. How does all this affect the State as a grower of timber? By definition, wood and more precisely timber, with the exception of developing economies noted earlier, are not public goods. Even stretching the definition to allow for political and economic strategic considerations, they could not honestly be given a substantially greater social value than a number of other resources, and they would hardly rate as high as foodstuffs in that regard.
It would therefore appear that the timber production aspects of State forestry and the public goods aspects, being in such widely different economic categories, could and should be treated separately in economic analysis. But this could be taken further. Why should the State be in the business of growing timber at all?

**Timber production in State forestry**

The economic circumstances in which wood was literally an indispensable commodity in most economies up to the mid-nineteenth century have long since disappeared, except in situations of fairly extreme economic under-development. The considerations of defence strategy that justified the great expansion of State forestry for timber production in the U.K. after the first World War and which paid off, in defence terms, so well in the second, are not quite so compelling in the present age. So why, to ask the question again, should the State continue to be in the timber production business?

There can only be two reasons. Either it is better, or at least as good as the private sector in growing timber, or it cannot avoid growing timber as a by-product of its public goods activities. In the first case, its activities must be analysable by and must, in fact, be analysed by the same economic techniques and criteria as apply to the private sector. Then, no special economic theory applies then to State forestry other than whatever special theory applies to forestry in general. Almost the whole of the privatisation issue depends on this line of argument,
showing that State forestry is a much less efficient means for the growing of timber than private forestry.

The question therefore arises: in what circumstances is the State actually engaged in forestry as a timber grower, entirely or with no greater element of public goods in its output than a similarly situated private forest owner? The most clear cut answer, at first sight, would seem to be in respect of timber production plantations located, established and managed without any allowance for social or environmental or political considerations. The qualification ‘without any allowance etc’ is enough to suggest that very little of State forestry, even in plantations, is likely to be closely comparable with a private sector plantation of an otherwise similar nature. It would be hard indeed to find any State plantation anywhere in which the sole or even the dominant influence in the choice of location or species was the timber market of the future. Private forestry aimed at timber production would, however, be one of the prime considerations. But if any such plantations can be identified or were to be established, then private sector forest economics should provide an appropriate and adequate analytical frame. The only catch, which the previous chapters have been grappling with, is which economics?

However, it is doubtful if such a relatively small part of State forestry is worth bothering with. After all, the objectives of the much greater part of State forestry, and thus of most forestry on the world scale, must, ostensibly, be concerned with the supply of public goods. To spend the great deal of time that would be required to find a more
satisfactory economic basis for forest management in the smaller part of the total forestry domain is not a good use of scarce resources when the major part of the domain is in even greater need of a more appropriate analytical frame. In that greater part, timber production is a by-product of a public body supplying public goods. The timber produced is simply an unavoidable result of the process of growing forests for almost any other purposes. There is, of course, no compelling need for the timber to be harvested or utilised, but that in no way alters the fact that timber is an unavoidable result in State forestry.

**Implications for an economic theory of State forestry**

The State, then, is in the business of timber growing for the second of the two reasons mentioned earlier. It simply cannot avoid it once it is in forestry at all. An appropriate economic theory for State forestry therefore must apply to a public corporate firm whose primary purpose is the production of public goods as joint products amongst themselves, but also as joint products with commercial goods that are of an intermediate nature rather than final goods. This is a far cry from the neo-classical theory of the firm, whose failings, even with the corrections for deviations from an owner managed private firm growing forests in a perfectly competitive timber market, were explored at length in the previous chapters.

All the same, none of these requirements for an adequate economic theory of State forestry rule out the neo-classical tradition. Within it
there are public goods theory, joint production theory, imperfect competition theory, derived demand theory and even theories applying to the State. Surely, then, it could be argued that there is no need to go beyond the neo-classical extended framework. State forestry could thus be accommodated as a special case by combining the elements into the one appropriate package. Only three things stand in the way.

Firstly, it seems that some elements of institutional economics have to be introduced either as precursors to, or as elements in any economic theory of forestry, which aims at managerial relevance. The point was made earlier that even the individual private forest owner is, on Jenning’s (1980) evidence, far from being the single-minded profit maximising grower of wood predicated in the neo-classical model. Much the same goes for industrial forest owners. Even if they can be held to act as profit maximisers, whether they know it or not, their profits are not reckoned, in any real sense, at the point of the maturing standing forest. The forests can be and commonly are treated as profit centres in internal accounting systems but the profit that counts in the final analysis is the profit at the end point of the chain of manufacturing and marketing activities owned by the firm. The ownership and management of company forests are, in effect, insurance cost rather than a profit source in itself.

For the neo-classical paradigm to apply, the widely different forms would have to be dismissed as having no bearing on the economics of forestry. That seems to be stretching ‘the negligibility assumption’ a bit too far.
The second obstacle seems, at first sight, to be more fundamental. Managerial economics is economics aimed at guiding a manager to rational decisions about the business in hand. It is straight-out normative. In neo-classical literature, much is often made of the non-normative nature of neo-classical micro-economics. The whole rationale of the neo-classical paradigm in all its variants is based on the belief that it analyses things as they are and does not lay down how they ought to be since that would involve making value judgements and they are inherently subjective. Yet to tell management what ought to be done in specified situations is the very point of managerial economics. An analytical system that denies it is doing that must, by definition, disqualify itself.

However, the distinction between the ‘is’ and the ‘ought’ approaches is not as clear cut as is implied by taking it as a simple basis for the separation of normative from positive economics. This has long been recognized (e.g. Hutchinson, 1977; Emmer, 1966), as referred to in Chapter I, in effect, simply clarified the logical identity of the two. Given this, the second obstacle to the application of the neo-classical model to State forestry cannot then be as decisive as suggested at the start of the preceding paragraph. Nor, incidentally, does the rebuttal, also in Chapter I, of criticisms of the performance of real-life State firms in forestry by invoking the normative/positive distinction, hold either.
Hence, it is not enough to say that managerial economics differs from the neo-classical structure in that it is normative. The only difference is that there is no secret about it in managerial economics, whereas it takes a great deal of philosophical digging to find that it underlies the neo-classical version, and even then it is not freely admitted to be so or to matter.

The third obstacle lies in the complications introduced by treating timber production as a joint product of a public goods objective. The timber is, strictly speaking, purely a by-product only if no special efforts are directed towards growing it and hence no additional costs are incurred in growing it. Once efforts are made to influence the nature of the timber grown or the rate at which it is grown or to protect public goods values at risk by the harvesting of timber, the analytical situation is changed. For one thing, the question of the allocation of the joint costs could be raised. But more importantly, time as a major component of the production process now has to be taken into account. It is in connection with the treatment of time and the uncertainties associated with it that the weaknesses of the orthodox neo-classical formulation of a theory of the firm most limit its managerial value. To all intents and purposes, the production process in the neo-classical theory of the firm is instantaneous. Time, in effect, is assumed neither to be a significant cost nor to introduce any significant uncertainty about the future.

These sets of negligibility assumptions may not be unjustified where the production period is, in fact, relatively short. All the same, the
near-dismissal of time in the neo-classical model is the subject of criticisms of the theory as theory, which as exemplified, for instance, in the long series of books and papers by Shackle (e.g. Shackle, 1967). These cannot be easily absorbed by simple modifications. More significantly, for present purposes, it could render the traditional theory virtually pointless for analysing the economics of forestry in general.

Three conditions operating together must therefore hold for there to be a real distinction between managerial economics and what can be built up from the neo-classical theories. They are:

i) that the decision criteria used in the various institutional forms of real life firms engaged in forestry differ from the criterion assumed in the neo-classical analysis,

ii) that the differences are too significant for them to be safely disregarded under the negligibility assumption (i.e. they are not neutralised by the inherent value content in the neo-classical version) and

iii) that time and the complications arising from it as a major input in the production process are dealt with explicitly and more effectively in managerial economics.

To see if and to what extent these conditions do hold requires a more detailed consideration of managerial economics.
6. NATURE AND CONTENT OF MANAGERIAL ECONOMICS

The essential functions that delineate management from other forms of human input to production are summarised by Chambers (1953) as decision-making, facilitation and review. On that basis, the process of management is a continuing three-phase cycle going through the sequence of:

1. taking decisions in the light of current circumstances and expected future circumstances;
2. facilitating the implementation of the decisions taken; and
3. reviewing progress in the implementation of the decisions and their continuing relevance or otherwise in the light of new or additional information and changing conditions and expectations (the activity now commonly referred to as monitoring).

The cycle then begins again with the taking of new decisions or amending the earlier ones in the light of what has been revealed by the monitoring.

Although other writers on management add more functions, these three are common to all descriptions of what management involves. No matter whether the speciality is production management, personnel management, marketing management or financial management, the decision cycle function is at the core of it. With decisions regarding the essence, there is then, at first sight, nothing special about
management, which would seem to contradict or limit the relevance of mainstream economic theory. That theory is, in part, a science of choice, and choice implies a decision in favour of one course of action out of a set of available alternatives. From that point of view, there can, apparently, be no basic difference between managerial economics aimed at guiding management to rational decisions and the orthodox economic theory of decision.

But a concern with the same thing does not necessarily mean that the methods are or could be or will be identical. The difference lies in what prompts the concern. In the neo-classical micro-economic theory of the firm, the concern about production decisions is to establish, as argued in Chapter 3, a generalised supply curve in a general theory of relative prices or of value. In managerial economics, the concern is with the decisions to be made by the management of a specific firm. There is a world of difference. It would be surprising, therefore, not to find differences also in the analytical methods developed for reaching their respective and different objectives.

**Managerial decisions**

A situation calling for a decision by the management of a firm implies that there is already a problem, a problem is developing, or a problem is anticipated in the ongoing activities of the firm. In fact, since it can be inferred from the three-phase cyclic functions that management has a responsibility to avoid problems before they become problems, decision-making is a constant and continuing function.
The first characteristic of a problem is that something in the present situation has been detected as being or shaping up to become unsatisfactory in such a way that the management could correct, modify or, at least, soften the impact. In effect, therefore, while some situations may be beyond the control of management, none are outside its scope. Even if it is impossible for the firm to take any action to correct the source of a problem originating outside its own area of control, it can still take evasive action or apply damage control to minimise the adverse effects on it. This also calls for decisions, which might, in the last resort, involve assessing such alternatives as abandoning the present line of business or entering new or additional lines.

So the characteristics of the current situation represent the second element in a problem situation, and the alternative courses of action open to the firm a third. The fourth element, then, is to list and quantify the known and expected benefits associated with continuing along the present line, and the alternatives to that and a time schedule of when they are expected to occur.

Armed with that assessment of the situation, a fifth element has to be introduced, and this is a means for reducing all of the items to a common measure of value to the firm and a means of bringing them to the same point in time so that differences in timing do not result in misleading comparisons.
The final element in the process is then a criterion or choice indicator, to use Heady's apt terminology (Heady, 1952), by which the alternatives can be ranked in order of their expected effectiveness in solving the problem.

Two points must be made about this description of the process of decision-making. The first is that, taken in conjunction with the three-stage cycle of management functions, it is simply a slightly expanded version of the sequence analysis developed by the Stockholm School in the 1920s and 1930s (Shackle, 1967). The second is that, as Encel et al. (1981) found, very few decision makers actually follow the process except in some reduced form.

The implication would thus seem to be that this is just one more example of the gap between what happens in the real world and what is assumed to happen in economic theory. It is, therefore, another justification for scepticism about the relevance of economic theory as a basis for management in State forestry.

That would, however, be a misinterpretation. The sequence is inherent in any decision-making process. Short cuts are undoubtedly taken, but this may only mean that the range of options under review is reduced, in the extreme to one. Comparisons are not then consciously made, but the reduction of the field to one is itself a rejection, often subconsciously no doubt, of all possible alternatives. In any case, the sequence is, in the normative sense, which applies to management, what should be done in reaching a decision.
The short cut could, however, not lie in ignoring alternatives, but in restricting the comparisons of alternatives to partial rather than complete sets of effects. Quite often and perhaps more often than not, cases in support of a given decision deliberately exaggerate the pros and play down or omit the cons. This tactic of arguing of a case so as to swing the decision one way rather than others, somewhat in the fashion of law suits, is consistent with the view argued by McCloskey (1986) of economics as rhetoric.

Often, however, the short cuts are enforced by the lack of time or resources to make a thorough sequence analysis, or the decision may be regarded as too trivial to warrant one.

Such examples of how and why the sequence is not followed in practice return in a way to the positive/normative dichotomy. In management, the positive approach, ‘things as they are’, has little significance. For management, a decision is a question of what should be done. That the appropriate orientation is normative and sequence analysis is the normative way in decision-making.

**The choice indicator**

One interesting conclusion from the decision sequence is that the neo-classical model and the managerial approach are identical up to the point at which the criterion is introduced. In the neo-classical model, the criterion by which alternatives are to be compared is that of profit
maximisation. It is, perhaps, the point on which most criticism of the model has been directed. All of the arguments and evidence reviewed in the previous chapters can be summarised as follows: the evidence indicates that firms do not in practice maximise profits or even make the attempt. In any case, they could not even if they wanted to or tried to, since the information they would need to maximise profit is not available to them. Instead, they therefore work towards other single or more often multiple objectives with profit operating as a certain minimum level set by the firm itself to be attained. Profit, in other words, for the real life firm, is more of a constraint than maximum profit is an objective.

On the other hand, profit maximisation has many defenders (e.g. Friedman, 1953; Boland, 1981), essentially on the grounds that if it works then it does not matter if it is unrealistic. The crucial point in what might appear to be an intractable paradox between the two sets of views lies in the sense by which the profit maximising criterion is seen as working or not. Why it works as Friedman, Boland and a host of neo-classical micro-economic theoretician’s claim, is because it is good enough as one of a number of steps in building up a general theory of broad application. The context is such that the lack of realism comes, conveniently and safely, within the negligibility assumption. But the lack of realism does matter when the factors conveniently assumed away are not negligible in relation to the purpose, which the criterion is meant to serve.
This is the situation with managerial decisions. The judgement of what constitutes a better alternative than another is entirely a matter for the individual or the firm to judge in terms of its objectives. In other words, in managerial economics, the choice of a criterion for comparing and choosing between alternatives is both subjective and institutionally determined. It is on these grounds, more than any of the several points on which it can be criticised, that the neo-classical model of the firm tends to fail as an adequate and useable guide in economic analysis for the management of State owned and operated forests. The critics of the performance of specific State forestry organisations or of State forestry in general, from the standpoint of neo-classical economic theory, imply, in effect, that their objective should be substituted for whatever objectives are presently in place. They may be right, but in so arguing, they step outside the conceptual framework in which their findings hold, and into a normative one where they do not.

Other points of difference between the conventional neo-classical economic theory of the firm and a theory appropriate to managerial economics in State forestry are less fundamental. Two, however, are worth considering. The first is time as a factor of production. The omission of time may well be the telling point Shackle assigns to it in his appraisals of neo-classical theory at the purely theoretical level. But it is of much less practical significance now that discounted cash flow analysis is being incorporated in applied neo-classical analysis. The developments have at last caught up to the stage at which forest economics had arrived 150 years ago in the Faustmann formula. Any
difference between the standard version of the behaviour of a firm and the managerial version can only lie, therefore, in the criterion by which one discounted cash flow value is judged to be better than others. In both the discounted cash flow analysis and the Faustmann formula, the criterion is a form of profit maximisation.

The second point of difference, which is also less relevant in practice, is the introduction of non-marketed goods and services into applied neo-classical analysis. The technique of cost/benefit analysis is deliberately designed to bring social benefits and costs into the decision making process. As cost/benefit techniques also combine the discounted cash flow accounting for time, these two defects in the firm of neo-classical theory are thus, in practice, overcome by this one technique.

But profit maximisation, the criterion in the theory, is still the criterion by which alternatives are compared under standard discounted benefit-cost analysis. This is not, however, necessarily the criterion applied in or even appropriate for State forestry. If so, then what are the criteria used in State forestry and how appropriate are they?

The answer is obvious to those who hold to the neo-classical tradition. In that view, the only appropriate criterion is profit maximisation, since it alone can lead to the most efficient use of the available resources. Any other criterion must therefore be wasteful of resources. Since these are, in State forestry as well as elsewhere, usually scarce
and most of them could be applied to other forms of production, the logical implication is that any other criterion is irresponsible.

The logic would be hard to fault and the profit maximisation criterion would certainly apply if efficiency were the only criterion by which to judge the performance of an economic system. However, it is not. As Hirshliefer et al. (1960) and Buchanan (1969) show, equity considerations apply as well as efficiency. The critical question is really the weighting to be given to each in reaching a decision. In the neo-classical model, a weighting of zero is given to the equity effects. This could well be an appropriate and justifiable approximation to the procedure in the private sector. The underlying assumption is that taking equity considerations into account involves ethical judgements. These, in the neo-classical view, have no place in economic inquiry. They must be therefore dealt with in the political process, so that to the extent they affect the economic calculation, they must come in as constraints, not as objectives.

In a State enterprise, the weighting for equity must, almost by definition, be greater than zero. It is indeed conceivable that equity could be the only criterion. That is, there is no logical necessity why the State could not legitimately give the zero weighting to efficiency in just the same way that it is given to equity in the neo-classical model. But it could hardly be on the same sort of reasoning whereby the private sector could be left to look after efficiency as equity can be left to the State. The State can force the private sector to take equity into account as a legal obligation, but the private sector does not have
a corresponding power to force the State to be efficient. It may, of course, through the electoral process, change the political arm of government and, to a more limited extent, the bureaucratic arm. But as experience repeatedly shows, any subsequent improvement in efficiency with the government tends to be partial and short lived. That, however, does not prevent efficiency being brought into the economic calculation in the same way as a constraint on management decisions in State forestry.

That device, however, would not solve the question of relative weightings for State forestry. The weighting for equity imposed on the private sector can be found by trial and error. Costs in the private sector can be forced up by impositions to favour equity considerations, but only to the point at which the private sector completely abandons the activities affected. In principle, the same approach could be used in State forestry simply by tightening the efficiency constraints to the point at which the equity effects summarised in the supply of public goods fail to satisfy the electorate. In a sense, this is what has provoked the environmental attack on State forestry, and which brought forestry into such prominence in the second half of the 20th century.

In that respect, what is happening in the fourth quarter of the 20th century is a repetition of the processes that have periodically focussed political attention on forestry since the Middle Ages.
However, waiting until the two competitive criteria of equity and efficiency become so out of balance that something must be done to reverse the situation seems to be a rather inefficient way to manage a business. It is probably what happens more often than not, especially in State run businesses, but it still does not match any criterion of technical efficiency in the sense of resource use. Management is meant to anticipate problems and avoid them, not just react to them. Simple reaction to problems as they arise, no matter how effective it may be, is, in reality, a symptom of bad management.

This is particularly so in forestry. The response time of a forest to change, of course, is normally too long for the revisions to be satisfactorily evident for many years, unless whatever is causing the malfunction is abandoned completely and immediately. This means that in State forestry, a specific weight, even though it may vary over time, has to be given to each the efficiency and the equity criteria. There is no necessity for the weightings to be equal or almost so, but neither should be given so little weight as to make it negligible in practice. This seems to suggest that if the supply of public goods, which, after all, is the only justification for the State to engage directly in forestry, is so important, then multiple use management must become a main operational tool in State forestry and not just a slogan.

It might therefore appear that the managerial economics of State forestry is simply the economics of multiple use management. Moreover, since multiple use management itself is really an application of joint production theory, then joint production theory is
the appropriate theoretical base for State forestry. And so it might be, if the supply of public goods can be taken as adequately covering the equity criterion, and if the problem of the relative weighting of public goods to commercial goods can be resolved to unanimous satisfaction.

**Public goods and the equity criterion**

The justification of State forestry lies entirely in it being, if not best, a satisfactorily reliable way at least of ensuring an adequate and appropriate supply of those services of forests that are of a public goods nature. This does seem to have an equity foundation. Many people, including those of future generations, would be disadvantaged by a failure in the supply of some of these types of services. Relatively few, on the other hand, and all of them in the present generation, would be the beneficiaries of the lower production costs of the commercial goods, which could be achieved by under-supplying the non-commercial services. This is a clear case of the distributional problem that underlies the equity criterion, but in this form, it is more the defects in inter-generational distribution that are the issue, than those between members of the present generation.

So the question comes down to this: do the public goods cover all of the equity considerations? There is reason to believe that they do not. Inter-generational distribution is probably covered well enough, but the needs of future generations can hardly be foreseen with enough exactitude as to warrant imposing very substantial opportunity costs on the present generation, except in respect of the fundamental human
basic needs. As far as forests are concerned, reservations now meet the basic and expected supra-basic needs of the present and possibly the next generations would, therefore, probably be going far enough.

For the present generation, however, equity goes well beyond the basic needs, even if an agreement could be reached on what they are. At the very least, it can be taken that they go well beyond the minimum needed just for survival. But how far is a different matter and, to a large degree, that is a matter of relative rather than absolute values. For the present generation, it is those relative terms that matter, and by which equity would be assessed. The measurement of equity, departures from it and progress towards it, even at the most elementary level of basic needs, is almost certainly not going to be done effectively with a single factor index of the type that may be good enough for efficiency.

Efficiency can be measured against a single objective, such as profit or growth rate, with others being set as constraints. But that simplification is not really applicable with equity. Even at the most elementary level of basic needs, too many elements - food, water, air, shelter, and clothing - are equally essential for survival for it to be sensible or easy to pick out one as indicative of the adequacy of the others. Then, above the mere survival level, other items - education, health services, recreational services, for instance - come into the measure of equity. But with survival assured, these additional factors really represent levels of dignity, opportunity and comfort, so that any
measure including them is of necessity subjective and probably more arbitrary than even any measure of efficiency.

In the light of equity defined more widely than in terms of basic survival needs, management in State forestry, therefore, would involve the assessment of alternatives according to their expected capacity to supply social needs not covered well or at all by the public goods associated with environmental protection. But the very introduction of this wider view of equity makes the criterion, inherently subjective and arbitrary enough, even more so.

**The combination of equity and efficiency**

What this means is that it is virtually impossible to reduce the equity criterion, even for forestry alone, to a single clear-cut and relatively generally accepted form. It is no wonder then that Hogwood & Peters (1985) suggest that ‘Government organizations lack a clear standard against which to judge their actions, such as profits or market share provide private actors. They lack any clear criteria that would allow them to design programs for effectiveness or efficiency’.

It could therefore appear that the efficiency criterion alone offers the degree of objectivity and stability needed in a consistent and reliable choice indicator. The inference is tempting, but it is far from being necessarily justified. In neither economic theory nor accounting practice is the ostensibly clear-cut efficiency criterion, even in the profit maximisation form, free enough of subjective and arbitrary
assumptions and approximations as to warrant such unqualified superiority. For a start, if, as Obrinsky (1983) argues, ‘mainstream neo-classical economic theory has no real profit theory because it cannot’, the case for an economic theory of State forestry based on the profit criterion is decidedly shaky. On top of that, the clarity of ascertained or reported profit is, in practice, only sustained by containing the arbitrariness within a set of generally accepted conventions having legal and quasi-legal status (e.g. Hendriksen & Budge, 1974; Gambling, 1974).

However, and this is the crucial point, in the efficiency criterion all the conflicts, the compromises and the ambiguities are combined into a single figure result. The criterion is thus operational and quantitative and hence, provided it is not investigated too closely, it is convincing. This is far from being so with equity. Until the many considerations that must come into an equity criterion are condensed into a single convincing standard, it will always be possible to dismiss it as being too woolly to offer a practical replacement or partner for efficiency. The conclusion seems inescapable: in economic analysis, equity considerations can, in other words, only be entered as constraints.

But even this only sweeps the problem under the carpet. From a practical point of view, the minimum level of attainment of the equity considerations has to be established. But to do that, and as part of it the trade-off values between different types of services, between different levels of adequacy and between different groups of people have to be determined. If those can be done, then a fairly big step has
been taken towards quantification. So why not go the whole distance and develop the operational equity criterion? And then, why not use it instead of the efficiency criterion?

A second difficulty with this formula lies in the choice of the form of efficiency criterion to use. That there are several candidates may be fortunate in a way. Profit maximisation itself, as argued earlier, conceptually is not even assessable, let alone attainable. This may not matter in theoretical work, as long as actual measurement is not involved, but that let-out is not available in management in the real world. Market share, mentioned by Hopgood & Peters (1984), is certainly one possible alternative. It is a single unambiguous figure and, on the face of it, also an indicator of relative economic efficiency. As generally understood in terms of holding or preferably increasing market share, it hardly sits well with the public interest base of State forestry since that, it can be argued, might be better served by a declining share of the market for some goods and services. That is, however, not a particularly relevant objection, since there is anything in the idea itself to prevent setting the share at a declining level. More substantial is its limited relevance where the State has a near monopolistic control over the forest resource.

Another alternative is to set performance relative to a target level of profit as the criterion. Again, it is a single figure and thus perfectly operational. It is not, however, as unambiguous as market share, simply because the determination of profit is itself a somewhat arbitrary matter. Nevertheless, it is one that does seem to confirm to
what commonly happens in practice. Cost plus pricing, for instance, is one manifestation of it. But for forestry, it has the difficulty of determining costs as a function of the time involved in the production processes (Leslie, 1985).

Perhaps more fundamental in the long term is the questionable validity of seeking to reduce the complexity of an economic entity to the simplicity of a single factor criterion. The development of methods for analysing complexity without reducing the system to its elements is not yet advanced enough to offer an alternative decision making process which could be applied to State forestry. However, it has gone far enough to confirm what has been known since that analytical method began to be applied in economics. This is that the behaviour of an isolated element or the system in isolation does not transpose to the behaviour of the system as a whole or the system open to its environment. Yet the mistake of trying to make that transposition is almost the foundation of applied work in neo-classical economics.

All of this does not, therefore, settle anything. State forestry, in effect, confirms the scepticism, which Ulen (1990) sees, expressed in Coleman (1988) ‘about the extent to which the consensual, rational choice paradigm can be used to explain such topics as collective choice rules’. State forestry is undertaken because, or in the belief that, the non-market services of forests are, of necessity, undervalued in private sector forestry. They are undervalued because efficiency effects only are, can or even should enter into the choice indicator for decision making in the private sector. In State forestry, on the other
hand, equity effects must be taken into account, ranking at least roughly equal with efficiency. But equity cannot be expressed in a single index commensurable with efficiency. It may be possible to express the quantity or quality of each output of the public goods and social services required of the State forests in question, but these cannot be combined into a single figure even in physical terms. This means that if two criteria have to be applied in decision making in State forestry, but only one can be expressed in clear-cut quantitative terms, trade offs between the criteria must be affected on purely arbitrary grounds. Since State forestry is by definition a political activity, the arbitrary choices will, almost invariably, be made by and in terms of the political element. It must therefore be at least as significant in the decision making process as the economic. Any decision rules or guides based solely or largely on the efficiency criterion cannot therefore be relied on either as positive descriptions of the economics of State forestry or as normative guides in it.

In practice, there can be no great and reliable stability in political decision-making, unless the effect of the decision on the political prospects of the government of the day is expected to be neutral and to stay neutral. Very few policies for, or affecting forests, would come into that category nowadays. The political element in State forestry has to be reckoned upon as a highly flexible and unpredictable one so that there is a very high probability that most decisions will be examined on a case by case basis in the light of the estimated political advantage or otherwise to the government of the day. This is a
situation that no general theory can handle or for which one can be sensibly developed.

The choices therefore seem to be three. One is to abandon the attempt to find an economic theory of State forestry, given that only a political theory is relevant. The second is to adapt the existing mainstream theory to equity constrained profit maximisation. The third is to adapt to forestry one of the alternative schools of economic thought that do attempt to modify the efficiency criterion to allow for the impact of the State as an active element in real world economics. The third of these approaches is pursued in the remainder of this work.

**Some key elements in managerial economics**

One of the obvious characteristics of managerial economics is its concern with what to do in the future. This alone would seem to eliminate that part of economics as a field of inquiry concerned with things as they are or as they have been. In decision-making, if the present and the past have any relevance, it is only as the starting point for deciding what to do or to do better in the future. This does not, however, represent any real difference from neo-classical analysis in which the past is disregarded under the sunk costs rule. All the same, the past is not completely irrelevant to either of these two forms of economics. They depend, in fact, quite heavily on the accurate or, strictly speaking, the consistent reporting of financial performance as a source of statistical information. Moreover, if, as Robbins (1932) or Walsh (1970) argue, micro-economics is, in fact, about choosing
between alternatives (i.e. decisions), the future is a common concern in both versions. So a concern with the future is not a distinguishing feature between managerial and neo-classical economics. How they treat it, however, is. To the neo-classical theorist, it is a special case; to the manager, it encompasses everything that has to be dealt with.

The second characteristic is a logical consequence of this focus on the future. This is that managerial economics is entirely normative economics. It is concerned with what ought to be done and nothing else. This is the complete antithesis of the positive stance claimed for mainstream economics: that it is concerned only with things as they are not as they ought to be. The stance as Emmer (1966) has shown does not stand up to close examination, and once he pointed this out it is easy to see why. In neo-classical positive micro-economics, the objective of the firm is taken to be profit maximisation. This then leads by logical analysis to certain decision rules, which are, in effect, what a firm ought to do to maximise profit. The rules vary a little according to the type of market in which the firm operates, but all amount to the fact that production should be carried on up to the point at which marginal cost is equal to marginal revenue. But if the objective of the firm is something else, is that still what it ought to do?

A third characteristic also arises automatically from the concern with the future. This is the uncertainty associated with events that are yet to happen. It is by no means certain, for instance, that the expected results will occur at all, or, if they do, whether they will occur in the way and when expected or whether altogether unexpected events will
occur as well or instead, and the longer into the future that results of present decisions have to be awaited, the greater the uncertainty in all of those respects. Uncertainty is thus greatly aggravated in forestry simply by the great length of the production period.

The fourth key characteristic has, however, nothing to do with the concern with the future. On the contrary, it has its roots planted very firmly in the past. This is the fact that institutional matters cannot be dismissed from managerial economics as readily as is done in the neoclassical theory of the firm. Management decisions in real life very quickly run into the questions of what can be done and how within the legal, cultural and social environment, at least as much as the economic environment. In State owned enterprises, the political institutional considerations tend to dominate in the final analysis, because, in a sense, they amalgamate all of the other institutional factors. Although less potent in private sector management, it is rare, even there, that they can be totally neglected.

The fifth characteristic follows from the institutional nature of managerial economics. This is the separation of management from ownership in the corporate economy.

A sixth characteristic, which may be crucial, is that the technical relationships of production can play a significant part in the economic decision-making process. How big a part probably depends on the specific problem in question, but it is unlikely that managers could, in practice, safely resort to the analytically convenient ‘black box’ device
of standard micro-economics whereby the complications of what happens in the production processes can be ignored.
7. IS THERE ANYTHING ELSE?

ALTERNATIVES TO THE MAINSTREAM APPROACH

The justification for State forestry depends on the risks that are believed and, to a considerable extent, have been demonstrated to be inherent in leaving forests to the control of private owners. The case is a good example of the conundrum, explored by Sen (1988), arising out of the dual origins of economics. As he shows, economics has one origin in ethics and another in what he calls the engineering or logistical approach. From this point of view, State forestry is an institutional system for combining, in practice, the set of ethical objectives represented by the provision of the public goods services of forests that would otherwise be not supplied, either adequately or even at all, with the engineering principle of using the resources tied up in the forests and their management with maximum efficiency.

A great deal of the case for State forestry is therefore made up of accounts detailing the failures of private forestry to take care of the public interest. There are, however, several reservations that must made about the case presented in those terms. The first is that the failures do not necessarily mean that the State itself must take over forestry to make sure that the deficiencies are corrected or do not arise. Regulation of private forest owners might be sufficient.
The second is that there is no guarantee that the government as the representative, for the time being, of the State will be any better either in assessing or protecting the public interest. As Schumpeter (1954), who ought to know, having served earlier in his career as a politician and as a bureaucrat, says their interests are ‘entirely different’ from those of the people they are supposed to represent. Downes (1957), followed by a number of others, takes this point further in arguing that the government, in its political arm, has but the one over-riding interest, which is to stay in power.

The idea actually goes back much further in history. Passmore (1976) points out that Plato (362 B.C.), for instance, makes, in his ‘The Republic’, what must be one of the earliest recorded statements of this position with one of the debaters arguing that it is self evident that rulers govern in their own interests. Then, in ‘The Prince’, Machiavelli (1527) gives, in effect, a detailed analysis of the implications of the precept.

In fact, as Schumpeter (1954) points out, public policy cannot be anything but politics. With this in mind, it could then be held that anything which is judged likely to increase the government's chances of retaining office will be adopted as policy, but only for as long as it is clearly a powerful vote winner. Anything that is regarded as a handicap in that respect and, moreover, as having little chance of being transformed into a vote winner, will be dropped, no matter how well it might serve the public interest. Neither regulation of private forests nor State forestry itself are, therefore, likely to live up to their
theoretical advantages unless they are seen as likely to enhance the government’s electoral appeal or are seen, at least, as neutral.

Stretton & Orchard (1994) argue that this view of the political arm of government having a single-minded objective of staying in power is neither fair nor accurate. Governments do have other items on the political agenda and do take actions that they believe are necessary in the public interest although seemingly of little electoral appeal, all of which is true enough, but hardly enough to undermine the theory as a working generalisation. The other objectives are usually found to be subservient to the retention of power or means to it, while actions likely to be electorally unpopular actions are rarely taken close to an election date.

A third reservation lies in the possibility that the electoral appeal of the social objectives may tempt the government to give them too much emphasis at the expense of the efficiency objectives. The dangers in doing that are graphically illustrated in Barnett (1986). His analysis is a general one, tracing the demise of British industry as a competitive force under the pressures of an unbroken procession of governments, regardless of party, giving excessive emphasis to the social aspects for political advantage, ever since the first World War.

It is interesting that State forestry, which was strengthened enormously in Britain immediately after that war and as a direct consequence of it, is not mentioned by Barnett. But the message is as valid for it as it is for the regulated private sector industries, which he
considers in detail. For Barnett, the danger lies in allowing the social considerations to dominate public policy so much that the economic machinery of the State is virtually destroyed. His book, in fact, could hardly be bettered as an example of the point that the government and the State are not necessarily the same thing.

All of the three reservations are significant comments on State forestry, but only the third bears directly on the subject of this chapter. What it means is that an adequate economic theory for State forestry has to combine the efficiency and the equity criteria in a way that is not fatal to either. The traditional neo-classical theory of the firm, applied as the analytical system, clearly fails to do this. Nor do the modifications that replace profit maximisation with another objective for profit maximisation. They may make the formula more realistic, but they are no better in meeting the dual criteria. The device of taking in the equity criteria as constraints may be more promising if they are given an appropriate total weight. But, as the discussion in the previous chapter indicates, the practical difficulties of determining the appropriate weight are quite forbidding. At this stage, therefore, it may be more rewarding to turn the search to the theories outside mainstream economics. If they offer nothing better, then it may be time to return to trying to make the constrained single criterion approach work or to abandon the search altogether.

All of this, however, is valid only if State forestry continues, in spite of the current success of market oriented economic philosophies, to be a significant form of forest ownership and management. The
likelihood that it may not be for much longer was examined in Chapter 3 and found to be fairly remote. The search for an alternative base in economic theory is, therefore, still worth pursuing.

The candidates

Some of the alternative versions of economic theory have been mentioned at various places in the previous chapters. Two were singled out as having some plausibility - the institutional or, to be up to date, the neo-institutional school and the Austrian school. The Marxian school was also found to be another. In principle, it ought to be the one. It, after all, is directly concerned with the provision of most, if not all, economic goods and services by the State, which is the essence of the economics of State forestry. Those mentioned are not, however, the only possible candidates. There is, in fact, quite a number of alternatives to the neo-classical theory and their suitability might also be worth consideration. Davidson (1986), for example, lists six schools of macro-economic thought to which a rough correspondence might be found with some of the various versions of micro-economics.

Of these, however, it might be more fruitful to limit the list to those, which on the face of it, appear to incorporate specifically some, at least, of the characteristics of State forestry. The first and by far the oldest is Marxian economics. Although, as just mentioned, it should fit the bill almost perfectly, it does not, as it has not yet developed a useable theory of managerial economics for the firm in a socialist
society. Nevertheless, some elements such as its view of the class struggle as the motive force in the economy could have a place in the formulation of an appropriate theory of State forestry. After all, some of the issues in State forest policy and management arising from native peoples' rights (e.g. Fernandez & Kulkarni 1983), are quite consistent with a class struggle interpretation.

A second school, which, on the face of it, ought to be directly applicable is the recently developed and growing field of public choice economics. Again it, in principle, coincides almost exactly with the scope of State forestry. Yet again, it, for several reasons, is not. For one thing, it is, as yet, mainly framed in terms of macro issues, which does not fit the micro orientation of managerial economics. For another, its analytical base, so far, lies almost exclusively in the neoclassical micro-theory, which, as the preceding argument has found, has little applicability in the economic management of State forestry. Yet again, as with Marxian economics, some elements from it could apply to the economics of State forestry. For example, such tendencies for public officials (and any official for that matter) to seek to further their own interests as much as and perhaps more than those of the organisations they are supposed to serve; for the managers of the organisations themselves to put their organisation's interests above the national interest or, perhaps more accurately, to regard them as identical, or for the organisations to become defenders and advocates for the interests they are supposed to regulate are well documented (e.g. Jackson, 1982). Such real life characteristics of public
bureaucracies obviously have implications for decision analysis in State forestry.

Somewhat similar considerations apply to public enterprise economics, a variant of public choice economics, which is aimed at the micro-economic level. While explicitly taking account of non-market objectives, as exemplified in benefit/cost analysis, it still works, however, from a conventional neo-classical base, and thus suffers from the weaknesses of that version for managerial purposes. The version of micro-economic theory termed Managerial Capitalism by its principal synthesiser (Marris, 1964) has a much more accurate portrayal of the structure of modern corporate production. However, it does not yet seem to have developed into a cohesively identifiable school. All the same, several other pictures of corporate economic behaviour such as, for example, Simon's (1966) satisfying firm, Baumol's (1967) sales maximising firm and Galbraith's (1967) market manipulating corporation are consistent enough with the Marris version for them to be conveniently taken as a broadly homogeneous alternative to the simple owner-managed, profit maximising firm of orthodox theory.

The firm of managerial capitalism with its finance provided, in the first instance at least, by the theoretical owners whilst the use and control of the finances are left almost entirely to the management fits corporations generally. It is equally appropriate to corporations in either the private or the public sector. So far, however, it has been typically considered within the private sector. At first sight, this hardly
seems to matter. State ownership could easily be converted to the same form as the private corporation simply by giving it, for example, a shareholding structure with all of the shares owned by the State. But the resemblance would hold only up to a point. Many of the crucial institutional features of the private sector corporation, which are designed to control its operations in the public interest to some degree, could be reproduced on paper but fail in practice to act as even moderately adequate safeguards. The trouble is that, unlike the private corporation, the State is not just the principal shareholder. More importantly, it is also the sole legislator and the ultimate adjudicator.

Nevertheless, the implications of the separation of ownership from management are most significant for economic decision making in State forestry. The point made earlier about the possibility of divergence between the objectives of the managers and the public interest, which State ownership is meant to protect, is especially significant.

But dismissal of possible candidate schools does not mean that any one of the remaining schools will, on examination, fare any better. Rather, it seems likely that even if an alternative school is found to have an economic theory of the State firm that can be adapted or developed to fit State forestry, further adaptation might be needed to incorporate aspects of reality, which these schools have shown to apply.
An exception may be the institutional school. For a start, it tackles head on, as its name implies, most of the characteristics that seem to be lacking in the otherwise suitable versions. That is to say it starts from the premise that the institutional setting of the firm, State or private, governs its economic behaviour at least as much as the limited number of relationships summarised in supply and demand interactions. The corporation, for instance, is an institution that differs from corporation to corporation and from State to State in structure, in the resources available to it and the ways in which they can be used, added to or disposed of. Moreover, both its institutional environment and its own institutional structure tend to be slower in reacting to the changing economic and social circumstances than those changes that are occurring. The institutional factor in managerial economics may not, therefore, always be appropriate or adequate for the problem at hand. But neither of the two forms in which it operates can be abandoned uni-laterally. Hence, it must be endured, hoping that whatever modifications can be effected by the management, within the existing institutional limits, are enough to avoid the worst effects of the deficiencies. What this means, then, is that institutional factors enter directly into the decision process rather than simply being constraints on it, or even irrelevant as implied in the traditional theory of the firm. And this is, in effect, the idea behind the institutional school (e.g. Eggertsson, 1990).

The question, at least for managerial economics in relation to State forestry, thus becomes whether, and to what extent, institutional
economics school has yet developed a usable or adaptable theoretical base.

**Institutional economics for State forestry**

On the whole, institutional economics is not quite respectable. At its peak in the 1920s, it rivalled, for a short time, the still-evolving neo-classical orthodoxy (Galbraith, 1987). But the intellectual brilliance of the blossoming neo-classical theory and its rapid domination of the teaching of economics and the career prospects of economics virtually killed off institutional economics. A few heretics survived and even thrived, of whom Galbraith is perhaps the most well known. Their misgivings about the glaring discordance of the orthodox theory from the real world pushed them in the institutional direction. By the mid 1980s, a revival was starting to be evident. For the most part, however, the form it was taking was to work for the incorporation of institutions into the neo-classical formulation. This version is therefore distinguished from the old and discredited institutional school by the name ‘neo-institutionalism’. Strictly speaking, therefore, it is not so much an alternative to neo-classical micro-economics as a modification of it. But the modifications seem to be drastic enough as to involve a substantial re-working of the theory of the firm. Most of the major writers in the revival do, in fact, make quite a point of emphasising the neo-classical synthesis at which they aim. Hodgson (1988), on the contrary, recognizes that the revival, as far as he is concerned, is really intended to develop ‘a modern institutional
Another feature, which recommends the institutional approach as more appropriate to forestry, is the distinction made by Kuenne (1968). He argues that in the short run, an economic system can be taken as constant enough to disregard any changes in it or in its social and political environment, but not over long run periods. In the short run, therefore, the mechanistic model implicit in the neo-classical version is probably sufficiently accurate. For long run analysis, changes in the economic and social environment will affect the structure of the system and its functioning, so that the historic-institutional view then becomes more appropriate. The production period in forestry is normally so long that the economic system cannot safely be taken as a constant. Automatically, the institutional mode of analysis is the more appropriate for forestry in general.

One note of caution must be made at this point. It is now common for the term ‘evolutionary economics’ to be used as a synonym, or as a more accurate name for institutional economics. There is a danger of the term being taken as identical with the concept of evolutionary economics developed by Boulding (1979). The only resemblance between the two is in the name. What Boulding describes as evolutionary economics is an analogy between economic system and biological systems in which institutions play a very minor role. Evolutionary economics seems to be more appropriate in the sense to
which Boulding applies it than as a replacement to distance institutional economics from its antecedents.

The neo-classical theory of the firm has, however, more weaknesses than the institutional omissions, which make it an inadequate basis for a theory of managerial economics in State forestry. The search for a more adequate base is therefore more logically started with the alternative version than the neo-classical institutional synthesis. It may not, of course, come up with an appropriate answer, but it starts, at least, from the right premises.

The elements of institutional economics

The first difficulty arises from the fact that the older school of institutional economists never developed an institutional theory of the firm to an operational level, while Hodgson's (1988) manifesto for a modern institutional economics is mainly concerned with establishing the urgency of the need for substituting institutional economics at the macro-economic level. In other words, there does not appear to be much to start with other than the inadequacy of the neo-classical version. This is not, however, quite right. Galbraith (1967, 1977) did develop a view of how the modern corporation tackles its economic decision, making problems and how that approach ties in with, as well as affects the performance of the economy. A similar theme is taken up in more detail by Chandler (1992). Drucker (1983) then goes on to argue that this ‘new industrial state’ has brought about changes in the
world economy making national economies of ever diminishing relevance.

The implications for the management of individual firms in this institutional environment can hardly be handled by the ‘black box’ device adopted for neo-classical micro-economics. The technical and organisational relationships within the production processes cannot be safely left, in real life, to somebody else in the management of a firm. Some of the more spectacular failures after the 1980s showed that the control of financial matters alone was not necessarily a guarantee of success. The dismantling of conglomerates in the return to their ‘core business’ is clear recognition that some fairly detailed knowledge of production and market characteristics is just as necessary.

The characteristics of forestry as a production process, which were outlined earlier, together with the institutional characteristics of the State as a provider of the outputs from forestry, are therefore the inescapable starting points for an appropriate managerial economic theory of State forestry.

**Ecological economics**

However, this does not yet point conclusively to institutional economics as the appropriate theoretical base. There is still another alternative worth consideration. Ecological economics, although not strictly an established school of economic thought, has been around for a long time (Martinez-Alier, 1987). Its basic principle is that of
entropy in thermodynamics, a theme developed in economics as early as 1971 by Georgescu-Roegen (1971), but entirely without effect on mainstream economic theory. From entropy, it follows that resources in the real economy do become exhausted, and in that process, waste is unavoidably produced. Hence, the outcome of economic activities cannot be predicted from models or theories that do not allow for the flow of energy and materials. Thus energy flow, which is fundamental in ecological analysis, is equally so for economic analysis. Just as economic outcomes cannot be predicted from economic rationality alone, neither can ecological rationality alone do any better. The two elements need to be combined and it is this that ecological economics is apparently meant to do.

This, it would appear, also fits the situation in forestry. There are, however, two points, which means that it may be little better than institutional economics as an alternative to neo-classical theory. The first is that, in view of the comment made by Martinez-Alier (1987), ecological economics is allied to institutional economics, and either may be equally appropriate. The second is perhaps more telling. The concern in ecological economics is, almost by definition, with the use of non-renewable resources but this is quite the opposite of forestry in which forests are managed as perpetually renewable resources.

Institutional economics then could be taken not only as a more appropriate theoretical basis for the economics of State forestry but also, perhaps, as the most appropriate of the alternatives.
8. MUCH ADO ABOUT VERY LITTLE?

There is, it seems, a fairly good chance that institutional economics could be a more appropriate theoretical basis for State forestry than the neo-classical version underlying standard forest economics. But, in practice, does it matter all that much? Would it really improve the analysis of economic problems in State forestry to substitute the rather nebulous institutional theory for the definite precision of the neo-classical firm? It may be more realistic but, would it be any more useful? After all, the Faustmann formula gives a single, unequivocal answer regarding the expected net return from investing in a plantation or in natural regeneration for timber production, and this is one of the things that a forest manager requires from economics. But is it much use if it is precise but wrong? The catch is that, although the Faustmann formula was developed well before neo-classical economics was even dreamed of, it depends on exactly the same decision rule - profit maximisation. Institutional economics may not give as precise an answer, but it could be more correct.

Perhaps the best way to go about looking at this possibility is therefore to try some of the typical economic problems that managers are confronted with in State forestry. At first sight, this may seem to imply that it is possible and necessary to separate, before a start can be made, those management problems that could be classed as ‘economic’ from those that are not. This, however, is not so. All management problems are, in fact, economic in that they all involve, in one way or another, the balancing of the costs that will almost
certainly be incurred in solving them against the returns whose magnitude is much less certain and whose achievement could even be doubtful. Since it is this balancing act that is the essential role of management, the best place to start is with the nature of the economic problem itself.

The economic problem, as defined by Robbins in 1932 and ever since almost universally accepted in neo-classical economics, is to determine the allocation of resources between alternative uses so as to maximise the owner's advantage at the micro-economic level, or the sector's advantage at the meso-economic level, or society's in macroeconomics. As Duerr (1949) explained, this problem occurs at three levels in forestry. At the first level, there is the problem of choosing between allocating resources to forestry rather than to other sectors of the economy in which they could be used. At the second level, the problem is to choose between the different things within forestry for which the resources could be used. Then, at the third level, the problem becomes that of choosing between different ways of doing whatever alternative within forestry has been selected.

The decision rule for choosing between alternatives available at any of these levels is crucial. In the neo-classical theory of the firm, the decision rule is maximum profitability. Nothing in the above statement of the problem, however, necessitates profit being synonymous with advantage. Nor is it, in practice, necessary for the advantage to be maximised. All that is necessary is that the use of the resources in the way selected is expected to produce a net positive
advantage to the owner, to the sector, or to society as a whole. To say or assume that it should be maximised is a normative rule that destroys the credibility of the claim that neo-classical economics is a positive analysis. Simon (1966) is fully justified, therefore, in substituting a satisfactory level of profit as a more realistic rule than the maximum. The difference between the two approaches is that only one allocation of resources can satisfy the first rule, while any number of allocations would satisfy the second. Nevertheless, they do have one thing at least in common: that they both equate profit with advantage.

Profit as a measure of advantage is probably justified in the case of the owners of a private firm engaged in manufacturing, trading, or commerce. The same probably applies to agriculture as practiced by large, corporatised firms and for industrial forestry firms. It is, however, probably much less applicable to individual farmers to whom the way of life is often the main criterion, provided that the farm generates enough monetary profit to ensure continuity of ownership. Advantage can, in other words, be a combination of monetary profit and other considerations such as life style. The same might also apply to small single or family owned manufacturing, contracting or servicing businesses. The independence of being one's own boss is an important part of advantage. It is an error, then, to assume that profit and advantage are always identical in the private sector, or even that profit can always be safely taken as a proxy for advantage.
Apart from this, it is also rather disconcerting to find that neo-classical economics does not have a theory of profit but many and not always compatible theories of profit (Obrinsky, 1983) while the calculation of profit, in practice, has a very large subjective element to it. The inadequacy of profit as a measure of advantage is even more evident where the State, or some derivative of it, such as the economy or a sector, is concerned. From here, advantage is not restricted to the comparison of costs with returns in monetary terms, nor is it even largely measurable in such terms. This is especially apparent with State forestry. The returns from State forestry are the net value to society, present and for many generations into the future, of a set of non-market services such as watershed protection, stream flow regimes, soil conservation, climate amelioration, conservation of biodiversity wildlife habitat and forest conservation per se, as well as the monetary value of timber and other forest products. Of these, only the forest products are directly measurable by market-determined values and often these are relatively minor components of the total value to society. Even the indirect methods of assigning monetary values to the non-market values or the device of transferring some of the services to private ownership or franchise are rarely much better than fairly arbitrary and hence disputable approximations.

So does this really mean that the problems in the economics of State forestry are insoluble? If managerial economics is the solving of the resource allocation problem in any particular case, then the fact that in State forestry, some of the costs and many of the returns are incommensurable must mean that the necessary comparisons cannot
be made. This may be true enough, but it does not alter the fact that, in reality, forestry and State forestry have to compete with all other activities for whatever resources are available to the economy. Like it or not, the non-monetary returns and costs will be evaluated, in some way or another, relative to the alternatives. It could, therefore, seem to be preferable for the evaluations to be on some sort of quantitative economic basis than left entirely to subjective or emotional or polemical debate. The logic is not, however, all that convincing; it is not necessarily true that a partly subjective technique is better than a wholly subjective one.

Perhaps more to the point is the possibility that the difficulty affects the economic problem in forestry at the first level more than it does at the second and third levels, where the comparisons are all within the forests sector. In effect, the joint subjective/monetary criterion ought to be more consistent within the sector, and especially so with the State part of it, than it would be between sectors. Whether this is a reasonable assumption should become evident from seeing what difference, if any, results from using the institutional basis rather than the neo-classical version in the second and third level economic problems of State forestry.

**The State forestry firm**

The economic problems that confront managers in State forestry are no different, in principle, from those facing any manager in any firm. The same set of production, location and pricing decisions as listed in
Chapter Five apply with the possible exception of the last; i.e. whether to enter or stay in forestry. For the managers, this decision is a given, being made by the government, but even in this the option is still there of staying in certain lines of production or of expanding in some or adding new ones.

Any differences relating to forestry in general, or State forestry in particular, are differences of degree according to whether and with what frequency the series of questions is cyclic. The questions of what and how to produce arise initially before the planning stage only. In general, with mass production manufacturing industries, once answered, they stay answered for a long period, subject only to minor improvements or adjustments unless the market has been badly misjudged or until the market for the products changes so drastically that the questions have to be faced again. In industries that manufacture to order, the market directly answers the question of what to produce specifically, although it and the question of how to produce are anticipated by the decision to invest in the specific industry in the first place.

In primary production, however, the questions recur on a cycle equal to the production period. In agriculture, for instance, the cycle is relatively short, with production periods of several months to one or more years. In forestry, the production period for most products or services is measured in years, more often in decades and sometimes in centuries. The questions thus recur on corresponding cycles. With such long cycle operations, there is always, therefore, the risk of
circumstances changing so much during the cycle that the initial answers are no longer valid. The manager would then be faced with another set of questions, such as whether to terminate the production process at some intermediate or unfinished stage, or whether to change to another end product, or whether to continue on the original course in the hope that circumstances will change back again. But these are, of course, no more than the two basic questions about what and how to produce in slightly different form.

It is the joint product nature of forestry referred to earlier in Chapter 5 that, as the basis for multiple use management, allows for the versatility to change the end products or the combinations of end products before the production period for an initially chosen product has been completed. This is without incurring the total loss or waste of what has been produced to date. Pulpwood, for example, can be the end product chosen for forests managed specifically to produce it, but it also can be a by-product of the process of managing a forest for the production of saw logs. But the forest planned for saw log production also passes through a stage in which it is all pulpwood, and even when fully grown, the saw logs can still, as a last resort, be used for pulpwood. The later in the production period that the change is made, the greater the likely loss. At no stage, however, is all of the wood produced to date lost or all of the resources applied to growing it, unless there happens to be no market for the pulpwood. Similarly, if a forest under multiple use management for watershed values as well as for timber is at some later stage transferred to protection forest solely
the wood produced up to the date of the change may be lost but only some, not all, of the resources used are lost.

The first economic problem in the management of State forests is, therefore, the decision as to what products or services or combination of them are to be produced from which specific tracts of forest. That is, in the terminology of classical forest management, to establish the objectives of management. Given the relatively long production period for most forest products and many of the services, this means making long-term forecasts of the demand for them.

**Forecasting and institutional economics**

How forecasts are made or selected should, therefore, be a test of whether institutional economics makes any difference. However, it is not, on the whole, a particularly good one. The trouble is that the forecasting methods in forest economics rarely go into the interplay between demand and supply to establish price relationships for the quantitative estimates of future consumption levels. The error in this is widely recognised, but the practical difficulties are so daunting that prices are assumed to stay relatively constant or to change along some historically or arbitrarily determined trend. The basic economic parameter, in neo-classical economics, of price as the determinant of consumption is, in effect, assumed away. Consequently, if there are any differences between economic theories in price determination, they will not show up in forecasting methods or in the outcomes of specific forecasts.
There is, however, one recent and very significant exception. This is the Timber Supply Model developed by Sedjo & Lyon (1990). In this model, price, calculated as the resultant of the interaction between supply and demand, is explicitly the driving force. On the supply side, the quantities of standing timber placed on the market are governed, partly by the stumpage (royalty) calculated as the residual value from end product prices. Those end product prices, in turn, determine the quantities demanded on the demand side. The economic criterion for supply is the financial rotation given by a Faustmann formula estimate at a given rate of interest. This financial control of supply by price is, however, subject to sustained yield and product mix limitations in that the combination of sawlog/pulpwood output at any time is not dominated by the characteristically short financial rotations. The model solves the simultaneous equations for the equilibrium price at which supply and demand for roundwood are equal.

This is a comprehensive and realistic approach to the problem of forecasting the demand or, strictly speaking, the consumption of timber products. It is neo-classical in that the output decisions of forest owners are based on the profit maximisation criterion. But at the same time, it is institutional. The constraints applied for sustained yield and product mix considerations and the exclusion of some otherwise market economies from the supply calculations based on financial rotations acknowledge that, in the real world, economic decisions are influenced by institutional factors as much as if not more than by financial profit.
In effect, realism in the model is achieved by abandoning the neo-classical version where it clearly does not apply. In other words, Sedjo & Lyon (1990) explicitly recognise that forecasts of the market prospects for wood products based on institutional economic theory would be different from those based on neo-classical theory. The test thus confirms that the search for an alternative to mainstream theory is by no means ‘much ado about very little’.

This has profound implications for a theory of the managerial economics of State forestry. Clearly, for instance, any reservations about forecasts that omit or ignore price effects, plausible as they might seem, are valid only within the neo-classical convention. This then means that institutional economics, nebulous as it is, could serve just as well, if not better, than the generally used and accepted neo-classical version as the theoretical basis for a theory of the economics of State forestry, and is probably a more valid one. One consequence is that most of the content of currently accepted forest economics could be misleading and possibly downright fallacious. At the very least, it means that the first two economic decisions in forestry about what and how much to produce are not wrong, in practice, if they are, as is commonly so, made largely in physical terms. In fact, the reservations about the omission of price or relegating it to a minor role in demand forecasting are more about what some people think ought to be done rather than what is done. The implication then is that in forest economics, neo-classical theory is normative, which is rather different from what its proponents claim.
Managerial decisions in State forestry are ultimately concerned with determining how much should be produced of each sort of the various services and products that forests can supply. Almost every decision and procedure in the management of State forests - the total area of forest that has to be reserved and the locations, and how much more and what sort of forest in addition the State will have to make sure is provided and the timing of such afforestation. The adoption of silvicultural and yield regulation regimes, which will satisfy these needs, depend on the decisions about what and how much to produce. The first step in the management process is, therefore, to forecast the amount of each service and product that will be demanded over a period of time into the future, at least as long as the rotation for a forest to reach the stage of maturity at which it will be capable of producing the appropriate combination of services and products.

Immediately, the problem is stated in these terms: the difficulty of the process is obvious, and what is more, its circularity. For a start, the appropriate combination depends on what the members of the society making up the State today think that the society will want in the future or, more importantly, need from the present forest resources. But the distance into the future that society today has to look, in turn, depends on how long a rotation is needed to produce whatever combination the present society decides is appropriate for the future society.
If the distance ahead - the forecast period or the planning horizon - is relatively short, no more say than ten years or so, present and future societies are virtually identical. Even forecast periods of twenty years introduce no major generational differences, but beyond that time span, present society becomes less and less representative of the future society that is gradually replacing it. But once the rotations envisaged and, hence forecast periods, begin to exceed fifty years, the generational overlap virtually disappears. The difference probably becomes significant at even shorter forecast periods than fifty years. Those who make the decisions in a given generation on behalf of a later one tend to be the older members; the younger ones who will feel the effects have little say, and those yet to be born have none. A more realistic transition time for complete replacement of the decision makers of any given society might, therefore, be between thirty five to forty years.

Two questions can be raised about these interpretations of the forecast period for State forestry. The first is obvious. Why should the minimum forecast period be as long as the maximum rotation? The second, almost equally obvious, is: what if the present society errs badly in deciding what is appropriate for the future?

Before going into those matters, it could be worth going back a bit to see for what products and services the forecasts of demand will need to be made in State forestry. The chances are that these will differ appreciably from State to State according to the differences between them in their economic, social and political conditions, in their
organisational structures, and in their institutions. In a market or mixed economy, any justification for State forestry depends on the State being the only potentially dependable supplier of those forest products and services that have a high social value, but which private forest owners would not supply or could not be relied upon to do so, either adequately or appropriately. In developed market economies, any justification for treating wood as one of these products is, at best, fairly slight. There is hardly any convincing reason for wood being singled out for special treatment when more basic, essential goods, such as food, energy, or alternative materials, are not. The only exception might be in those few economies that are so heavily dependent on the forest industries that their raw material supply is to some degree a public good.

In developing market economies, on the other hand, there may well be a case for the State to build up or safeguard forest resources so as to ensure a raw material base for the industrialisation pathway to economic and social development. But even this is, in principle, no more than a temporary phase. If and as development occurs, the justification decreases and eventually disappears. In socialist or command economies, State forestry is just one of many other State productive activities and is justified as part of the same general case for the socialist structure.

Almost all of the very extensive and now quite sophisticated work which has gone into the forecasting prerequisite of forest policy and management over the last 50 years or so has been concerned with
wood products. This bias, whatever the reasons for it, may have some validity for the forests sector as a whole. However, for State forestry in the developed market economies, with the earlier mentioned exceptions, the only forecasts of managerial significance are for those services that justify State forestry. Wood production is no more than an unavoidable incidental by-product of the type of forestry required for whatever conservation, protection, social or environmental services are needed. In developing economies, on the other hand, forecasts for wood products could have some validity in State forestry if the link between the utilisation of a forest resource and economic development is real and substantial.

At this point then it seems worth recalling the conditions under which State forestry in market economies is justified. The case rests on the four critical assumptions that:

i) certain services and products are essential,
ii) some of these cannot or will not be produced by the private sector either at all or in adequate quantities, qualities or locations,
iii) the State can and will produce them adequately, appropriately and effectively and
iv) the reasons for the private sector being unable or unwilling to meet the need do not apply to the State.

The credibility of these assumptions was assessed in some detail in Chapters 2 and 4. Although some reservations were noted, it was, in the end, evident that they do hold well enough for State forestry to be
a legitimate undertaking. The type of demand forecasting required and appropriate in State forestry will then vary according to the nature of the economy of the State and the stage or level of economic and social development it has reached. The first step in the managerial economics of State forestry is not that of forecasting demand, as was identified earlier, but involves analysis leading to the identification of the services and products the forests of the State could produce which satisfy the above four conditions.

**Public goods in forestry**

In developed market economies, forecasting in State forestry needs to be concerned only with services whose values to society as a whole are under-valued by the market pricing system. These services, in fact, coincide with the category of goods and services known as public goods in economics. At first sight, they fit the definition given by Buchanan (1969) as those services and goods for which the interaction of supply and demand takes place through political institutions. This, however, is, for State forestry at least, too much of a tautology. It implies that all that a good or services needs to qualify as a public good is for it to be supplied through the State. Whether it is an essential service, having the four characteristics listed earlier does not, apparently, come into it. Yet this essential service function is the sole and whole justification for State forestry.

More to the point may be the more general idea of public goods, as those goods and services whose benefits, if they are supplied at all,
cannot be withheld from anybody unable or unwilling to pay for the cost of being supplied. It is this non-excludability, which, as Cornes and Sadler (1986) argue, is the crucial feature of a public good. The ability to exclude non-payers from the benefits is the only basis on which a private firm or individual has a chance and the motive to profit from providing a good or service. Without a certain level of sufficiently tight excludability, the service or good will not be supplied by the private sector at all or adequately, unless it is paid well enough by the State to do so. But whether this matters or not depends on the extent to which the society as a whole, or which parts of it, would be disadvantaged by the unavailability, the limited availability, the poor quality or poor distribution of the service. The greater and more widespread the disadvantages, or the more powerful are the interests adversely affected, the higher the chances are that the good or service will be deemed to be essential.

If this is so, then public goods are those that, for their supply to be adequate, will have to be financed mainly from taxation rather than from sales. This means that in developed market economies, the first task in the management of State forests is not just to identify the essential services, but those that are also non-excludable. This automatically eliminates most forest products, unless those who benefit from the State owning and managing the resource are powerful enough to have the forest product accepted as a public good and see more benefit in keeping it that way than in taking over as the managers or owners themselves.
This exception has some significant implications for forest and public policy. It means that the beneficiaries from the products in question believe they would have to pay less for them under public ownership and management than the cost they would incur to produce them themselves. But this in turn implies that the State is a more efficient producer of forest products than the private sector, or that the State is subsidising the buyer of the primary forest products. Neither explanation fits comfortably with the ideology that private enterprise is more efficient than public, nor the philosophy of no subsidies, which forms the free market foundations of developed market economies. If for no other reason than consistency in logic, forest products have no place in State forestry in developed market economies except as by-products of forest management aimed primarily at the provision of services which are unquestionably essential public goods.

So what, if any, are these services? The possible candidates can be conveniently if not completely satisfactorily classified into three categories. They are:

**Category I:** those functions associated with forest hydrology and watershed protection, avalanche control or the amelioration of micro-climate, reduction of wind force, wind erosion and the control of desertification, shade for crops, stock, buildings and people and, with the concern about the greenhouse effect, act as carbon sinks. Category I, in effect, covers all of those services provided by protection forests in a strict sense.
**Category II:** those functions associated with the protection or conservation of non-human inhabitants of users of forests and the general benefits to mankind generally from forest conservation. This would include such values as the conservation and enhancement of flora, fauna and wildlife habitats, conservation of bio-diversity per se, conservation for its own sake, or to cater for recreation and scientific study or to safeguard sources of chemicals of known or potential industrial or medical value as well as for aesthetic and landscape values and for psychical enjoyment or therapy.

**Category III:** those functions which have primarily localised social benefits for human communities living near the forests and largely dependent on them for food, materials or refuge, and possibly through this of indirect value to a wider population generally. This category could legitimately include timber production forestry in developed economies aimed at decentralisation or the stabilisation of declining rural communities, although economic rationalism philosophy would rarely admit this.

Of these, probably only Category I would find near-universal and unanimous acceptance as public goods meeting the dual criteria of essential and non-excludability. The public goods status of the other two categories is strongly urged by many environmental, human rights, animal rights and deep ecology movements, as well as other less well defined or organised groups. These are all, to varying degrees, valid claims, but none of them is yet accorded anything like
the same degree of universal and unanimous acceptance that marks the first group.

However, some services in these two categories have found enough local support to qualify as local public goods, as defined by Cornes & Sadler (1986). But in some countries, the support for some of these services is national more than simply local, while some have virtually acquired international acceptance as a result of the UNCED. It could be useful, therefore, to add other groups to the two proposed by Cornes and Sadler covering those public goods of global significance (e.g. the carbon sink, world heritage), of multination regional significance (e.g. the forests of the headwaters of rivers such as the Mekong or the Amazon), of sub-national regional significance (e.g. forests of the headwaters of the Murray-Darling rivers).

Nevertheless, it is tempting and all too easy to exaggerate the value of forests as suppliers of public goods. For instance, a major role in flood control was claimed and accepted for forests in the early conservation campaigns. It is now well recognized that they are almost insignificant in all but very minor flooding. However, the fact that the blame for major flooding in India continues to be placed on deforestation in the Himalayan Ranges shows that the claim can still be advanced without drawing the questioning it should. Much the same sort of propaganda - exploitation of plausible but greatly exaggerated and, at times, fabricated claims - is a characteristic also of much of the contemporary furor over forest conservation as a public goods and the public ‘bads’ nature of forestry for timber production.
This probably means that propaganda and counter-propaganda are appropriate and essential managerial functions in State forestry. But it does not follow that they are also a necessary part of managerial economics in State forestry. Managerial economics is only part of the total management function. Its scope is concentrated on the decision aspect rather than the facilitation phase in which propaganda is more likely to have a place.

**State forestry and Pareto optimality**

The social welfare effects, to the extent that they figure in the prevailing neo-classical theory, are based on a view of social welfare developed from the Pareto principle that social welfare is increased by any change that benefits one individual in the relevant society without disadvantaging any other. One of the two reservations about the general validity of the public goods case for State forestry shows the weakness of the concept in this simple form. Services that could earn general recognition as international and national public goods very often act to the great disadvantage of local communities. Asia has some prime examples of the local public ‘bads’ arising from wider public goods. Many of the small communities in or adjacent to forests are left to carry the costs of the damage done to crops by elephants or of the deaths and injuries from tigers that accompany conservation and management of forests to protect wildlife habitats. In a similar fashion, the timber dependent communities in North Queensland have been greatly disrupted and adversely affected by the reservations
made to create a world heritage global public good. None of these
groups are likely to be convinced by the wider public good value, nor
to benefit much from it. This clearly contravenes the conditions
required for Pareto optimality

With its usual resilience neo-classical economics has been able to
neutralise this awkward fact through the compensation modification of
Pareto optimality. In principle, those who gain could compensate
these disadvantaged communities and, if they do, nobody is then any
worse off, so the Pareto criterion is satisfied. In reality, the losers
rarely have the economic or political importance to force those who
benefit from the public good to compensate them fully for their loss.
But again, the neo-classical version can handle the problem. The
breach is plugged through the Kaldor-Hicks adjustment to the
compensation principle whereby total social welfare could still be
increased if the beneficiaries stood to gain more than enough to
compensate the losers fully, even though they do not actually do so.
That this affords no consolation to the losers is of no significance in
neo-classical economics; value judgments about fairness or justice are
outside its domain.

It is not so easy in managerial economics to dismiss, simply by
definition, those who feel they are disadvantaged or not adequately
compensated. The value-free status of mainstream economic theory by
which any responsibility for the losers is evaded does not stand up to
close scrutiny. Bergson (1966) has shown that consumer sovereignty,
one of its pillars, is very much of a value judgment. That the whole
idea is a delusion is a constant theme in almost all of Myrdal's writings (e.g. 1958, 1967) and is endorsed, for instance, by Seligman (1962) and Stanfield (1983). This criticism, although debated by Wiles (1983) and ignored by the orthodox, is plausible enough, but it is really a point of theory. Of more practical significance for State forests is the potential threat from groups of aggrieved customers, redundant workers or dispossessed landholders, who, it must not be forgotten, are also among the theoretical owners. The risk is too real and great, on both the cost and revenue sides, for it to be written off by defining it as somebody else's business.

**Identification of public goods in forestry**

The second reservation about the generality of the public goods case in State forestry applies to the forecasting of demand for them. The public goods that warrant State forestry or State intervention in forestry are quite country specific. The only general rule that can be applied is that of the State's responsibility for public goods or the public interest. While this covers the public goods of forestry, only the broadest of general statements are valid about what they are. To say which goods and services qualify is a matter, largely but not entirely, for each State to decide according to its own circumstances. The qualification is necessary because of the multi-national and global public goods that would be otherwise left out. A given State could be important in the supply or protection of them, but either not realise its role or accept that it has one. It is then up to the international community not only to identify and add them to the list for that State,
but more importantly, to finance their supply. Existing super-national bodies have delegated to them too little capacity for governance to do any more than identify, and often too little financial autonomy to do even that. At present, therefore, any provision in State forestry for multi-national regional and global public goods depends on the extent to which a State voluntarily accepts that it has an obligation, or can be forced by national and international public opinion or pressure to recognize that it has one.

This limited capacity in the international organisations compared to the powers of their member States applies, however, only to their capacity to ensure the supply of global public goods. It does not limit the responsibility they have in helping to identify and quantify the level and evolution of the demand for global and regional public goods or to make sure somebody does it. Forecasts of the demand for public goods at all levels are, therefore, pre-requisite to managerial economics in State forestry.

**Forecasting demand for public goods from forestry**

In developed market economies, only the Category I services would qualify without too many reservations as the national or global public goods to be supplied or safeguarded by State forestry. Whether some of the social values in Category III could also be included is a point of some debate. The idea of forestry as an instrument of social welfare tends to be discarded under the free market philosophy as part of the general dismantling of the apparatus of the welfare state. This does not
prevent States that have not fully acted on the philosophy from electing to continue to carry out or sponsor forestry activities and projects with social purposes such as unemployment relief or the stabilisation of local communities. They will, however, have to endure constant pressure from the orthodox to mend their ways. But this only confirms that the list of public goods to be catered for by State forestry is entirely a matter for the specific State to determine.

Those protection services associated with the conservation of water resources and soil, apart from being the easiest to specify as public goods, are also, to some extent, easier to quantify than many of the others. The locations and extent of important watersheds and of areas of high susceptibility to soil erosion or avalanches, and which should therefore be maintained in forest or afforested, are readily measurable. Forecasting the need for these services thus tends to be a largely once-only exercise, but subject to relatively minor additions and excisions over time as gaps in the reservation system or excessive or wrongly located reservations are revealed by experience.

The extent, as well as the nature of the forests needed to supply the global public good of a carbon sink, is also calculable. The fact that there is a very wide range in the estimates that have been made so far does not invalidate the principle, nor does the fact that the effectiveness of forests in this respect is open to question. At this stage, most of the differences probably reflect the point that those presenting the calculations want to make more than the intrinsic difficulties of the process.
By comparison, it is certainly more difficult to quantify the social services such as decentralisation, rural community stabilisation or the conservation of cultural features, which, in a specific State, might be regarded as public goods, which its forests should supply. But the same does not necessarily apply to forecasting the area, location or type of forest needed to carry out the policy.

On the other hand, it is all but impossible to say how much forest of what sort and where is needed, or would be adequate, to supply the global public good, the conservation of bio-diversity. Much of the claim for this to be a global public good depends on the possible existence, in natural forests especially, of hypothetical undiscovered chemical and genetic resources, which may be of benefit to mankind in the future. Since they are unknown, they may not exist. If they do, they may not, when found, turn out to be of any significant benefit. The value thus seems to lie in retaining a somewhat speculative option. To the extent that this is a valid case, there would seem to be no upper limit to the area and variety of forest needed while the minimum would be the same. The case as Norton (1987) argues is not, however, as self-evident as its proponents urge. So the first thing to establish, therefore, is the validity of the argument and its limits.

Much the same applies to the psychological and therapeutical values of forests as local, national and global public goods. There is no doubt that, to many people, conservation of forests simply because they are forests and they are there, is a valid and necessary objective of social
政策。毫无疑问，许多人从访问或漫步在森林中或在森林中放松中获益，尤其是如果他们相信或能够被说服认为森林是自然的、永恒的和不可侵犯的。然而，有些人对森林的反应相当强烈，方向相反。因此，公共利益中内在的一致性并不总是公共利益本身的结果。

鉴于关于森林作为公共产品的冲突观点的现状，各种服务之间的互动以及估计未来需求的各种可能性的量化方法，问题可能很容易被认为是不可逾越的。幸运的是，林业的联合生产性质为摆脱困境提供了一些方法。

森林保留用于水系价值，联合提供其他公共产品，如心理和精神价值，碳汇，野生动物栖息地，生物多样性，土壤保护，甚至有时，文化价值。

基于这一基础，水系保护服务的森林可能作为代理来获得一个工作水平的初步预测，或更准确地说，其公共产品价值的一般需求。根据所涉流系统地理的估计，可估算出所需森林面积以提供适当地保护城市或农村供水系统（如Bren, 1995）。允许对可能用于应对人口增加或变化的其他水系进行调整。
industrial development and changes in usage patterns and intensities expected in the future. Similarly, estimates could be made for the headwaters of streams crucial or likely to be crucial to rural and agricultural development. These could then be summed to give a forecast of the area of watershed forests to meet the national demand. At the same time, it would give an idea of the future supply of jointly produced other public goods, which mainly are a function of the area of forest. Any specific needs not covered by this supply would then be identifiable and could be catered for by the addition of appropriate forest areas.
9. HOW MUCH CAN WE MAKE OUT OF IT?  
COMMERCIAL PRODUCTION IN STATE FORESTRY

Although forests produce commercial goods and public goods jointly, it is the public goods that are the sole justification, and hence the primary objective, of State forestry. Even when the public interest in the form, for example, of employment or foreign exchange earnings is sought through the production of wood as an industrial raw material, the commercial goods are only a means, not the objective, of the State, in either its own or the forests of private forest owners under State regulation. Commercial goods in State forestry are thus completely subsidiary. Whether they should be harvested and sold depends on the extent to which this would impair the output or quality of the public goods. As by-products, they may make a cash contribution to the social value of forestry, but this is not a necessary part of the purpose. It makes no sense, therefore, to criticise as uneconomic a decision not to harvest commercial products such as timber, if that is the best, the easiest or the surest way to protect or provide the public interest for which the forest is to be managed. If they can be harvested without damage to the public interest, and at a positive net cash return, this could increase the social value. But the social value of State forestry lies in the value of the public goods, not in the generation of cash income. In such circumstances, the economics of State forestry is concerned with the determination and allocation of the minimum level of resources that will ensure the supply of public goods or safeguard
the public interest at standards at least equal to the minimum level regarded as adequate and necessary. But regarded so by whom?

**Responsibility**

The decision as to whether to harvest the commercial by-products does not, however, always lie with the forest managers. Prohibition of timber harvesting may be one of the ‘givens’, as is often the case with National Parks. Or, commercial timber harvesting may be prohibited, but not harvesting by specific communities of wood, or of non-wood products such as fruits, game or fish for local or traditional uses. When the uses, which may or may not be made of the forests, are given, then decision making at Duerr's (1949) second level in which the economic problem occurs in forestry, i.e. as choices between alternative products or services, is not a relevant function of management. While the other functions of management in Chambers' list (1952), such as facilitation and review remain, the role of economics in the decision function is restricted to choices at the third level, i.e. between alternative ways of doing what the management staff has been directed to produce.

Decisions about the production of timber and other commercial goods in State forestry thus apply only where timber production is one of the permitted uses under multiple use management. But economics as an aid to management decision-making does not apply in the same way as it might under private forest ownership. The big difference is that all of the fixed costs of establishing the forest and running it are
charges on the public goods. If there are no extra costs involved in producing the commercial products, then their cost of production is zero. In effect, the only costs that have to be recovered by the sale of commercial goods are those additional costs incurred by measures specifically taken to produce commercial goods in quantities or qualities different from what they would have otherwise been.

**Conditional nature of commercial forestry in State forestry**

In this respect, commercial goods under State forestry could be produced at a potentially substantial cost advantage compared to private forestry. But against this, the production of commercial goods in State forestry is a conditional use. The condition is that it is carried out without, in any way, reducing or impairing the public goods values, which are the purpose of State intervention. It is virtually inevitable that additional costs will be incurred in complying with this condition. Depending on the type of commercial goods, which it is proposed to produce, and the nature of the public goods to be protected, this cost could be quite high. For example, to meet the standards set for timber production from forests on domestic water catchments will certainly involve higher harvesting costs than from similar forests in less sensitive locations. In a competitive market, the net sale price for a given class of product after this extra cost is deducted from the market determined price, could be lowered by enough to more than offset any cost advantage arising from the by-product status of timber in State forestry.
This situation may not apply where the State has a near monopoly position in the markets for standing timber. Market prices may then be set by the State - administered pricing rather than market determined prices - with any extra costs being passed on to the industry. In the absence of competition from imports of wood raw material, or of other commercial forest products, or from substitute materials, the extra cost may simply be passed on along the production and marketing chain until it finishes up by being loaded on to the end consumer.

**Institutions and commercial production in State forestry**

The economics of State forestry in the production of commercial goods is thus very much dependent on the institutional setting within which it operates. Several settings can be recognised as follows:

1. Monopolistic or near monopolistic State ownership and management of forests with administered pricing by the State for setting stumpage or royalty rates and conditions, arbitrarily or by formula.

2. Monopolistic or near monopolistic State ownership and management of forests with stumpages or royalties and conditions set by competitive tenders or auctions, and reserve prices set by the State arbitrarily or by formula.

3. Monopolistic or near monopolistic State ownership but private management under contract with conditions for timber production set by the State and stumpage, or royalties for commercial products and sale conditions set by the State or subject to State approval.
(4) Monopolistic or near monopolistic State ownership but private management under contract with conditions for timber production set by the State, but stumpage or royalties and conditions for timber sales entirely market determined.

(5) State and private ownership of forests in such proportions that no one owner has or can establish monopolistic or near monopolistic control, but with conditions for timber production set by the State and stumpages or royalties for commercial products and sale conditions set by the State or subject to State approval.

(6) State and private ownership of forests in such proportions that no one owner has or can establish monopolistic or near monopolistic control, but with conditions for timber production set by the State, but stumpages or royalties and the sale conditions for commercial products entirely market determined.

(7) Predominantly private ownership and management of forests, but with the conditions for timber production set by the State and also the stumpage or royalty rates and the conditions of timber sales or subject to State approval.

(8) Predominantly private ownership and management of forests with the conditions for timber production set by the State, but stumpages or royalties and conditions of timber sales for commercial products entirely market determined.

In five of these institutional arrangements, State forestry has a price determining role for commercial products, although its primary function is concerned with the provision of public goods. Hence, in these situations, the economics of State forestry has to deal with
pricing of the primary commercial products, although it has no necessary role in or concern with their production. But does this mean that the economics of State forestry also extends to the forecasting of the markets for these products? It might well be so. The link between investment decisions relating to timber production, which have to be made many years before the revenue from product sales can be expected, depends on the future markets for the products. Those markets, therefore, have to be forecast explicitly or implicitly.

While this clearly applies to private sector forestry, it does not necessarily follow for the State. The State's concern in forestry is with an adequate and appropriate supply of certain public goods at present and in the future. This requires a fairly precise idea of what the future needs for those public goods is likely to be. In managing or regulating forestry to meet those needs, a substantial amount of potentially commercial wood will unavoidably be grown. But does it matter to the State as a forest manager how much is grown, either in absolute terms or relative to whatever the future markets may want?

It is not evident at first sight that it would. After all, the chances are that commercial use of the wood is more likely to have a negative rather than a positive effect on non-wood public goods, which are the objective. Whether the future market is likely to be bigger or different from what it is now has no obvious bearing on that. But this conclusion does not stand up to deeper examination. Some silvicultural treatments enhance certain public values. Thinning can increase water yield; fellings can favour certain animals; regenerating
and young forests are more effective carbon sinks than old stands; a change of species composition may favour the conservation of some animal or understorey species, which might otherwise be endangered.

But there are two counter arguments against making a necessary connection between this and timber markets. The first is that most treatments have obverse effects as well. Regenerating forests can lower water yield; fellings spoil the habitat for some other animals; thinning to effect a worthwhile increase in water yield may have to be far heavier than the silvicultural optimum; induced changes in species composition of forests contradicts the conservation of ecological sustainability.

The second is that any silvicultural treatment does not require removal of the felled timber to be effective in enhancing the supply of the public goods. In State forestry, removal of commercial timber is an option that only pays off if the net revenue is positive after deducting the costs of eliminating or repairing any impairment of, or damage to the public goods values, for which the forest is managed.

But it is this second reservation that at the same time shows that forecasting of the future markets for the commercial goods is as necessary a component of the economics of State forestry as it is in private forestry. The net revenue, which governs whether commercial goods are sold, depends on the prices for forest products in the future, and these depend on the future markets. What they are likely to be,
therefore, governs whether the commercial goods jointly produced with the public goods in State forestry are sold or left in the forest.

**Market outlook for commercial forest products**

At first sight, it might seem that whatever pertains to forecasts of the markets for forest products in private sector forestry and in forest industries would also apply in State forestry. But this can be soon seen to be too simple a view. There is, in fact, one very big difference. Forecasts for private sector management are directed at decisions of what to produce, how much to produce, where and how. Species and silviculture, locations and production methods, can, within quite wide limits, be adjusted to match production to the outlook for each product. In State forestry, in contrast, these are all more or less given, especially with the commitments accepted by adherence to the UN convention on the conservation of bio-diversity. What can be treated as variables in private forestry tend to be constraints in State forestry.

The result is that forecasting of the markets for timber in State forestry is less concerned with quantities than in the private sector. But with timber production, a conditional option in State forestry, depending on the expected net revenue, future timber price levels are of special interest. This means that, unlike the forecasts, which, as outlined in Chapter 11, have tended, without great loss of credibility, to neglect supply, forecasting for State forestry cannot. The forecasting of prices over any lengthy distance into the future is thus a classic example of Shackle's (1967) point that it is ‘quite beyond the
range of illumination from even the most comprehensive knowledge of the future’.

This implication of the sheer impossibility of forecasting prices could well be a sound enough reason for leaving them out, given the decades-long time periods involved in timber production forestry. But they are not, and cannot be, in fact, left out. It is implicitly assumed that prices will stay constant in any forecasting mechanism that seems to leave them out. There is nothing to stop the same device being adopted in the pricing forecasts for State forestry, but in this case, the assumption must be explicit, or prices could be assumed to move upwards or downwards from current levels at some arbitrarily estimated rate, or by some amount, or in some pattern. This could be a practical, if still a theoretically invalid way of tackling the difficulty. But again, it, at least, has the virtue of forcing the assumption about price into the open.

In reality, it is probably impossible to do any better. However, some guide to the future pattern or rate and direction of price levels to be incorporated into the forecasting mechanism might be gained by including the supply outlook. Like most things in economics, the idea is, however, much easier to say than to apply. Certain features are, nevertheless, fairly clear-cut. Plantations are generally much more productive and fast growing than natural forests. It would follow, then, that the greater the area of plantation forest likely to contribute to future physical supply the greater the total. But as the adjective ‘physical’ implies, this way of thinking has to be handled with
caution, as supply in economics is always linked with price. The volumetric forecast of supply is consistent with the forecasting of demand in physical terms, but it is no more logical. The omission of price is purely a device of convenience.

Price could be incorporated, after a fashion, on the supply side by applying the future price pattern assumed for the demand forecasts to the physical supply outlook through an assumed relationship of the quantities supplied for each assumed future price level. Since the volume of the total plantation outturn can be estimated, stochastically, if that degree of refinement is wanted from expected and known rates of plantation establishment, yields and rotations, a supply curve, not entirely arbitrary, could be fabricated.

Whether it is worth going to all that trouble is as yet far from certain. It is, in effect, the method used by Sedjo & Lyons (1990). The differences between the several forecasts of ‘demand for industrial roundwood’ as summarised in their Table (10-1) show that the forecast volume of world demand is markedly lower when supply and price are included as in their Timber Supply Model. For example, the FAO study of 1982 gave a low level of 2.3 million m$^3$ and a high level of 2.6 million m$^3$ as the demand in the year 2000. A World Bank forecast made in 1978 and including, incidentally, an assumption of constant real prices, gave demand at 2.8 million m$^3$ by the year 2000. The Timber Supply Model forecast with 1.7 to 1.8 million m$^3$ at the base (the most likely in the authors' opinion) and the high levels respectively, is at least 25% lower than these others.
Whether and to what extent this represents an improvement over less comprehensive systems of forecasting will have to wait until the actual consumption data for the year 2000 becomes available. At present, no more can be claimed for it than that it does take explicit account of more of the factors than would be expected to affect future markets for industrial wood. But more importantly, the explicit use in the Timber Supply Model of future price trends as the outcome of the interaction of future supply and future demand produces exactly the information that is of most interest to State forestry in the outlook for the markets for commercial goods. Here, it is worth recalling, prices, not volume, are the focus. Although prices in the Timber Supply Model are ‘the driving force’, i.e. an input, they are projected from the interplay of physical supply and physical demand quantities built into the model. These projections of prices can therefore be identified and used where future price levels rather than volume are the objective.

The Timber Supply Model indicates an average rise in the real global price of industrial roundwood of 0.2% per annum between 1985 and 2000 for the base case and 1.2% for the high demand case. The IIASA Global Trade Model (Kallio et al., 1987), also using similarly derived projections of real price trends indicated, as would be expected, that a global average is made up of widely variable rates of growth for different products and regions. For instance, the projected growth rate of real prices for conifer saw logs in the eastern United States was 5.9% per annum up to the year 2000, but only 0.3% per annum in Western Europe. No increase in real prices for hardwood pulp logs
was projected for the eastern United States over the same period, but increases at a rate of 1.8% per annum for western Europe.

It is evident that the supply/demand based forecasting systems can produce price forecasts more consistent with micro-economic theory and apparently less arbitrary than assuming constant prices or guessing the changes. The indication of a little better-than-constant real average price for industrial wood static over the next 40 years from the Kallio et al., 1987 model is certainly a timely corrective to the commonly held and expressed opinion that real prices for wood must rise under the combined pressures of the highly publicised diminishing resources and rising populations. But disaggregated projections, such as those given by the IIASA model, are probably more useful for decisions about the harvesting, not of industrial wood by-products of State forestry in a given State than the single global figure. The examples above show that the outlook in regional markets for different products could be quite different from the global trend for wood as a whole.

At this stage, however, it is probably premature to rely on either of the two existing sets of projections as definitive or even reliable indicative guides. Sedjo & Lyons (1990) refer to a comparisons by Binkley & Vincent (1988), which showed that while both the Timber Supply Model and the Global Trade Model gave much the same volume of timber harvest in the U.S. South in the year 2000, the rate of growth in the real price of saw logs under the Global Trade Model model was projected to be twice that under the Timber Supply Model. This very
marked difference, from the point of interest to State forestry, could be attributed, according to Sedjo & Lyons (1990), to the greater weight given to supply side responses in the Timber Supply Model.

With such wide variation in the projected price trends, it is obvious that a great deal more needs to be done in the field before there are results that can be used with confidence. This is less important than the facts that:

a) systems do exist for projecting future movements of prices associated with the changes in physical supply likely to come as the expanding plantation resource comes on stream, and

b) the Timber Supply Model can be operated to provide price projections for disaggregated forest product groups and other regional groupings.

As it is, these comparative price rather than volume outlooks, which are relevant in the managerial economics of State forestry, the systems may be worth more detailed consideration. There is no need to go into great technical detail, however, as the Timber Supply Model is fully described in Chapter 7 and Appendix O of Sedjo & Lyons (1990). The points of main interest here are what it includes, how it includes them, and how they interact.
The elements of the Timber Supply Model

The model moves from the present wood supply/demand balance to a steady state one over a period of fifty years. The physical supply side of the model is made up of:

- the present area and age or size class distribution of the mature and over-mature, immature and regenerating resource in seven supply regions;
- various rates at which the resource could be harvested; the area regenerated after or in conjunction with harvesting;
- the final mean annual increments on mature stands not yet harvested and on immature and regenerated stands plus the area and
- the increments of plantations, where it is known or expected to be added to the resource base in the future.

Increments are adjusted to encompass the effects of varying levels of silvicultural investment and a steady constant rate of increase expected to result from ‘bio-technological development’. Subdividing the regions into a set of 22 land classes reflecting local differences only accommodates factors such as access or the biological limits on the ability of a site to produce saw logs or pulpwood.

In addition to the effect on the regional supply function of the costs of harvesting and of regeneration in each of the regions, the possibility of increasing regional supply by imports is allowed for by incorporating interregional transport costs. Trade brings with it the complication of different currencies so that the current patterns of the rates of foreign
exchange and the likelihood of movements in the relativities over a fifty-year time span have also to be taken into account. This is done fairly arbitrarily by setting rate structures for the regions against a weak, an intermediate, and a strong level of the U.S. dollar base. The effect of time as an input to the wood growing processes is introduced as an overall interest rate, which reflects the global opportunity cost of capital.

By combining and manipulating these two sets of variables in a system of difference equations, the regional and global market supply schedules or functions are established. Demand/price functions are not, however, similarly calculated. Demand is entered into the system as exogenously given by applying a pre-determined pattern of the rate of growth in world demand for industrial wood.

Demand is, however, price related, so the imposed demand pattern can be modified as the volume released into the markets changes in response to the system induced prices. In the solution developed in the 1990 book, the original rate of growth in demand of 1% per annum for the base case (the one the authors consider most likely) is thus reduced to 0.8% to the year 2000 and to 0.6% to 2035.

This global demand schedule interacts with the global supply function established by summing the regional supply functions to get a dynamic transition path to the steady state balance, i.e. the sustained yield harvest with the whole system being solved to maximise the
present net discounted value of consumers' plus producers' surplus over the fifty years.

The use of optimal control theory in economic modelling, of which the Timber Supply Model is an example, has been strongly criticised (almost ridiculed, in fact) by Blatt (1983) for its mathematical weaknesses. While this may throw additional doubt on the method and hence the actual outcomes of the Timber Supply Model, it does not alter the fact that prices can no longer be left out of or arbitrarily allowed for in forecasts of timber markets.

The model meets most of the requirements for confidence in a forecasting mechanism. It is consistent with the neo-classical version of price theory in that the quantities demanded and the quantities supplied at any given time are balanced through price. The supply curve is derived from the costs of supply and the demand curve, while arbitrarily selected and applied, is modified by price. Thus, most of the criticisms about the neglect of price relationships in the common timber demand forecasts are less valid. It is also consistent with the physical constraints and characteristics of the processes in timber production forestry in that it includes most of the dominant elements of yield regulation and allows for the changes that can be affected by silvicultural regimes and technological development. The numerical values adopted for some of the variables, e.g. 6% as the global real interest rate, can be challenged, but this is of little significance, as the effect of any variations on the solution can be readily assessed by sensitivity analysis.
One possible weakness from the theoretical standpoint is the imposition of a rather arbitrary demand curve. From the point of view of theoretical purity, it should, perhaps, be derived, as with the supply curve, as a function of price. Two counter propositions can be raised against this criticism. The first is that demand in the sense of the size of the markets for industrial wood has a very minor role in the economics of State forestry. The most that may be needed is a general idea of the directional trends rather than the magnitudes. The second follows from the earlier lengthy discussion of the limited applicability of mainstream economic theory to State forestry. Hence, the neo-classical theory of price formation is not necessarily correct, or even mildly appropriate, for the set of commodities produced under State forestry.

The use of optimal control theory in economic modelling, of which the Timber Supply Model is an example, has been strongly criticised (almost ridiculed, in fact) by Blatt (1983) for its mathematical weaknesses. This does not alter the fact that there is no longer much practical justification for leaving prices out of forecasts of timber markets, or allowing for them in some arbitrary way.

In principle then, if not yet fully in fact, forecasting methods are available, which, by combining the supply and demand sides, provide adequate and appropriate market forecasts for commercial forest products for use in the managerial economics in State forestry.
11. FORECASTING IN FORESTRY
IN GENERAL

The previous chapter concluded with the idea that forecasting of the future markets for commercial forest products was just as relevant in State forestry as in private. There is, however, a school of thought and perhaps two, to whom forecasts are neither necessary nor useful. The song ‘Que sera, sera’ expresses the underlying idea very clearly – ‘whatever will be, will be; the future’s not ours to see’. It rests on good authority, too. The advice in the Bible about taking no thought of the morrow as God will look after it, implies both, as also does Carlyle's advice ‘not to see what lies dimly in the future but to do what lies clearly at hand’. Furthermore, as many and probably most attempts to foretell the future turn out to be wrong, they can be not merely useless, but positively dangerous as well. All of this may be true, but it is a long way from being the whole truth. For a start, it is possible to forecast some things with certainty, as for example, the times of sunrise and sunset, and some things with a high degree of reliability, e.g. the times of high and low tides. As for being unnecessary, anything relating to the future, which includes virtually all human activity, involves a forecast of something in or part of that future. In other words, forecasting is necessary because it is unavoidable. As for being a useless action, one way or another based on the forecasts, is also unavoidable so that a forecast having thus been used, modified or discarded cannot, ipso facto, be useless despite the chances being quite high that it will turn out to be wrong.
That the literature on forecasting is enormous and being added to continuously is evidence enough of the unavoidability, if not the necessity, of forecasting and its traps. The literature includes many good reviews (e.g. Benton, 1972; Ascher, 1978; Ayres, 1979; Twiss, 1982; McKern & Lowenthal, 1985) of the topic in all or some of its aspects. Nothing much could be gained here by analysing the pros and cons of forecasting, the techniques of it in general, or the ways of interpreting or evaluating forecasts. Nevertheless, a brief summary of some key features may be worthwhile to highlight points of specific significance to forecasting in forestry.

A great deal of this literature is concerned with the testing of forecasts, especially against the eventual actual outcome. There may be some point in this if the aim is to find out what caused any error in the forecast as a step to better forecasting methods. But the test of a forecast is not whether it will or does turn out to be accurate. That would be a decisive test if it could be done, but as the actual situation cannot be known beforehand it is not only an impossible test to apply but also a useless one. Even more to the point, it offers no guide to the first managerial decision to be made – whether or not to accept the forecast. Rather, the test of a forecast has to be whether it generates enough confidence in it for it to be taken as a basis for action. That is, does it convince forest managers that it will turn out to be accurate?

The crucial question in forecasting is, therefore, what are the attributes of a good forecast in the sense that forest managers will accept it? Unfortunately, the literature on forecasting is almost as confusing as it
is voluminous. Many synonyms have been devised in order to
distinguish forecasts from the scientifically disreputable art (or
deception) of prophecy. Projections, predictions, forecasts and
forward outlooks are some of them, but they all mean the same thing -
a statement of the future state or value of a specific economic, social
or physical quantity or situation. Since there are many possible ways
of arriving at the statement, ranging from arbitrary figures pulled out
of the air or a state of affairs drawn from imagination or dreams to
sophisticated mathematical modelling systems, there are almost as
many ways of classifying types of forecasts (e.g. Ascher, 1978; Ayres,
1979). Broadly, at the first level of classification, forecasts are either
unconditional or conditional terms, which correspond closely to
Ayres' (1979) two types of predictions or projections.

A conditional forecast is a statement of the most likely value for the
variable or variables concerned, or state of the situation in total, under
certain specified or implicit conditions, at or by some specified time in
the future. In contrast, an unconditional forecast stands completely
free of any such qualifying conditions; it is a statement of what will
happen. In effect, it is more of a prophecy than a forecast.

Conditional forecasts can, in turn, be of several forms. One is a
projection in which the governing conditions (the determinants) are
extrapolated over the period covered by the forecast, and no other
factor is introduced to modify the resulting outcome. In other words, a
conditional projection says ‘if these are the only or the main
determinants of the behaviour of the variable or variables for which a
future value is wanted (e.g. the consumption of domestic fuel wood in East Africa in 2010) and these factors change as specified while everything else stays constant, then this is what that future value or situation is most likely to be’. The effect of variation in the behaviour of any or all of the governing variables or conditions (i.e. the determinants) can be allowed for by setting values for them at maximum and minimum levels or anywhere between. In the strict sense, then, a forecast might be distinguished from a projection in being a set of projected future values, which also allows for the possibility of other changes as well as those in the determinants.

Forecasting methods would then differ in:

(a) The determinants which are identified or selected as having the main effect on the variable or variables whose future value is to be estimated.
(b) The way in which those determinants are related to or influence the value of the variable or variables which are the subject of the forecast.
(c) The way in which those relationships are assessed.
(d) The way in which future values of the determinants are established.
(e) What other factors are brought into account and how.
(f) How likely changes in them are assessed and related to the variable whose future value is to be forecast and to the other identified determinants.
Projections are thus part of a forecast. While projections are not involved in all forecasts (e.g. a figure or situation can be established by guess or some other arbitrary method), any projection can be taken as a forecast unless accompanied by a specific waiver to the contrary, or unless the content or internal evidence drawn from the content or structure suggests that it would be risky to do so.

A good example of this point can be found in the publication ‘Forestry Statistics Today for Tomorrow’ (FAO, 1993). First, the basic document, ‘Forest Products: World Outlook Projections (FAO, 1988)’, which describes the methods used in preparing the projections, is quite explicitly titled to show that they are not forecasts. That they are not intended to be forecasts is, however, only implicit, and this is not enough to have prevented them from being adopted as representing authoritative FAO forecasts (e.g. Resource Assessment Commission, 1992). But they contain internal evidence, which suggests that there are dangers in doing so. For example, the implied rate of growth in the world consumption of sawn timber is 2.5% annually from 1991 to 2010, compared with an average annual rate of 0.3% over the 20 years prior to 1991. There might, therefore, be some danger in taking the projection as a forecast. Similarly, the projected increase in the consumption of sawn timber in Australia to 6.2 million m$^3$ by 2010 from a level that has oscillated around a more or less static 4 million m$^3$ since the early 1960s, could warrant a little caution. Of course, it is not impossible that such marked leaps in consumption could eventuate, but reasons that would justify the use of the
projections as forecasts are neither set out in nor deducible from the documents.

Projections, then, it is worth repeating, are not forecasts, but they can be an important or even necessary step in the preparation of one. In fact, there are only two alternatives to projections. One has been mentioned - that of arbitrarily drawing the forecasted value or situation out of the air. The other is to envisage a picture of the future economic, social, political and physical environment, and deduce from that what must be the value or range of values for the variable that is the subject of the forecast. In terms of the likelihood of these types of methods turning out to be accurate, neither can be rejected simply on the grounds of their naivety. They could turn out to be correct. In fact, naive methods in which the value for the next year is taken to be the same as that for the current year have had as good a record in forecasting agricultural commodity prices as most of the more sophisticated techniques (Heady, 1952). Indeed, such a method would have been startlingly accurate for forecasting the size of the Australian sawn timber market in 1995 from any time since the early 1960s. As for pictures of the future, those envisaged by Jules Verne or Arthur Clarke have turned out to be uncannily accurate.

These methods could and probably would be rejected on the grounds that they do not give managers much basis for confidence in believing that they will be right. While a good record of performance over the past could be enough to tip the scales, a forecast, as a general rule, has a better chance of being accepted, the more soundly the method used
is judged by managers to be based on analysis and reasoning that can be checked or verified. This does not mean that it is also more likely to turn out eventually to be correct, only that managers think it will be or close enough for them to plan on. The trouble with this test is that it could lead to the rejection of forecasts based on, or introducing ideas or evidence, which are not part of the conventional wisdom when, as time eventually shows, they should have been selected. A good example of this danger is given by the manner in which forecasts of a declining consumption of fuel wood in developed countries, which were commonly accepted up to the mid-1970s and were consistent with the trend up to then, were confuted by the reversal of the trend following the oil shocks of 1973 and 1979.

So this test of whether the forecast is regarded by forest managers as credible enough to act upon is valid only if it includes the prior test of whether the internal evidence suggests that there are some unlikely or inconsistent results. Thus the FAO projections, discussed above, might be accepted as forecasts under the first part of the test, since many managers seem to have taken them as such. But they have less chance under the second. But even this addition does not guarantee that an eventually accurate forecast would not still be rejected. The projected decline in the consumption of fuelwood in the developed countries would have passed both tests in the 196Os. A forecast of the opposite would not have passed either.

With this cautionary tale in mind the idea of taking the FAO projections as forecasts may not be as risky as implied by the earlier
questioning. There could be something in the future to reverse the trends just as there was with fuelwood. Although the fuelwood reversal was not foreseen, it was not, in principle, unforeseeable. Fossil oil supplies have to run out someday and when that event occurs or comes very close, it would be reasonable enough to forecast an increase in the demand and consumption of fuelwood as one alternative source of energy for some purposes. What was more unforeseeable, although not entirely, was the timing of the oil shocks since they had nothing to do with the inevitable long term depletion of oil reserves.

A similar sort of unforeseen but foreseeable change with regard to the consumption of sawn timber could bring about the sharp jump of the projections and thus justify treating them as forecasts. There is one such possibility. This is for the developing world to move rapidly into developed status. If this were to happen on a large and rapid scale and if some of this development took the form of or was channeled into better housing for the mass of their people and sawn timber were to be used as a major component in that housing then the very large acceleration in sawn timber consumption implied by the world projection could occur (Leslie, 1990). It would not, however, flow through to bring about the increases in consumption projected for such developed countries as Western Europe, Australia and New Zealand. Although their production might increase in response to any resulting expansion of export markets for sawn timber or wood based panels their own domestic consumption would not be directly increased.
However this offers at least one other clue for assessing whether this would give forest managers enough confidence to transform the projections into their forecasts. To them it matters very little whether action to increase future production of sawlogs is justified by the likelihood of greater potential wood deficits at home or in export markets. The clue is how likely are forest managers to believe that the conditions on which a rapid and substantial increase in the rate of growth of world sawn timber consumption depends will, in fact, eventuate. The conditions to be assessed may be worth repeating at this point. They are that:

1) the developing world countries will move rapidly into developed status,
2) some of that development will be reflected in a big and widely distributed improvement in housing for the mass of their populations,
3) sawn timber will be a major component of those housing programs and
4) for this to flow through to the already developed countries the increased demand for sawn timber or wood based panels in the now developing countries cannot and will not be fully met from their own resources.

Forest managers who transform the FAO projections into forecasts without much amendment are accepting that the answer in all four cases is ‘‘yes’’. Whether they have explicitly conducted analyses to reach that answer or not is immaterial. In effect, they have and
moreover, in most instances, they have already taken or recommended immediate action deduced from the 2010 levels.

But does the situation really warrant a confident and positive answer to the four conditions? To be certain the subjective probability of each condition being met would have to be 1.0. Some forest managers might be as confident as that, but most would admit to some degree of uncertainty. To have a high degree of probability, say 0.75, for the combination of the four conditions the probability of each would have to be around 0.93. If, more realistically though still optimistically, each is judged to have a probability of 0.6, the joint probability is no more than 0.13. Outsiders do come in at such odds but to invest heavily in forest management or plantation development on such a low probability is close to reckless.

So those forest managers and investors who take or have taken the FAO projections as forecasts as a basis for action must have:

1. assigned very high subjective probabilities that all four conditions will apply, or
2. accepted the volumes projected because they correspond to what they themselves have worked out, or
3. accepted the volumes projected because they are what they want to believe, or
4. accepted the volumes projected because they bolster their claims or arguments for more resources to be allocated to their part of the enterprise.
In fact it is hard to justify applying anything but a very low probability to most of the conditions. The chances of some of the developing countries attaining or getting close to developed status by 2010 are quite high but only for a few. For most, a high input from foreign aid is still and for a long time yet will be, a necessary although far from sufficient condition, for any development to occur. Yet the trend in the 1990s is for declining levels of foreign aid and that under more tightly applied conditions. Only those which are nearly there are likely to have passed the barrier by 2010. In those few the chances that some of the development will be channeled into better housing for the masses are moderately but not spectacularly high. In the remainder the probability is close to zero since the development is not likely to be much more than marginal. The chances of sawn timber being a major component in that housing vary from country to country and could be moderately high in some but not overall. The chances may rise later in the 21st century as the merits of wood as a favoured material in sustainable development start to influence economic and political management but to assign a high probability to this possibility before 2010 would seem to be overly optimistic.

The probability of increased consumption in the developing countries opening greater export opportunities for developed countries is harder to assess. If the tropical forests are as depleted by then as some extrapolations suggest or are removed from timber exploitation as most conservationists want then a deficit for developing countries as a whole may have emerged by then. But as plantation programs in developing countries are expanding and the expected rotations there
for many of the species favoured are less than 20 years, the deficits may not be all that substantial.

Taking these considerations and possibilities into account, a recalculation, along the following lines, of the global consumption of sawn timber might give a different outlook.

**Timber consumption from a picture of the future**

These somewhat contradictory considerations and findings are a warning that the procedures for testing the credibility of forecasts based on the past are not particularly definitive in forestry. Other approaches, therefore, might worth a try. The idea of working from a picture of the future is one possibility. The most familiar examples of this approach are the global models discussed in McRae (1985) and probably most widely known through “The Limits to Growth” (Meadows et al., 1972), which estimate the effects of various possible scenarios of the future. The conditions described above as necessary for an increase in consumption of sawn timber to occur as projected in the FAO projections are, in effect, a scenario of factors influencing the size of the global market in 2010. The key condition perhaps, is a very marked acceleration of the rate of economic progress in developing countries. The probability of this occurring over developing countries as a whole within the next 15 years cannot be realistically set much above zero. Nevertheless, some developing countries could make the transition to developed by then. For the so-called Asian tigers, at least, this seems to have a fairly high probability. Such a rise in their
economic status could be expected to have some effect on their consumption of sawn timber and hence lift world consumption. The extent of this lift could then provide another measure by which to judge whether and how far the projections can justifiably be extended into forecasts.

To illustrate a simple procedure for making such an estimate and one possible outcome assume that the following combination of the necessary conditions will apply by 2010.

1. Korea (Republic of), Taiwan, Singapore, Malaysia and Thailand will make the transition to developed by then.
2. They will transfer enough of this development into mass housing for the quality of housing to reach $15 \text{ m}^2$ per head.
3. The population in those countries now housed at lower standards than that is 100 million.
4. Their population growth rate is such that another 36 million will be added by 2010.
5. The volume of sawn timber used per unit of new housing will average $4.5 \text{ m}^3$ over all types of dwelling construction.
6. Housing will account for 60% of all consumption of sawn timber in these countries.
7. Enough development will take place in other developing countries and enough of this will be channeled into improved mass housing to the above standard, using saw timber enough to raise the average per capita consumption of sawn timber in them at a rate of 4% per annum.
On this basis the global consumption of sawn timber would increase by about 15 million m$^3$ each year. This is almost exactly the same average annual increase implied by the projection for 1991 to 2001. They could, therefore, be more credible than suggested by the simple comparison against the much slower rate of increase recorded over the recent past. But this optimism is diluted by the fall in the average annual increase to 11.5 million m$^3$ in the later projection for 1993 to 2010.

The net addition to the world consumption would not, however, necessarily be that 15 million m$^3$ or even the 11.5 million m$^3$. The per capita consumption of sawn timber in developed countries as a whole has been consistently on the decline for many years. Indeed the three FAO publications summarising their projections to 2010 (FAO, 1991, 1993, 1995) show a very rapid rate of decline (6.6% per annum) between 1989 and 1991 and a rather lower annual rate of decline at 5.5% over the longer period from 1989 and 1993. These intervals are, perhaps, too narrow for either of these rates to be taken as a measure of the long-term trend in the future. A more appropriate rate may therefore be that recorded over the period from 1983 to 1993. This, as calculated from the FAO Yearbook of Forest Products for 1993, works out at 1.5% per annum, the equivalent of an annual average decline in the consumption of sawn timber in the developed countries of 4.5 million m$^3$. This decline was only partly offset by an average annual increase of 1 million m$^3$ rise in consumption over the same period in the developed countries.
Comparison of this recorded increase in consumption of sawn timber in the developing countries with the eleven to fifteen fold increase projected, suggests that the projections could be excessively optimistic. But the likelihood of some developing countries continuing to make substantial progress in both the rate and level of economic development is high enough to warrant an assumption that at least enough of the projected increase in sawn timber consumption in the developing countries would more than compensate for a continuation of the decline in developed countries.

A continuation of the decline at least over most of the period to 2010 cannot be ruled out. There are few evident grounds such as there may be for developing countries, to indicate that an early reversal of the recent trend is likely to occur. One of the few could be the near certainty that there will be a substantial addition to the availability of industrial round timber by 2010 as the first wave of the expanding global plantation resource from the 1980s comes to maturity. However, in the absence of a more detailed analysis of the supply/demand interactions, it cannot be safely assumed that this will bring about a substantial increase in world consumption of sawn timber. Of equal and perhaps of even higher probability is the possibility of plantation timber simply displacing other current sources of supply.

However, to allow for some addition to consumption from the plantations, a decrease in the speed of the rate of the continuing decline in per capita consumption in developed countries as a whole
could be adopted say to 0.5% per annum. Developed country consumption in total would then fall by about 1.5 million m$^3$ annually over the period to 2010. The net effect of this fall and a rise of 15 million m$^3$ annually in the developing counties would be a world consumption of sawn timber around 645 million m$^3$ in 2010. Strangely enough, this level for the global consumption of sawn timber is almost the same as the 639 million m$^3$ given in the 1993 based projections. But it depends on the attainment in developing countries of a rate of economic and social development, which would bring about an average annual increase of 5% over the next 17 years in their consumption of sawn timber.

Whether such a forecast can or would be accepted as an accurate portrayal of the future world market for sawn timber depends on the subjective probability assigned to the combination of factors necessary for such an outcome actually coming about. If, for example, it were felt that a more likely scenario was for lower rates of social and economic development, such that the consequent increase in sawn timber consumption in developing countries would be 10 million m$^3$ rather than 15 million then the forecasted level of global consumption would fall to around 560 million m$^3$.

Neither of these revised outlooks is meant to be definitive nor can they be safely taken as definitive to any great degree. All of the assumptions and figures adopted for the calculations are feasible enough, but the main value lies in the three inferences that can be drawn from the illustration. First, it shows that picturing of the future
as a basis for building up forecasts in forestry is not an unrealistic way to approach forecasting for forestry. Second, it provides another test to help judge whether or to what extent a set of projections should be adopted as forecasts. Third and more generally perhaps, the method of working back from pictures of the future rather than relying so heavily on data and relationships from the past, is worth more study and experimentation for forecasting market outlooks in forestry.

The method and the test could be made of more practical use by assigning subjective probabilities to the assumptions so as to reduce the deterministic implications in the forecast. But, even as it is, it does suggest that there is a considerable risk in taking the FAO projections as forecasts, even at the global level, to which they are most suitable.

The method could also be made more realistic by quantifying the allowance for plantations on the supply side and then translating this into price effects and their implications for the quantities demanded. To do these would involve the addition of the type of projection mechanisms developed by Sedjo & Lyons (1990). None of these refinements is necessary for illustrating the technique of working back from a picture of the future which is the purpose of the exercise at this point.
12. SHADOW BOXING WITH SHADOW PRICES

Production economics is that branch of economics concerned with decisions about what to produce, how much to produce and how to produce it. Logically it could also include the question of where to produce but this is more commonly treated in another branch/location theory. In neo-classical economics production economics makes up the greater part of the theory of the firm. With State forestry, however, decisions about what and how much to produce are already given by the basic reason for the State to be involved in forestry. That is to ensure adequate provision of those public goods which forests can provide and are regarded as essential by society but which private forest owners could not be relied upon to produce in at least the minimum quantities and qualities deemed safe and appropriate.

State forestry is not a necessary means for doing this. There is a variety of ways in which the public goods interest might be provided and protected. At one end of the range is State regulation of private forestry, with forests privately owned and managed but subject to State control or regulation designed to ensure that the public interest function is met. At the other end of the scale is State forestry in which the State owns and manages the forests for this public interest objective. But the same objective could be met by several different combinations of ownership and management between the two extremes. In a strict sense, only the second end of the scale is State forestry. However, as the first possibility also works towards
achieving the same result it might be considered as part of the economics of State forestry although the economic implications in the two forms are far from identical.

The discussion so far has established certain features of the economics of State forestry. Among the more significant of these would have to be the following:

1) only the costs of safeguarding the supply of certain public goods are relevant,

2) commercial forest products are unavoidably grown as joint products in State forestry but at no cost unless special measures are expressly taken to foster their production,

3) the jointly grown commercial products must be harvested in order to realise on their commercial potential,

4) this harvesting must be done in such a way that neither the supply of those public goods which are the objective of management nor the capacity of the forest to maintain that supply in the future are impaired,

5) this harvesting is not a necessary part of forest management in the public interest so that it does not have to be undertaken unless the social return is expected to be greater than the cost involved, so that

6) the full cost of any harvesting that is undertaken is a charge against the revenue from the sale of the commercial forest products as is also the full cost of any measures required to prevent or repair damage to the public goods which are the objective of management.
These features have their counterparts in State regulated private forestry but more often as mirror images. Just as for State forestry, the fixed cost is the cost of managing the forest for the owner’s principal objective, whatever this may be. In industrial forestry and for many non-industrial private owners this objective is timber, and for these owners, the fixed cost is not a charge against whatever public goods happen to be jointly produced. But any additional costs incurred in harvesting to the higher standards needed to meet the public interest safeguards imposed by the State’s regulations and not fully compensated for by the State have to be carried by the owner. They are thus a charge against the revenue from the sales of timber and other commercial forest products. The prices for these products therefore have to be high enough to absorb all the fixed and variable costs of growing and harvesting them plus the additional and not otherwise reimbursed costs of preventing or repairing damage to services of public interest.

But not all private forest owners have timber production as their primary objective. Some may consider it if the expected revenue is high enough and the damage to whatever services they want from their forests is expected to be low enough. In effect, the same principles of economic analysis apply to them as do in State forestry. But to others timber production is never a consideration, even as a minor objective. The value of the forest to them is the forest in itself, allowing them a lifestyle to which the term rural retreat forestry could well be applied. Where, as in Scandinavia, the public interest is so
interpreted that rural retreat forestry must make some contribution to the national timber supply, it may be subjected to regulation to this effect. The extra cost of timber production management and harvesting to a standard which does not conflict with the owners’ rural retreat objective or of repairing any damage that does, must then be a charge against the timber sales revenue and has to be borne by somebody. This somebody has to be either the end use customers in the form of higher prices or the forest owners in the form of lower net returns or the industry in the form of lower profits or the State in the form of subsidies as payment for the extra cost.

The extra cost of forest management and harvesting to meet standards set or implied by the requirement to safeguard the public interest or the supply and distribution of public goods is, therefore, common to both State forestry and State regulated private forestry. In either of these two forms of forest ownership, this extra cost is one of two crucial factors in production economics, irrespective of whether the commercial timber production is a desired objective or only an incidental and potential one. Almost by corollary, the second crucial factor is then the expected price for the timber at the time of sale. The comparison of the one with the other then governs the decision of when to harvest the timber or whether to harvest it at all.

Industrial forestry is an exception. The principal purpose of industrial forest ownership is to guarantee the wood supply for the company concerned. This does not admit of any choice as to harvest or not although it may allow a choice as to when, if the company can draw
on other wood resources than its own. But there are several other purposes served by industrial forest ownership. The present and future potential magnitude of the wood resource is only one consideration. A second and often more important consideration is the greater security that comes with a self-owned wood supply together with the bargaining advantage this independence gives the company in negotiations with other forest owners. A third aspect and one of growing importance is the opportunity it gives the company to grow wood to its own specifications. A lesser consideration may also be that the internal or transfer price to the company for its own standing timber, although not negligible, does not have anything like the same significance that sale price has to a private forest owner to whom the timber sale is the main source of revenue or to the State if timber sales are a significant revenue source.

For the latter, the difference between the additional cost of timber production to the standards required to satisfy public interest considerations and the price of standing timber is decisive. In industrial forestry it is not. Thus production economics in industrial forestry is very different from the mainstream version. And so it is in State forestry but for a different reason. In industrial forestry, the standing timber price, a key of production decisions in mainstream production theory, can be and commonly is a minor factor. Nor can price in State forestry be market determined any more than State forestry itself can be market driven. Its purpose is the production of public goods, which, by definition, are outside the market. The costs of production in State forestry are incurred in meeting the public
goods function. Hence the supply cost for the by-product timber could be zero if, as would be normally the case, no extra costs are involved in growing it. Additional harvesting costs would be involved in working to the standards required for the public goods function but these would not necessarily be higher than logging to the same standards in private forests. To sell standing timber as a by-product in State forestry on the basis of its cost of production would amount to providing the purchaser with a subsidy compared with a price based on covering the full cost of production under private ownership. In other words the supply curve for standing timber from State forestry would lie well below that for timber from private forests managed primarily for timber production.

There is no valid reason why timber buyers should be subsidised, even in this covert way, at the public expense and at the expense of the producers or users of alternative materials. Moreover prices received in public timber sales, either on-going or in the past, being doubtfully free of this sort of inbuilt subsidy cannot safely be taken as market prices without the risk of continuing the subsidisation. Hence instead of standing timber prices in State forestry being determined by or from open market transactions, they have to be estimated by indirect methods or ignored. Prices for standing timber can easily be ignored in State forestry, simply by not selling the timber at all but the same choice is not an option for the public goods. They, or at least some of them, are in the nature of essential services. Even so, no economy can afford to pursue the production of public goods entirely without regard to cost, although some enthusiastic conservationists seem to deny this
fact. The pricing of public goods cannot, therefore, be ignored as timber pricing can. So the first pricing problem in the economics of State forestry is concerned with the valuation of the public goods it produces or is required to produce and not with timber prices.

**Pricing the public goods services of forests**

The existence of ‘‘unpriced values’’, (Sinden and Worrell, 1979) and the existence of prices that seem to undervalue (or conceivably overvalue) the items to which they refer, has long been recognized in economics. It might even be said that the idea underlies Adam Smith’s delineation of the duties of the sovereign. Yet the development of a theory and techniques aimed at quantifying prices for these non-market values or for adjusting the incorrect prices is relatively recent. It was, in effect, the almost inevitable accompaniment of the spread of benefit/cost analysis for the pre-investment appraisal of public works from its beginnings in 1936 (Prest & Turvey, 1965) to the major field of economic inquiry that had become by the 1960s.

Benefit/cost analysis or economic analysis as it has been, rather misleadingly but conveniently, termed (FAO, 1974) to distinguish it from the strictly financial pre-investment analysis in private business, deliberately incorporates unpriced and under-priced items and extends the analysis beyond the scope of the firm directly concerned by also incorporating the external effects (externalities) of the proposed investment. But for the sum of the benefits to be compared with the sum of the costs, prices have to be assigned to the unpriced values.
The problem of how to work out or estimate these prices is exactly the same in benefit/cost analysis as it is in the economics of State forestry.

The terms “shadow prices” or “accounting prices” are commonly used to describe these fabricated or hypothetical prices. The concept to be that the shadow price is the equilibrium price for such goods and services which, it is believed or estimated, would apply in a perfect market for them, or, in other words, if their market price exactly equaled their social value. The term applies equally well to services or disservices for no prices exist - the unpriced values - as these are only a special case for which the market price is, in effect, zero.

To distinguish these fabricated prices with an appropriate adjective such as shadow or accounting is convenient but it does nothing more than that. The managerial problem is not what to call them but how to calculate them. Opportunity cost seems to be the underlying principle but most of the work on calculating them seems to derive from the principle of pricing at marginal cost. A fairly wide variety of methods is in circulation and the tendency to treat certain types of prices as special cases, each with its separate distinguishing name adds to the complexity of the shadow price literature. For example, interest rates are transformed into a social rate of interest, import prices are adjusted to and listed as border prices, wages are recalculated as shadow wages and the calculation of each has its own specific array of methods.

These specialisations seem to be mainly concerned with how to adjust existing market prices so as to bring them into line with their social
values. But where markets provide no prices at all to start from, there seems to be no alternative to the opportunity cost basis. Since many of the outputs of forests are in this category, especially those which, almost by definition alone, justify State forestry, opportunity cost has to be the starting point.

The neo-classical version of economic theory has a built in answer to the question of establishing a shadow price for any good or service. This is the price at which supply and demand would be in equilibrium in a perfectly competitive market. Or, to put it in another way, the price ‘as it would appear at the intersection of supply and demand in a world in which all real costs and all real values were assigned to and accounted by the gainers and losers there’. In other words, the price that internalises all externalities. Actual prices, which deviate from the relevant shadow price, must therefore be the result of equilibrium not yet having been reached or reflect the fact that the market is not one of perfect competition.

Market failure or market imperfection is often cited as the reason why shadow prices have to be used instead of actual prices in some forms of economic analysis. It would seem logical, therefore, to expect that methods for calculating equilibrium price in a perfect market would have an important place in applied economics. But they do not and for obvious reasons.

There is for a start the awkward fact that there are no perfect markets. Some, such as international markets for some primary products,
appear to be close enough for them to be taken, for all practical purposes, as perfect. However, the very conditions for the existence of a perfectly competitive market are so stringent as to be unrealistic for all but a very few actual markets. Rare, for example, are markets in which no party has greater buying or selling power than any other party in the market, or where every party has equal full and immediate access to all information in or affecting the market. Even then the theory of second best (Lipsey & Lancaster, 1957) should sound a warning about the dangers of taking even close approximations as surrogates for the perfect structure.

Then, as Prest & Turvey (1965) point out, there is rarely such a thing as a clear and indisputable market price for any good or service. On the contrary, it is much more common to find a range of prices for any given commodity at any one time in any one market with transactions taking place at any price within that range. The integrity of the theory can, of course, be maintained by explaining this as evidence that the market has not yet reached equilibrium or that the goods or services in question are not fully comparable, differing in some feature such as quality, location or appearance. While such subterfuges can help to salvage the theory, they are of no assistance in the practical management problem of working out a shadow price. Without a clear, single market price there is no unambiguous basis for determining the deviation of market price from equilibrium price.

The limited assistance from equilibrium theory in establishing a shadow price means that less direct methods have to be devised. The
obvious candidate is opportunity cost. In “real” as distinct from monetary measures, the cost of anything is the value of everything else that that to be foregone in order to have it. This opportunity cost is easy enough to estimate, up to a point. In State forestry, the value of the timber left standing or of other forest products not harvested in order to protect watershed services is an opportunity cost as directly measured from the market prices of the products foregone. The “up to a point” comes in because this is not necessarily the total opportunity cost. Access to such for forests for non-timber recreational purposes may also have to be banned or restricted as well. These also represent opportunities foregone but they are not so easily or directly valued from market prices.

The “up to a point” is further relevant in that opportunity cost, in whatever form it may be estimated, is only a minimum value. It is incurred by the decision to manage the forests for, say, watershed services by the exclusion of other uses. But the society concerned may have been prepared to forego more of those goods and services and other services as well, in order to get the quality of watershed management that it wants. In other words there could be a consumers’ surplus involved in the society’s purchase of the watershed services and opportunity cost only measures the lower end of it. So by bringing in the consumers’ surplus it should be possible to measure the total social value of the services provided. For this it would be necessary to determine the maximum opportunity cost that the society would tolerate.
The trouble with this solution is that there is no way of testing the range of public tolerance of State expenditure on the supply of any specific public good. In a representative democracy, the public has the opportunity every three to seven years to give its verdict on the government’s choice of public goods and its competence in supplying them. But the elections which give them this chance are fought on the basis of package deals on what the contending parties say they are going to do so as to keep the economy going as well as it has been (the party in power) or to fix the mess into which the past years of neglect and mismanagement have pushed the economy (the parties seeking to get into power). Only guesses can be made of how much of an over-expenditure or under-expenditure on State forestry or other suppliers of public goods affect the ultimate outcome. The “green” vote has certainly influenced the results in a number of developed countries in recent years. It is generally accepted that the “Gordon below Franklin” and the Daintree rain forest controversies in Australia were important factors in the Federal elections of their times. But whether they were decisive is nothing like as clear. The package deal nature of the election campaigns plus the depth of feeling about the past performances of the contending parties combine to make guesswork of any assessment of how decisive single factor environmental issues have or will affect election outcomes.

Similarly, the swing to the conservative economic policies (termed economic rationalism in Australia or free market or neo-liberalism elsewhere) aimed at reducing the size, role and cost of government, could be taken as signaling that the total cost of public goods has
passed the limit that the community is prepared to tolerate. Its advocates would probably claim so but it could also signal or conceal a number of other things. It may, for instance, be that the community desire is for an increase in the supply or quality of some public goods while willing to have the total expenditure reduced. Then as many of the cuts entailed by economic rationalism were not announced in the election campaigns, it is hard to assess whether what the community is said to have voted for is what it would have chosen if it had known the real intentions at the time of the election. In reality, this sort of opportunity cost evidence is no more indicative of community chosen shadow prices for specific public goods than is the “green vote”.

Thus empirical evidence from voting results on shadow prices or the range of the consumers’ surplus for public goods is much is easier to assert than it is able to stand up to examination. That there is an upper limit is not, however, generally contested. Some people do claim or imply that certain values from forests are beyond price, an attitude especially evident in the ‘old growth’ controversies. But even here, the claims rarely go so far as to assert that everything else, economy wide should be sacrificed in order to save the old growth forests. Total sacrifice of local economies may be implied or even advocated but never of the national economy, unless it is somebody else’s economy.

Indirect methods for estimating shadow prices are, therefore, unavoidable. One alternative often urged involves the techniques of contingent valuation and option valuation. These are based on the answers that people give when they are asked how much the would be
prepared to pay or give up in order to guarantee the supply or keep open the option of having specified public goods. The situation is almost entirely hypothetical so the sincerity of the answers is suspect and altogether indeterminable. As McKillop (1992) points out, the chances are that the answers would be higher than those which would eventuate were the respondents actually required to pay or give up what they said they were prepared to do. Evidence, which he quotes from experiments conducted in agricultural economics, indicates that respondents over-estimate by as much as 60% when an actual cash outlay is involved.

With the possibility of a discrepancy of that magnitude, the hypothetical assessment of willingness to pay is no substitute for opportunity cost. Whatever its defects, it is hard to beat. It may only give a minimum and partial value but it is, at least, not entirely guesswork. That a forested National Park contains x million m$^3$ of saleable timber with an average royalty value of $y$ per m$^3$ are fairly easily ascertainable matters of fact. If the community as a whole is not pressing for that timber to be sold and utilised, the chances are that the community values the park as worth at least its opportunity cost of $x.y$ million. The likelihood that the community as a whole has little idea of the magnitude of the sum it is foregoing does not alter the principle. It only means that the community acceptance of the opportunity cost is more implicit than explicit.

This does not, however, establish the shadow price for all National Parks or for areas of forest similarly protected to safeguard the supply
or quality of forest based public goods. For a start, it is only the minimum level of the valuation; the community could well be prepared to accept an opportunity cost of $2 x.y million. Moreover, many factors govern the average royalty rate for any given tract of standing timber or other commercial forest product, so that the royalty rate would have to be estimated separately for each tract of forest or part of a forest withdrawn from commercial use and the shadow price of the services would vary accordingly. As royalty rates also tend to change over time, a shadow price based on them is unlikely to hold for very long.

But there is no escaping the fact that the cost of supplying the public goods, which justify State intervention in forestry, will have to be known or set eventually. This is what leads to the need to establish shadow prices for those public goods. With this comes the need to establish them from opportunity cost and this, in turn, involves royalty rates. A knowledge and understanding of timber prices and their formation is thus a necessary part of management in State forestry. Thus there is something of a paradox in the managerial economics of State forestry. The techniques and economics of timber production play no necessary or direct role in State forest management but the branch of forest economics concerned with timber pricing and timber sales in general is crucial.
13. WHAT IS IT WORTH?
THE PRICING OF FOREST PRODUCTS

The values of the public goods output of forests are largely, if not entirely, established outside the market system. The reverse, however, applies to the prices of the commercial forest products from which shadow prices are estimated for those public goods. That is, their prices are almost entirely determined through the operations of the market; the resultant of the interaction of the supply and demand for the product in question and for products that are more or less close substitutes for them. Indirectly, therefore, through the shadow price route, market determined prices become a matter of direct concern in the economics of State forestry. They are also of direct, although subsidiary interest, in that they help to decide whether sales of the by-products such as timber are likely to be worth pursuing. In this way, the level of prices for forest products and how they are established become necessary elements in the managerial economics of State forestry, even though the products themselves are not an objective of it.

A great deal of neo-classical micro-economics, the whole of price theory, in fact, is concerned with the question of price formation. Being, largely in terms of general or relative price levels, however, the principles, which may have some broad relevance in managerial economics, are not much help to the manager of a specific firm in the practical problem of working out the prices to accept or set for the goods and services that the firm produces.
More appropriate is the analysis of pricing in terms of price makers, being those who set their prices and price takers, those who accept the going price (Bates & Parkinson, 1969). This does not, however, represent much of a break from neo-classical price theory, as the two categories correspond with the situations in the monopolistic and the competitive market structures respectively of that theory. Moreover, the effects on pricing of these market structures are worked out largely in terms of final demand (or consumer) goods, whereas most forest products are intermediate goods or derived demand goods. That is, the demand for them and hence the price, is derived from the demand for and price of the consumer goods in which the intermediate product is finally used (Gregory, 1972). Thus, the price of the sawn timber used in housing is derived from the price of houses or similarly for furniture. In this sense, the price of standing timber in the forest, i.e. the royalty or stumpage, is the amount left after deducting all of the costs of producing timber from the standing tree and getting it to and into the finished house. This is the underlying principle of the residual value method of setting the price to be charged or the price that could be received for standing timber. But whether it is used to set prices or to judge prices offered, it is the derived demand equivalent of price taking.

But why should it not work in the opposite direction? That is, why should the price for the sawn timber used in the finished house not be the sum of the cost of growing the trees, converting them into sawn timber and getting that timber to and into the finished house? In other
words, making use of the cost plus or full pricing (Andrews, 1949) approach of the price maker.

The role a State forestry enterprise could adopt depends initially on the market conditions under which it operates. With plenty of alternative sources of supply of standing timber creating a competitive market situation, the State authority would have to be a price taker. On the other hand, where the State owns most of the forest resource or so regulates private forest owners that the supply of standing timber is virtually equivalent to State ownership, there are no or only negligible alternative domestic sources to which roundwood buyers can turn. Then the State authority can and probably would act as a price maker.

For the competitive situation, standard neo-classical theory based on supply/demand interactions might give an adequate approximation to the price that may be expected for any given lot of standing timber. In fact, in such a situation, market prices may be well enough known from the range of ongoing timber sales. If, however, they are not or are not closely comparable enough, estimates from calculations of residual value are then probably as good a way as any. The State forest authority would then have the choice of accepting this estimate of the market price or not selling at all. In other words, stumpage appraisal, as residual value methods are often termed, would be used to set a reserve price, accepted if the going or offered price equals or exceeds it, or otherwise the timber sale does not proceed. In effect, stumpage appraisal is a necessary technique in the managerial
economics of State forestry under competitive market conditions for standing timber sales.

In situations nearer to a monopolistic market structure, the State may be put in a rather anomalous position. On its own, timber production is neither a necessary nor sufficient reason for the State to own forests or regulate privately owned forests. However, it can happen that the State holds a near monopoly over the roundwood sources of timber supply, either as a result of historical accident or because the location of the forests needed for the supply of public goods coincides with the main forests capable of timber production. The state may then have no choice but to take the lead in round timber production, and hence in the pricing of standing timber. As the price maker, how does it set those prices?

Residual value based stumpage appraisal seems, at first sight, to have little place. As a price taker approach, it is at odds with the price maker role. But this is only at first sight. In principle, the residual value is the maximum price that end users, through the production/marketing chain, allow buyers of standing timber to pay for it. Stumpage appraisal thus provides a calibration point - the upper limit - in the price setting process of a price maker.

But the extent to which this is really so depends on many more factors than those listed. For a start, it is not necessarily so that buyers of standing timber would have to go out of business if the State sets prices above the residual value. This is only one of several possible
responses. They may go out of the business of processing of local roundwood, but stay in the timber processing business by importing logs or pulpwood at net c.i.f. prices lower than their estimate of residual values for locally sourced material. Another theory is that they may go out of the primary processing side of the business entirely, but stay in the timber business by importing rough or slightly processed wood (e.g. squares or chips) as their raw material, again at net c.i.f. prices matching their estimates of residual values. They can, in fact, turn to imports at any point in the production chain at which they calculate where they can beat their estimate of the residual value for locally grown roundwood raw material. Unless imports can be prohibited or taxed at rates that effectively debar them, the price fixing power of the State as a monopolistic owner of forest resources still has an upper limit, which is set by residual value.

More than this, however, residual value is also a function of the supply of non-wood substitutes for the wood based products. Final end users are rarely restricted to wood based products, regardless of how much the several intermediate users are. A wide and apparently ever increasing range of substitutes for most wood products is usually available whenever the end user becomes aware that there is a cost advantage in turning to them. This point is reached when net prices of the raw wood material, at whatever stage, exceeds the residual value at that stage. In the terminology of neo-classical micro-economics, demand for standing timber is not so highly inelastic that the State as a monopolistic price maker can act as though there is almost no limit to its pricing policy.
But there is an implicit assumption of a single residual value in all of this, and it is one that does not hold. Each buyer of wood as a raw material at any stage along the production chain is likely to have a different idea of the maximum affordable price. Thus, the range of residual values can be as wide as the range of the population of interested buyers. This comes about because each processor, even of a fairly standardised product such as sawn timber for house construction, could and probably does have a different pattern of costs and costings from every other manufacturer. So unless the State has estimated the residual value on the basis of a super efficient producer, there is a good chance that one or two buyers will have estimated that they are able to afford an appreciably higher price than the State’s appraised stumpage.

The concept of residual value as a basis for pricing in standing timber sales for State forestry is, therefore, significant, regardless of whether the State is a price taker or the price maker. Nevertheless, in which of these two positions the State actually stands does govern how it uses its estimate of residual value and, perhaps, how it makes the estimate.

**The State as the price taker**

With the State in the position of a price taker and making estimates of residual value that are higher than the prices being recorded in the market, it would then seem that:

a) its estimate is wrong, or
b) buyers are offering and sellers are accepting less than the market could bear, or
c) the State’s resources differ markedly in one or more characteristics from the resources currently being traded.

In principle, the State is under no economic obligation to sell its standing timber if market prices are below its estimate of the residual value. Nor, in the competitive market situation, is it able to force the price up to match its estimate. In practice, however, it is much more likely that the timber sales decision will be governed by legal and political considerations, at least as much as the economic ones. The risk of forcing unemployment onto small rural communities by refusing to provide local industries with roundwood raw material, because the market prices are lower than residual value calculated by the State authority, or the need to meet contractual obligations under long term timber sales agreements, or the need to maintain the cash flow into the State budget from timber sales, are factors that can typically override the economic criteria. In such circumstances, the estimate of residual value is hardly worth making. But in the unusual situation where the State is not so constrained, it can, in the light of its estimate of the residual values, decide whether it is worthwhile selling at the going prices or not to sell at all at that given time. In effect, its apprised stumpage is the key factor affecting its timber sales policy and even then, only as a guide to the acceptability of the going price.

One of the practical difficulties for the State as a price taker is, however, to determine the going market price. The general problems
as discussed, for example, by Machlup (1952) and Morgenstein (1953), are very much aggravated in timber sales. Almost every lot sold differs in location, topography, species composition, log quality, the conditions of the sale, the pressure on the seller to sell or the buyer to buy and their estimates of the volume and quality of the timber on offer. Hence, recorded prices per m³ can and do differ quite widely. In effect, each timber sale is a different commodity, each with its own, almost unique price. The State might elect to make an estimate of the residual value, but the estimate can be nothing better than a calibration guide to the applicability of market prices.

The State as the price maker

On the other hand, the State, as the price maker in the standing timber market, has several options for determining the prices at which it will sell its standing timber. It can set the rates and the terms of the sale - a form of administered pricing - or it can negotiate prices and conditions of timber sales with prospective buyers, or it can sell the timber by open auction or tender. The prices the State sets as the administered prices or uses as the reserve prices in negotiations or auctions can be a figure drawn more or less out of the air, a figure drawn from other States’ records of their own or private sales, or as an arbitrary percentage of prices end products, or from its own estimate of the appraised stumpage or residual value.

Thus, while there is not much point in the State estimating residual values when it is a price taker, there is, apparently, not much more
necessity for it to do so as the price maker. It does have other ways of setting the prices, but the chances are that an appraisal of the stumpage will be a closer approximation to the prices it should be able to command than would the other methods, most of which are little more than guesswork. Although there may be no compelling reason for the State to base its prices or pricing policy on residual values, it could still be advantageous to have a fairly good idea of where the upper calibration level lies.

**Terminological ambiguity in the pricing of standing timber**

Methods for the calculation of residual value are commonly termed ‘stumpage appraisal’ from the North American terminology. In one sense of the term, ‘stumpage’ is the collective noun for standing timber, but it is also the maximum unit price that a buyer can afford to pay for stumpage in the first sense. By abbreviation, in a third usage, it has become one of a number of synonyms for the price paid per unit volume or per tree for timber standing in the forest, i.e. on the stump. McGregor (1961) recorded terms such as ‘royalty’, ‘tariff’, ‘fees’, ‘cess’, and ‘forest charges’ to then use in the British Commonwealth. More recently, several others such as ‘levy’, ‘forest fees’ and the American term ‘stumpage’, have come into general or local use. Quite often, the synonyms have been introduced to get around the way that ‘royalty’ especially (and occasionally ‘stumpage’) has been fixed in legislation.
The terms are not always used consistently between countries or, even at times, in the same sense within countries. Hence, from here on in, this work, in order to reduce the risk of confusion, the term ‘royalty’, or as the occasion may call for it, ‘stumpage’, will be used as shorthand for ‘ the price of timber standing on the stump in the forest’ and will include all of the terminological variants for that.

**Stumpage appraisal - the calculation of residual value**

There are so many good texts (e.g. Chapman & Meyer, 1947; Davis, 1954; Duerr, 1960; Walker, 1972; Gregory, 1972; B.C. Forest Service, 1974) describing the techniques of stumpage appraisal that there is no point in going into detail here. The essential elements might, however, be worth summarising. They are as follows:

a) the prices of the processed products at whatever point along the production/marketing chain between the standing tree and the final consumer that is taken as the end point for the calculation,
b) the costs involved in manufacturing the processed product from the standing tree and getting it to user at the selected end point,
c) technical co-efficients for calculating the roundwood equivalents of semi- and more fully processed products or vice-versa,
d) Calculation of the residual left after deducting the unit costs up to the selected end point from the unit prices at that point, both expressed in terms of roundwood equivalents, and
e) a formula for distributing the gross residual value (termed the conversion return) between the parties involved in the growing, processing, transport, marketing and distribution of the primary and manufactured products.

The application of the theory is, however, only as easy as that summary suggests in the case of a specific firm working out the value to it of the standing timber in a specific tract of standing timber. The technique is then relatively straightforward. The firm knows the prices it is getting for its products, and it has, or should have, a fairly good idea of its unit costs of production and distribution, and it knows what minimum required rate of return on investment it has set for itself. All it has to do is fit these into the RV formula and calculate the answer. But virtually none of this required information is available to a forest owner trying to work out what the unit value might be for even the same tract of timber. The best that can be done is to make estimates of the price and cost data for a firm or firms who might be interested, or for a firm that is considered to be representative of the industry. Apart from the practical difficulties in establishing the estimates, the calculation from the seller’s side runs into the algebraic impossibility of solving the one equation for conversion return with two or more unknowns (Weintraub, 1959).

The Weintraub difficulty is not as fatal as it might seem at first sight. The forest owner could do just what the prospective buyer does, i.e. enter into the equation a figure for what he wants as his share of the conversion return. Or, he could as is commonly done in administered
pricing based on the forest owner’s stumpage appraisal: enter a figure for what he considers is a fair rate of return for the buyer firm. But buyers may not accept either figure as fair and why should they, any more than sellers should, accept what the buyers claim for themselves and implicitly allow for the seller? Nor is the Weintraub difficulty an inevitable consequence of the method. It arises because the buyer’s profit is not allowed for as a cost in the procedures Weintraub was reviewing - the USDA Forest Service timber sales practices - nor is it, as a rule, in the general run of appraisals. As cost information is usually drawn from or estimated from financial accounting records, subtracting costs from revenues gives a figure for profit. But this profit is the conversion return, which is actually a single figure combining profit and residual value. In economics, on the other hand, profit, at least in the form of ‘normal profit’, is a cost. Hence, a calculation based on the economic concept of cost would automatically extract the buyer’s profit before deriving the conversion return, which would give the pure residual value directly.

The solution of using an economic interpretation of cost is no more than a theoretical possibility. An appropriate and acceptable rate of profit for the buyer has to be selected. What prospective buyers think is that this will be reflected in their guiding rates of returns that will probably vary between firms. Only each individual buyer will know what that rate is for the firm. The State as a seller will have to estimate what it thinks is a fair or reasonable rate for the industry and this guess is most unlikely to be accepted or agreed to by all possible buyers. In other words the conversion return will have to be split either before or
after it is calculated. Whatever way this is done the Weintraub difficulty remains an inherent weakness in stumpage appraisal. But whether it is a weakness that really matters depends on how the State uses stumpage appraisal.

The uses of stumpage appraisal

The State can use its appraisal of stumpage in either of two ways. As the price maker it can set its royalty levels at the appraised stumpages, or, alternatively, it can set the appraised stumpage as the reserve or guiding price in auction or negotiated sales. The importance of the Weintraub difficulty is probably greater in the administered price system represented by the first situation than it is in the second. The reason is that if the State in its appraisal allows a profit margin for a buyer that is lower than their guiding rates of return, the buyers will either have to adjust to that lower rate or withdraw or rearrange their business. While buyers, as outlined earlier, have in this situation more options than withdrawing completely from the business, the State does run the risk of losing the markets for the timber that it has grown.

In the negotiated price situation, however, the buyers can actively press for a higher share of the conversion return. They may do this directly by arguing on that point itself, but they are more likely to argue their case indirectly through trying to get lower royalties than the State’s opening offer or the latest level it has reached on its of the negotiating process. In negotiations, the State may be in a better position to judge the likelihood and the magnitude of the impact of its
pricing policy on the domestic timber industry than it is in an administered price sale. But in reality, the industry is unlikely to accept, without argument, administered price levels that it believes or claims do not allow an adequate level of profit. If direct appeal to the State forest authority fails, the argument could well be taken into the political arena. In effect, the administered price then becomes no more than the first step in a price negotiating process. Negotiations may stop at the administered price stage, but only if the buyers are satisfied with or have no option but to accept what the State, in its stumpage appraisal calculations, has pre-determined is a fair share of the conversion return.

Thus, in the end, the Weintraub dilemma - one equation with two unknowns - is inescapable. Yet stumpage appraisal does seem to work in practice in both versions where it is used, suggesting perhaps, that the dilemma is of theoretical interest only. But this is not so; rather, the persistence in the use of it shows either of two things. On the one hand, it may show that the State is so dominant on the supply side that buyers must accept what they are offered, with no more than a slight chance of achieving minor reductions. Or alternatively, it may show that the State, despite the complaints of buyers to the contrary, has not yet pushed royalties up to or beyond what the market can bear.

The implications from these relationships between stumpage appraisal and timber sales from State forests are both interesting and important. One implication is that stumpage appraisal as a technique for sellers to estimate the maximum royalty rates that the market can bear probably
under-estimates the true maximum. If it did not, then withdrawals of buyers from the standing timber markets on account of excessive royalties would be much more common than they are. Hence, stumpage appraisal by the State as the seller is applicable in State forest management as long as it does under-estimate the maximum and up to the point at which the appraised stumpage really, and not just allegedly, exceeds the maximum that the market can bear. This applies whether the appraised stumpage is used to set the administered prices or to set the State’s reserve price in auction or negotiated sales.

Another implication is that the power that buyers have to use political processes to dispute and overturn royalty levels set by the State forestry authority can be turned into an argument against State forestry. The grounds are that such political interference would not happen if all timber production forests and all timber sales were within the private sector where there is much less scope for political interference because the market is entirely governed by the free interaction between buyers and sellers. Like much of the free market, theorising the argument is rather naive and simplistic. It probably does remove royalty determination from the public arena, but the scope for political interference is much the same. The mode of its application is, however, broader and less direct, less overt and hence, less obvious. As Nicholson (1965) shows, the ‘Establishment’ is not so easily defused; it simply changes its tactics.

There is, however, a more fundamental and far reaching implication than these. This lies in the similarity and perhaps in the relationship of
the conversion return to economic concepts of consumer's surplus and rent seeking.

**Consumer’s surplus and the conversion return**

Consumer’s surplus is the extra amount that a consumer could afford to pay for a good compared with the market price that is actually paid. The source of this surplus is found in the ‘range of mutual benefit’ as termed and described by Boulding (1966). Only when both the buyer and the seller both feel satisfied with the price does an exchange take place. This can happen only when the minimum price that the seller will accept is lower than the maximum that a buyer will accept. It cannot happen in the reverse situation; then there is no zone within which a price mutually satisfactory to both can exist. In the zone of mutual benefit, an exchange will take place, although exactly at what price is indeterminate before the deal is struck. But at any price within the zone, both parties have gained something. The seller by having received more than the minimum he was prepared to go down to enjoys a producer's or seller's surplus; the buyer by having paid less than he was prepared to go up to enjoys a consumer's or buyer's surplus. If the exchange takes place at either the buyer's maximum or at the seller's minimum, both are still satisfied, but the combined buyer's and seller's surplus - now called the ‘economic rent’ - goes entirely to one or the other.

The idea of consumer's surplus or consumer's rent originates with Dupuit (1844), and was more fully developed by Marshall (1890).
However, after a while, it came so strongly under attack that it was all but expunged from neo-classical economic theory (Bergson, 1965). Eventually, it was revived by Hicks (1948) and has now re-emerged even more strongly in the guise of the theory of rent seeking.

The conversion return of stumpage appraisal could be viewed as a form of the economic rent (combined buyer's and seller's surpluses) occurring in the exchange of property rights to standing timber. The resemblance between the conversion return and the economic rent of economic theory is, however, rather superficial. Both are residuals and both are a source of dispute between buyers and sellers, but that is about as far as the resemblance goes. The conversion return, for instance, contains the buyer's profit, which as normal profit at least, is accounted for as a cost in the economic concept and thus is not part of the economic rent, so conversion returns can be a larger sum than the consumer's surplus. But it can be even larger in that it can also include a normal profit component for the seller and that, in the economic context, would not be regarded as part of the producer's surplus.

The point is that an economic surplus, i.e. the combined sum of the consumer's and producer's surpluses, is inherent in the zone of mutual benefit view of pricing behaviour. Only when the exchange price is at either the buyer's maximum or the seller's minimum is the economic surplus wholly absorbed as either a producer's or a consumer's surplus. At all other prices within the zone of mutual benefit, there is both a consumer's surplus and a producer's surplus. It is over the distribution of this economic rent that, as Boulding (1966) emphasises, most of the
conflicts in economic life have their origin. The process of capturing as much of the economic rent as possible and ideally, all of it is called rent seeking. The analysis of that process constitutes the sub-field of economics now known as the rent seeking theory.

In stumpage appraisal, then, economic rent is a part of the conversion surplus. Knowing that does not, however, overcome or by-pass the Weintraub dilemma. It may, in fact, merely complicate the problem of the division of the conversion return. But knowing that the buyers are or will be rent seeking means that the State can and should introduce an element of rent seeking on its own behalf in its royalty policy or it should, at least, be more skeptical about arguments to the effect that it is pricing itself out of the market.

Whether the State uses stumpage appraisal to set an administered price as royalty structure or as a base level in negotiated pricing, it would clearly have a stronger hand if it had some firm data on the magnitude of the economic surplus. But, as with so many concepts in economics, the theory of economic rent runs a long way ahead of possibilities of empirical verification. The fact is that the extent of economic rent in timber sales cannot be public knowledge, although it almost certainly exists, (Repetto & Gillis, 1988) and for some products, can justifiably be suspected as being considerable. But only the buyer at any given stage in the marketing chain knows what the maximum he could go to is. Nobody else knows and the buyer is going to make sure that it stays that way. In other words, the buyer's maximum is a trade secret and there is no direct way of anybody else finding that out.
There are indirect ways of estimating the economic rent in timber sales (Repetto & Gillis, 1988; Leslie, 1990), but they serve more as circumstantial evidence of its existence than to give indisputable measures of its magnitude. But knowing that it is there supports the use of stumpage appraisal by the State to target its royalty policy as its firm estimate of what the market can (easily) bear. In other words, it sets as the minimum it will accept its own estimate of the buyer’s maximum.

But the implications of the relationship of economic rent to the conversion return go even deeper than this. One of the basic conventions in stumpage appraisal is that the calculations are based on the first processing stage in the production chain (Duerr, 1960). That, as a rule, is taken to be at the point of delivery of sawn timber or plywood or panel board into the merchants' yard. What little evidence there is suggests, however, that the great bulk of the economic rent in the timber trading chain lies towards the final end users end of the chain (Leslie, 1990). On that basis, sellers of standing timber would therefore get a fairer share of the conversion return by deriving their stumpage appraisals from the prices final end user pay rather than from some intermediate point close to the forest end of the chain.

To be able to do this would require a rather detailed and accurate knowledge of the transactions that occur all along the production, distribution and marketing chain. But getting that knowledge involves the uncovering of trade secrets all along the chain. This gives a
different meaning to market research while making it, at the same time, a crucial element in forest management. This calls for a market research program, almost in the Lakatos (1970) sense, of some magnitude and great subtlety with as much a priority in State forestry as in private forestry, if not more.

The prominence given to prices for timber and wood products in general, and to stumpage appraisal in particular, tends to camouflage the possibility that there are relatively few situations that warrant this emphasis. Prices for forest products derive their importance from the fact that they, together with the volume harvested, determine the income generating capacity of forest management concerned primarily with timber production. That importance varies, however, according to the form of forest ownership. It is no doubt paramount with those private owners whose dominant, if not sole interest, is in the income provided from timber sales. But, as indicated earlier, this form of private ownership is often relatively minor in scale; many private forest owners have other purposes than income as their primary reason for owning forests. Then, for industrial forest owners, it is the wood itself as an input for their manufacturing plants that is the purpose of forest ownership, not the price it might bring in sales to other parties outside the firm. Market prices for standing timber may enter their accounting calculations, but if they do, it is mainly as benchmarks for internal costing of transfers between the growing and the processing arms of the firm. And then with State forestry, solely justified as it is for its public goods services, prices of any timber by-products are
almost irrelevant with the same thing holding also for those private owners for whom timber production is not a significant consideration.

**The paradox with prices in State forestry**

It follows, therefore, that in none of these latter three forms of forest ownership are the prices of forest products more than incidental or subsidiary matters in management decisions. Nevertheless, even in these cases, situations can arise in which prices for forest products are more than of minor importance. One is that they do provide a measure to guide the decision of whether the proceeds from the sale of timber would be more than enough to absorb the cost of the tightly controlled, ultra-cautious harvesting needed to protect the non-timber public goods for which the forests are owned.

There are, however, several catches with all of this. The view advanced that timber production is not a valid primary objective of State forestry is a corollary of the neo-classical mainstream version of economic theory. It reflects the underlying, though often covert, belief that a socially optimum allocation of resources and distribution of the proceeds is best brought about by free market operations, provided the State confines itself to the competent and effective provision of the ‘duties of the sovereign’ identified by Adam Smith. The benchmark use of prices in State forestry for judging whether or not sales of the timber by-products would be worthwhile fits within this neo-classical view, whereby the production of commercial forest products is not one of its direct concerns.
Not so, however, with a couple of other situations that might call for an active role for forest products pricing in State forest management. One is where State owned forests, or ‘rural retreat’ private forest owners, control so much of the national or local industrial timber resource that it is considered to be in the national or public interest for them to be harvested and managed for continuity of supply. Prices would then become as important in State forestry as they are to the private forest owners who are primarily interested in income from standing timber sales and management for timber production. Hence, though it may be acknowledged that timber production per se does not justify State forest ownership and management, the present heavy dependence of much of the world’s forest industry on State owned forests may mean that a public interest function has to be temporarily admitted until the private sector, and the timber industries in particular, can develop the resource base capable of providing the raw material supply believed to be needed. This, on present indications, could hardly come about much before the year 2030. Even for this earliest possible date to be possible, all States would have to issue immediate notice that State forests will not, thereafter, be automatically available for timber utilisation or management.

This could lead to another similar qualification to the view of State forestry based on neo-classical theory. Since that unanimous notice is unlikely to happen simultaneously or immediately, although given the trend towards sustainable management, it is an eventual probability that the transitional period for timber production being a primary
function of State forestry could run for fifty years or so rather than thirty. Hence up to the mid 21st Century, the pricing of primary forest products could be a legitimate and major concern in the economics of State forestry, despite timber production not being, in the strict sense, a purpose of State forestry.

As so often happens with temporary arrangements, this could quite easily become permanent. It is, for instance, conceivable that the private sector will not have developed a forest resource adequate to meet its then ongoing or future by the end of the transitional period. This judging from the outlook in Australia and New Zealand, two countries already heavily dependent on the output from their industrial plantation resource. In both countries, the plantation resource that now supports about half the Australian timber industry, and almost all of it in New Zealand, was largely established and managed by the State. But now, the State, as in New Zealand having privatized most of its plantations, is now no longer a significant player in the industrial wood supply sector or, as in Australia, is greatly reducing the scale of its new plantings and more or less actively trying to privatize its existing plantations. Both countries, however, envisage a trebling or thereabout of their plantation area by the year 2020 or 2025 (Ministerial Committee et al., 1997; Valentine, 1996). Most by far of the expansion is predicated to come through private sector plantation development. By definition under the economic rationalist doctrine, public incentives to make sure this happens are not and cannot be on the agenda. But the removal of disincentives, implicitly all governmental of course, is and in combination with plenty of
exhortation is, therefore, the only instruments allowed to the State to further this expansion policy. There is thus no guarantee or any way of guaranteeing that they will do the job that it is hoped they will do without government intervention. But what if they do not in either of these countries or in the world as a whole?

Neo-classical economic theory has an answer. In fact, given enough faith in the theory, it has the answer. Market forces will make sure that prices for standing timber, through the prices for processed forest products, rise enough to bring demand and the available supply into balance. But this again is according to the neo-classical version of economic theory. An institutional approach would, on the other hand, recognize the possibility of the State being forced under the political pressures generated by the higher prices and unemployment associated with the scaling down of the industry, to continue to fill the gap and to do so, deliberately and continuously rather than by incidental and occasional sales of by-products.

From the point of view of pricing in State forestry, all of this would only mean that the economics of timber production and of pricing in timber sales would be a permanent rather than a transitory feature of the economics of State forestry. This, despite there being absolutely no place for timber production in a pure theory of State forestry, introduces a strange paradox. Prices for forest products are the key instrument in the market driven adjustment to the social optimum of demand to the physically available supply. But prices only become anything more than an incidental matter in State forestry by
introducing the institutional factor of government intervention to ensure an adequate level of market driven plantation development and or to make up any shortfall left by the market driven program.

This leads to some rather paradoxical implications for an economic theory of State forestry. The first is that with a more realistic institutional form of economic theory replacing the neo-classical version as a basis for the economics of State forestry, much of the difference between State and private forestry, which has been the subject of the discussion so far, virtually disappears. The second is that this comes about mainly as the result of prices on the benefits side of State forestry becoming relevant, but only through the institutional factors that force the State to treat raw material timber supplies as a function covered by Adam Smith’s ‘third duty of the sovereign’. That is, to ensure the supply of those essential or strategic goods that are not profitable enough for the private sector to supply. The validity of putting commercial wood and wood products in this category was examined and dismissed earlier. Nevertheless, the possibility that they will be so treated cannot be excluded; logic and reason do not always - judging from Schopenhauer (1818), ‘often’ would probably be more accurate - govern human affairs. A third paradox then emerges. Once the relevant theory for the economics of State forestry is admitted to be institutional, but only then, neo-classical production and pricing theory might provide an adequate and perhaps appropriate analytical frame. The overall result is the generalised paradox that neo-classical economic theory has but little relevance to the economics of State forestry unless institutional factors, which it
excludes, are introduced. The view, therefore, seems to be confirmed that institutional economic theory, absorbing what is useful from mainstream theory, is a more appropriate basis for the managerial economics of State forestry than the neo-classical version or even the neo-institutional synthesis with it.
14. WHEN IS THE GAIN WORTH THE PAIN?

Hardly ever, could well be the response of the many victims of the political and economic ‘reforms’ of the late twentieth century. On the other hand, those who have benefited, probably somewhat fewer in number but not in influence, would, no doubt, claim the opposite. And who is to say which if either is right? The trouble is that for most people, the gain is all projected and promised while much of the pain is real and present. And all of this is greatly aggravated in forestry by the generally long period of time that separates the gain - the expected future benefits - from the more certain and often immediate pain - the known present and expected future costs. Is there anyway, therefore, of knowing in advance that the gain is really likely to be big enough to justify the pain? This is what investment analysis purports to do. Not with certainty, of course, but to an extent that engenders enough confidence to allow a decision to be made about whether to invest or not.

The prices of forest products have a key role in the generation of present day income, and they play the same role in the determination of the level of future incomes. Comparison of the expected future incomes against any already committed costs plus the expected further costs of growing forests for timber or other forest products is an important influence on the choice a forest owner has to make between reinvesting in a replacement forest and/or investing in additional forests and the type of forest in which to invest, or whether to
withdraw the liquid capital realised by the harvesting of the forest and the sale of the output and invest the proceeds in or spend them on something else. Where private forestry is undertaken solely or primarily for timber production, this form of pre-investment appraisal, that is, a comparison of expected future income with the expected current and future costs of forest re-establishment, of any additional or substitute planting and of tending, protection and management, is the core of forest economics. And for the time being, if not permanently, it will have to play some part in State forest management. But there are some big differences as to whose effect is such that investment appraisal in State forestry does not have the key role that it has in private forestry.

Some peculiarities of investment appraisal in State forestry

The first big difference is, of course, the possibility that any similar though lesser role in State forestry could be no more than a temporary and therefore transitional one. But while investment appraisal in relation to timber production has some importance in State forestry during this phase, there are certain key aspects that do not. For instance, all choices associated with forest replacement and silviculture aimed at continued or increased timber output are quite irrelevant. Decisions about investment affecting timber supplies in the future beyond the transition period are matters entirely for management in the private sector. If, after that fifty years or so, the forest industries have not invested sufficiently in the development of
their own resource base, that will be their bad luck, entirely the result of their own bad management.

Since decisions of that type are the main ones with which investment appraisal is concerned, its relevance to the economics of State forestry, already limited to the transition period, is even further limited to the few situations in which it may be needed. But if political considerations over-ride the fact that the market is responsible for any anticipated failure to provide for its own future, there may be cause for the State to continue to manage its own forests deliberately for timber production, perhaps permanently into the future as well as for the time being. Then, but only then, would investment appraisal assume a significance in the economics of State forestry comparable to that which it has in private forestry.

Nevertheless, even if this dubious exception is allowed, there still remains a second big difference. Timber, although now a deliberate product, is still secondary to the public goods purposes of State forestry. In fact, any justification that there may be for the deliberate production of commercial timber in State forestry can only be on social grounds. Thus it is a public goods function, not a profit driven one. Investment considerations involving such matters as choice of species, tree breeding or treatments to accelerate growth or to concentrate growth on trees regarded as desirable for their commercial properties, matters that are almost the staple diet of timber production management, are, therefore, only relevant to the extent that they also improve the public goods functions. One of the main purposes served
by investment analysis in forestry - the comparison of alternative silvicultural regimes - therefore has little place in the economics of State forestry. Replacement of any forests or parts of forests felled for whatever purpose by whatever means is an integral part of State forestry, but mainly and, perhaps, only, in order to maintain the set of environmental, conservation, social or protective services for which the State happens to be in forestry and which intact forests supply. Hence unlike private forestry and the implicit assumption of investment analysis, replacement is not an option to be compared with alternative uses to which revenue generated by timber harvesting could be directed. There are no alternatives.

This is compounded by another big difference. In State forestry, in the transitional phase, as well as any more permanent one, the protection and enhancement of the public goods functions over-rides all other issues. The profitability of the harvesting operations is entirely subordinate, and harvesting must bear the cost of the near zero impact logging required, not just to be the reduced impact logging typically advocated. The implications could be devastating. For instance, if the calculated margin available for stumpage is, as a result of near zero impact logging, reduced to zero or less, the State would have to conduct the timber production side of its activities at a loss. But an investment that promises, at best, a less than zero return is, by definition, an investment that should not be undertaken. Hence, to guarantee the supply of raw material wood to the forest industries while protecting, at the same time, the public goods services of State forests, could involve public subsidisation of the industry, something
that is ruled out under economic rationalism. The two policies - economic rationalism on the one hand and the deliberate production of industrial roundwood in State forestry on the other - could thus be incompatible. One then has to yield to the other. The problem is to decide which one.

None of this means, however, that the public goods need is such that there is no limit to the resources to be applied in meeting it. No economy could survive for long if it tried to put all of its resources into forests for the supply of public goods, no matter how crucial they might be. But any economy must invest in them to an extent that guarantees at least the minimum supply required for the physical survival, if not the enhancement, of the society of which the economy is a part.

**Effects on investment analysis for State forestry**

These differences might appear to come close to being fundamental, but they actually have no effect on the principles of investment appraisal. They are identical for State and private forestry. That is, a decision to invest or not depends, in both situations, on a pre-investment comparison:

a) of the expected future benefits with the present and expected future costs incurred introducing those benefits, and

b) of the difference between the sum of the benefits and the sum of the costs against some measure of what is regarded as an adequate difference (i.e. the choice indicator).
The idea is fairly straightforward in principle, but it runs into a number of difficulties when putting it into practice. The first, common to any form of investment possibility, is that of adding a mixed bag of very different items on both the benefit and outlay sides of the equation. This first difficulty, the adding up problem, can be resolved well enough, even if not always and entirely satisfactorily, by expressing all the costs and benefits in monetary terms. While this use of money as the common denominator is the normal and almost universal practice, this does not necessarily make it the only one or even the best. Energy, for instance, could well be a much more appropriate common measure from an environmental point of view in the judgement of ecological economists.

**Time in forestry and economic theory**

The second difficulty is, however, almost unique to forestry in intensity, if nothing else. Time is, by far, the dominant input in timber production (e.g. Fedkiw, 1960; Leslie 1971). Even with a fast growing tropical species, the physical rotation for fuelwood or pulpwood is five years at best, and more often seven to ten years. For industrial wood products such as sawlogs or veneer logs, the physical rotation is several to many times longer. With the faster growing tropical timber species such as Gmelina arborea or Pinus caribaea, the rotation in tropical plantations is rarely less than fifteen years. Pinus radiata, one of the fastest growing temperate species, has, on good sites in the mild climate of New Zealand, a physical rotation for sawlogs, of twenty to twenty five years. In less favourable temperate climates, rotations for
most species are more likely to be forty to eighty years, while rotations of a century or more are by no means uncommon. Over the generally prolonged periods of the rotations for timber production, the revenues accrue mainly at the end of the rotation and intermittently at various times during it but on a smaller scale, while some of the costs are incurred at the start of the rotation, some continually throughout it and some irregularly at various times during it.

Time is also an important input in the provision of some environmental and conservation services, especially those involving rehabilitation measures starting from a bare or degraded soil. Here, as with timber production, quite long periods of time can elapse between the initiation of the measures and the receipt of the benefits, but costs continue to be incurred throughout that time.

In such circumstances, it is hardly surprising that forest economics is very much concerned with both evaluating and minimising the financial impact of time as an input in timber production forestry. Clearly time, as the old adage has it, is money, but how much money? What, in other words, is the price of time?

The source of this second difficulty therefore lies in the wide differences in the timing of the inputs and the outputs associated with these long production periods. As with the first difficulty, this one is also resolvable, again well enough but not indisputably. The trick is to use the device of compound interest or its inverse discounting. As Hicks (1973) puts it, ‘any payment (or receipt) can be moved to a later
date by adding interest to it, or to an earlier date by discounting it’. Hence, through compound interest, all items can be brought to a common point in time, either to the end (compounding) or more commonly now, the beginning (discounting) of the investment period. In effect, the differences in timing are eliminated by incorporating the cost of time as an input as measured by the rate of compound interest.

In standard neo-classical micro-economics, time, though often mentioned as a factor in production, is frequently assumed away as in Pasinetti (1977), or less blatantly, as in Walsh (1970). In effect, production is assumed to be near enough to instantaneous for time to be disregarded as an input. Since the whole production process for some products can be completed within a few months, this simplification may not be introduce too much of an error, provided the involvement of any capital plant is also ignored. But production without equipment is almost impossible, and once capital is introduced, time as an input is also introduced. The essence of capital is deferrment of present in favour of future consumption. Thus, any theory of capital is inherently a theory of the cost of time. That is, in capital theory, the simple expedient of ignoring time is simply not an option. Since time is the major input in timber production forestry, the economics of forestry is, therefore, a classic case of applied capital theory.

Capital theory, unfortunately, is too far from clear cut enough for much of it to be directly applicable to forestry. Although neo-classical economic theory is often criticised for leaving time out of
consideration, there has been, at least from the time of Marshall (1898), a notable awareness of its role and quite a lot of theorising about it in or close to that tradition. But as Shackle (1967) points out, time ‘has many faces’. Accordingly, it is considered from almost as many different viewpoints. Marshall emphasises that time is required for the adjustment processes in the market mechanism ‘to work out their full effects’. Since markets are continually changing over time, equilibrium must be an ever-moving target, which, incidentally, suggests that disequilibrium analysis might be a better basis for economic theorising than general or even partial equilibrium. Others (e.g. Hirsch, 1977; Sharp, 1981) concentrate on the use by and the uses of the time available to economic agents, while to others (e.g. Hicks, 1973), it is the irreversibility of time that is the focus of interest. Especially noteworthy in all of this is the sustained work of Shackle (from the early 1960s almost up to his death in 1994) on adjustments to the received theory in the light of his innovative but uninfluential research on the effect on management decisions. Occasionally, economists such as Fisher (1930), Boulding (1966), Gaffney, (1957), Samuelson (1976) and Hirshleifer (1970) have found in forestry an example to illustrate or explore in some detail time as an input. However, none of them seem to have followed up the excursions into the forestry area, so that about all that they have actually done is to rediscover or resurrect what Faustmann (1849) had introduced into forest economics a hundred years or so ago, and which has never been lost to forestry. Renaming the topic as discounted cash flow analysis may create the illusion of something of an innovation, but for forest economics, it is anything but new.
More recently, several books dealing with time from an economic point of view have appeared. Sharp (1981), O’Driscoll and Rizzo (1989) and Price (1993), for instance, all deal, inter alia, with time, specifically as an input. To a large extent, the focus in these treatments is on the effects of uncertainty about the future that is associated with the time between the initiation of a production process and its completion. They all, therefore, have some ideas that can be related to the economics of forestry. For example, Hicks summarises the nature of production in a time profile with an initial construction period in which it is all input and no output; a running-in period in which output rises from zero to the eventual normal level and inputs may fall from a high constructional level to a possibly lower but certainly different normal operating level, followed by a long period of normal utilisation in which both inputs and outputs are fairly constant with the whole process eventually coming to an end.

This is, of course, little more than another way of expressing the flow of timber production over the length of a single rotation in forestry, so it is an idea that has been used in forestry for several centuries and even before the emergence of economics as a recognizable discipline. In fact, when ideas in capital theory such as this are examined relative to forestry, it is found that most, if not all of them, have been anticipated and used in forestry for centuries. The classic example of this is the recent development of discounted cash flow analysis in economics referred to above. The fact that time is a factor of great practical importance in forest management rather than primarily a
matter of intellectual interest, is probably the reason why forest economics was so far ahead of general economic theory in the development of techniques for time accounting.

In the Faustmann formula, the cost of time is incorporated by reducing, through the use of an interest rate, the whole series of costs and returns incurred or accruing at different times over the infinite length of time involved in planting and then maintaining a forest under a perpetual series of sustained yield rotations, to their value at the beginning of the first rotation. But why should the cost of time be represented by a rate of compound interest? The question justifies, implicitly perhaps, the recent questioning of discounting in mainstream economic theory by Kula (1997). Actually, the answer, to the extent that there is one, is fairly simple, depending, as it must, on the concept of opportunity cost. To postpone present consumption in favour of future consumption represents an opportunity foregone, which has a cost equal to at least the value of the present consumption foregone. It is generally held that such an opportunity cost would only be justified if the value of the future consumption were confidently expected to be greater than that of the consumption foregone. There are, of course, exceptions. Seeds set aside for sowing the next season’s crop, which, depending on the season, may or may not result in a greater output, is, all the same, a necessary input for survival. And similarly, is the withholding of enough of the present product for the maintenance of the production plant and equipment? But in general, the rule holds that it is the expectation of greater production or consumption in the future that justifies the opportunity cost of
deferred present consumption. The ratio of expected future consumption to present consumption foregone being, as it must by definition, greater than unity gives the rate at which production is expected to grow over the period of deferrment. This is equivalent to the rate of interest earned on the initial value of the opportunity cost and hence is a measure of the cost of the time involved i.e. time as an input.

**Private and public pre-investment analysis**

The big differences between private and public pre-investment investment calculations may not affect the principles of investment analysis, but they certainly do affect the actual procedure. They do this through the cumulative effects of the items entered into the benefit and the cost sides of the equation, the monetary values that are assigned to them, how those monetary values are established and the rate of interest used to value the time input.

In a private sector analysis, the only items that count are those that involve the firm in a cash outlay or provide it with a cash return. In other words, only the items that concern the firm itself (internal costs or benefits) have any bearing on its investment appraisals. Effects on parties outside the firm or effects on the firm arising from activities of parties outside of it are not necessarily excluded but they enter the calculations as estimated cash allowances either for benefits such as goodwill or as costs such as public relations. Externalities are, therefore, not ignored, but they amount, on the whole, to being
relatively minor though continuing irritants or occasional bonuses. The value assigned to each item in the lists of cash outlays and of cash inflows is the product of the quantity and its price. For this purpose, market prices are an adequate, appropriate, if not entirely accurate, measure for the value of the transaction. Of course, estimates of the prices at each point of time where they are expected to occur have to be made for those receipts and outlays expected in the future. Then the items on the two lists are brought to the selected common time, usually the end of the rotation or a series of rotations, by applying a selected interest rate to them. The sum of the discounted benefits minus the sum of the discounted costs can then be compared to whatever criterion the firm sets itself as the test of an acceptable net return on the investment involved. Market rates of interest provide an adequate and appropriate basis, either directly or indirectly, for selecting the discount rate and the choice indicator. While they vary over a fairly wide range at any given time and they are far from stable over time, they have the advantage of being readily accessible public knowledge. Each firm knows which of the prevailing rates are the appropriate ones to apply in its own operations.

This relative simplicity disappears almost completely in investment appraisal applied to State forestry. In stark contrast to the private firm, the outputs are all, by definition, externalities, i.e. those public goods, including even the socially motivated timber production, which alone justify the State ownership and management of forests. Also by definition, market prices rarely give appropriate approximations to the value of public goods. Either market prices do not exist, or if they can
be manipulated to fit, it is highly debatable how closely they or the adjusted estimates actually reflect the social values. Some of the potential costs, such as environmental deterioration or social disruption, are also externalities that can be incorporated as internal costs in the firm of the costs involved in making sure that the ill effects do not occur. These are, however, the principal operational costs, not the relatively minor incidentals of private forestry. They are thus too different in nature and scale for them to be effectively disposed of as externalities and treated as items that can be covered by an allowance in the public relations budget. Then and perhaps most significantly, while discounting or compounding as the means of overcoming the timing differences is still applicable, market rates of interest as a measure of the social cost of time are of even more doubtful validity than market prices are for public goods.

**Consequent problems in State forestry**

The problem with investment analysis in State forestry, therefore, can be summarised as finding or developing a convincing method for:

i) identifying and listing the public goods that a specific area or tract of forest is required to provide,

ii) applying a monetary value to each of them so that they can be added,

iii) estimating the expected costs of building up the forest in order to provide the services in perpetuity and allocating them over time,
iv) allowing for the returns from any market determined goods or services that may also be produced as by-products, and

v) choosing or working out a discount rate which reflects the social value of time to the society concerned.

This is, actually, little more than a summary of the situation in public sector economics that has led to the development of the technique of applied economics known as benefit/cost analysis. More correctly, for public investment appraisals, the term should be ‘social benefit/cost analysis’, as ‘cost benefit analysis’ is now tending to be applied also to describe appraisals used for private sector investments, but which being restricted to market determined values are considerably narrower in scope. It might seem, therefore, that investment analysis in State forestry is merely a special case of social benefit/cost analysis. And since the techniques for that are fairly thoroughly worked out, all that is needed is to adapt them to absorb any peculiarity specific to forestry.

**Social cost-benefit analysis for State forestry**

That the techniques of social cost benefit analysis are reasonably well worked out and advanced does not mean, however, that it is widely, let alone fully, accepted as a valid approach to pre-investment appraisal in the public sector. On the contrary, it is strongly criticised and even ridiculed not just for trying to do what it does, i.e. to quantify and put monetary values on the public goods interests but
also for how it does this. Some of this criticism is ideologically based and biased, deriving from such extreme versions of laissez-faire, which almost deny the validity of concepts such as public goods and externalities. But there are sometimes better practical reasons. For example, there is no denying that social benefit/cost analysis can be and often is used to justify a pre-determined decision rather than to subject it to rigorous testing. So much so that benefit/cost analysis can, as Adams (1978) says, often be hilarious and is thus not always to be taken seriously. All the same, it is on the right track, but as Liebhaisky (1973) emphasised, it is only a ‘useful first approximation’.

No economy, as noted earlier, can afford to put all of its resources into the provision of public goods, but this leaves unanswered the question of how much it can and should. At some stage, therefore, a comparison has to be made in social decision-making, between public goods and commercial or private goods. Social benefit/cost analysis, if nothing else, tries to bring the comparison into the open and make it a more objective process than that of the straight-out but rarely straightforward political horse-trading, which is the alternative. Actually it is, as a rule, fair to see through its use in justification of a pre-determined position and the pretence that it is a rigorous test of it. Any damage arising from such misuse is, therefore, more in the nature of a self-inflicted wound than being a genuine risk inherent in the procedure. But, to quote Liebhaisky again, ‘the user of such studies must be on his guard not to be misled by the precision with which the results are stated numerically’.
Subject always to this caveat about the status, in general, of benefit/cost analysis, attention can turn to how to do a social cost benefit analysis and to the features, if there are any, which might call for the treatment of State forestry as a special case. Another discussion here, even in summary form, is not likely to add much to the understanding of it and its procedures, over and above what can be found in the many excellent books, essays and critiques on the subject, e.g. Pearce, 1989; Sugden & Williams, 1978; and Little & Mirlees, 1974 to name but a few. So attention might be better focussed on those features, if any, which might make State forestry a special, case of social benefit/cost analysis. Several stand out as possibilities. They include the dominance of time as an input; the valuation of marketed, commercial products as public goods outputs; the shadow pricing of the public goods outputs and the amplification of uncertainty that accompanies the long periods of time involved in the production process for many of the outputs.

Again, there is no shortage of discussion of most of these features in the literature. Their treatment, however, is most commonly from the point of view of a private investor and in the neo-classical tradition. The contrasting view being taken here of a managerial, institutional public sector analysis might, therefore, call for some difference in detail or in emphasis if not in principle.
The Faustmann formula in State forestry

Almost everything written specifically on time as a significant factor of production comes from forestry. The cost of time in the growth of forests is the theme in Faustmann (1849) and the prolonged controversy, mainly in Germany, over the next century or more, which resulted from his, largely unwelcome, findings. It occupies less, but still a significant part, of the work of forest economists of the inter world wars period, such as Hiley (1927, 1930) in Britain Chapman (1944) and Chapman & Meyer (1947) in the USA followed by that brilliant group of post second world war forest economists in the USA, of whom Duerr, Vaux, Worrell, Fedkiw, Stoltenberg, Gregory and Zivnuska are some of the forerunners. A great deal of the considerable volume of literature on forest economics that has since developed is also concerned, perhaps less directly, with ‘the tyranny of compound interest’, which arises from the costing of the time input in forestry. The interest continues to bring with it some intriguing applications of advanced computerised mathematics, as is evident in the work of the next generation of forest economists, e.g. Pearse (1994), Price (1993), Buongiorno & Gilles (1987), Ferguson (1996), or Johanssen & Löfgren (1985). Yet the general consensus, albeit reluctant at times and often implicit, is that Faustmann was essentially right.

Something that has withstood all of this critical analysis and, often, not so benign neglect, must have something going for it. And it has: conceptually and mathematically it is a correct way to do a pre-
investment financial cost benefit analysis of a project or undertaking that will take a long time to produce its intended results. Any improvements to the formula in which Faustmann summarised the processes in pre-investment analysis of timber production options in forestry amount to little more than refinement of some of the details and in the calculation methods. In short, there have, despite all this work, been no significant or fundamental changes in or modifications of his approach.

Apart from their endorsement of Faustmann, these authors share several other characteristics. The first is that they all accept discounting as the way to handle the differences in timing that occur over the course of the investment and that it is, therefore, the way to take time into account as a cost. And secondly, they all, explicitly or otherwise, accept that the appropriate discount rate always has a positive value. Then, thirdly, those of the post-World War II era all follow the neo-classical tradition. There is, however, still plenty of scope for disagreement if not controversy, but it is largely over the level of the discount rate to use and over the valuation of items for which market prices are inappropriate or inapplicable.

There is, however, no disagreement about some common misuses of discounted cash flow analysis in general. The most obvious misuse has already been mentioned. This is the use of benefit/cost analysis to justify a pre-determined position rather than to subject it to pre-investment scrutiny. A closely related practice is that of manipulating the items and the valuations applied to them until the acceptance
criterion under the choice indicator is met or bettered. Actually, the error, serious as it is as a matter of principle, may not matter all that much in practical terms. If the proposed investment succeeds in being approved by the appropriate authorities, this may seem to be all that matters. After all, the precept that ‘the end justifies the means’ has a long, often successful and distinguished, if largely dishonorable, history. Its application in the benefit/cost analysis simply follows in the tradition. Nevertheless, it is still misused and, being detectable by honest and not overly onerous analysis, it can be a fairly dangerous managerial technique to adopt, especially in public affairs.

Less duplicitous, although equally misleading, is the misuse that could be made of the Faustmann formula in forest valuation. In the absence of market information about the sales of ownership of or rights in forests, or with only a very few and unrepresentative values available, the present net value given by a discounted cash flow analysis can be a convenient substitute. After all, it seems logical enough for prospective buyers to assess the value of a forest to them at the present net value of the stream of future benefits expected to come from owning the forest. When those benefits come predominantly from the sale of timber or other forest products, then a financial discounted cash flow calculation of present net value is a measure of the value of the forest to a prospective buyer, and hence, an approximation to the market value. But it is only an approximation; it is actually no more than an indication of the buyers’ maximum, which sets the upper bound of the zone of mutual satisfaction. It would only be the market value if it coincided with the lower bound, that is, the minimum the
seller is willing to accept. If the buyer’s maximum is greater than that lower bound a sale may eventuate, but the market price within the range could be lower. If it is lower than the seller’s minimum, it is unlikely that a sale would eventuate, and in that case, there is no market price.

As the Faustmann formula is a form of discounted cash flow analysis, it would seem, at first sight, that the land or soil expectation value it gives ought similarly to value a forest. But it cannot be used in this way because it is a restricted, special case of pre-investment analysis. The Faustmann formula applies to afforestation on bare land and the soil expectation value in which it expresses the benefit to cost relationship varies, for all its equivalence to present net value, with the way in which the calculation is done to an extent that is not duplicated in the normal sort of discounted cash flow analysis. In its original and simplest form, the Faustmann formula, the SEV can be calculated for a single hectare planted in the first year and followed through the first rotation and then an infinite series of repeated and identical rotations. It is possible to modify the calculation to allow for changes in the regimes in later rotations or to terminate the series after the first or any number of successor rotations. The value of the soil expectation value will depend on the regimes and timings applied to this single hectare.

But a calculation of the soil expectation value can also be made, as in a normal discounted cash flow analysis, for a project made up of a specific total area of plantation. This could be established either all at the one time or over a specified number of years that can be equal to,
less than or even greater than the planned rotation. The project would terminate at the end of the first rotation for the area last planted or continuing into, through or beyond successive rotations whose length and regimes can be different from those of the first. This cannot be done by the Faustmann formula, but the idea is much the same. The value of the present net value (or the soil expectation value in the Faustmann terminology) will depend on which combination of planting schedules, intermediate treatment regimes and rotations is adopted. It would be pure coincidence for the present net value to come out the same as the soil expectation value for the single hectare, even if the establishment regimes, item costs, sales revenues, imputed revenue from non-market benefits the discount rates were identical.

For in a sense, the present net value per hectare under the project approach is that of the hectare that represents the average time of planting and scheduling of treatments and positive net cash or imputed returns over the calculated life of the project. The two would coincide only if the peer hectare based calculation were made for that average hectare, whatever and whenever it may be. It is anybody’s guess as to which of the two or many more possible calculated land values given by the two methods would be the most appropriate approximation to the market value of the land.

To illustrate these distinctions, take as an example a plantation establishment regime with the following characteristics.

| Establishment cost (site preparn & planting) | $1300 per ha. |
| Tending in first year                      | $100 per ha. |
| Tending in second year                     | $100 per ha. |
Tending in third year $50 per ha.
First thinning (to waste) year 10 $300 per ha.
Second thinning – year 15
   \(40 \text{ m}^3\) per ha. Pulpwood @ $5 per m\(^3\) $200 per ha.
Third thinning - year 20
   \(100 \text{ m}^3\) per ha. @ $20 per m\(^3\) $2,000 per ha.
Final felling – year 28
   \(500 \text{ m}^3\) per ha. @ $50 per m\(^3\) $25,000 per ha.
Annual admin, managt & fixed charges $40 per ha.

and calculated for planting in the following ways:

(1) as a single hectare at the beginning of the 28 year rotation (LEV(1));
(2) as a single hectare planted 14 year ago (LEV(2));
(3) as a 10,000 ha. project planted at 1000 ha. per year for the first ten years and clear felled at 1000 ha. per year from year 28 and expressed as an average per hectare (PNV(1));
(4) as a 10,000 ha. project planted at 1000 ha. per year for the first ten years, clear felled at 333 ha. per year from year 28, and replanted in the next year at 333 ha and expressed as an average per ha (PNV(2)).

The soil expectation value or present net value, after one rotation (in the single ha. case) or after 37 years (in the project case), corresponding to each of these arrangements is, at discount rates of 4\% and 10\%, as shown in Table 14.1.
TABLE 14.1. Present net values of a hypothetical plantation under four different arrangements of the same set and sequence of costs and returns.

<table>
<thead>
<tr>
<th>Discount rate</th>
<th>LEV(1)</th>
<th>LEV(2)</th>
<th>PNV(1)</th>
<th>PNV(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4%</td>
<td>$6,308</td>
<td>$3,407</td>
<td>$5,545</td>
<td>$ 900</td>
</tr>
<tr>
<td>10%</td>
<td>$-227</td>
<td>$-272</td>
<td>$-426</td>
<td>$-902</td>
</tr>
</tbody>
</table>

Three features are fairly obvious. The first is that, with such wide differences between the per hectare values depending on the arrangement for which the value is calculated, neither the Faustmann formula nor the discounted cash flow analysis is a definitive or reliable means for deriving or estimating absolute values for land to be acquired for or allocated to afforestation. The utility of the techniques lies rather in the comparison of mutually exclusive alternatives. For example, arrangement three gives a much higher present net value than arrangement four. If the level of the present net value above zero is the decision criterion and the decision rule (Hirshleifer, 1970) is to choose the alternative promising the highest present net value, then the sequence in which each age class is clear felled at rotation age (arrangement three) is better than going for an even volume flow from the time that the first planted age class reaches rotation age. That comparison may, however, be valid only under that combination of decision criterion and decision rule. Change either and the comparative ranks may change as well.

This does not necessarily mean that discounted cash flow analysis is not a suitable method for land valuation. It can, in fact, be applied to
land valuation when a project involves or consists of the purchase of an existing block of forest, or an already established plantation or a combination of established and yet to be established forest and/or plantation and there is no adequate or comparable land market information. In these circumstances, present net value does give an estimate of land value, which can be used as a basis for management decisions about the project and in negotiations for the purchase if it is decided to go ahead. The Faustmann formula does not because it cannot; it is inapplicable outside the bare land situation from which it was derived.

The second feature is the simple confirmation of the well-known problem of what discount rate to apply. At 4%, all arrangements give positive net returns while at 10%, none do. It should be clear, therefore, from even this simplified and abbreviated example, that there are wide ranging possibilities for divergent views about the prospects of specific projects, or alternatives within or between projects. Not surprisingly, therefore, the literature relating to discounted cash flow analysis and, to a lesser extent, the Faustmann formula, is almost as boundless and yet, far from being unambiguous and definitive.

The third feature is that somewhere between the positive values at 4% and the negative values at 10% in this example, the soil expectation value or present net value must be zero. The discount rate at which this occurs, i.e. discounted benefits and discounted costs are equal, was termed the ‘financial yield’ in forest economics until it was
displaced by the term ‘internal rate of return’, which was given to that discount rate in the rediscovery, so called (Hirshleifer, 1970) of the Faustmann initiative. In benefit/cost discussion, as in investment appraisal generally, there is a considerable, but as yet, inconclusive debate over the relative merits of present net value and internal rate of return as the appropriate decision criterion with equally eminent authorities preferring each (e.g. Hirshleifer, 1970).

However, the bearing that all of this has on the economics of State forestry is debatable. While there is no question that the choice of a discount rate is fundamental, the role of most of the rest is much less certain. The trouble is that in State forestry, the output from timber production, to which all of the above is clearly relevant in the context of private forest ownership and management, is a public, good not the timber itself, even when timber production does qualify as a legitimate function of State forestry. The timber produced is only a means to a social or political end. Its value is thus a social value and neither necessarily nor even approximately measured by the market value of the timber or wood products. The revenues from sales of market priced commercial outputs are much less significant than the social value of the public goods for which the State forests are reserved and managed. The net benefit/cost analysis is truly social. Revenues from timber sales may be a handy bonus, but as a decision variable, their only relevance is on the cost side, and then as an opportunity cost. The only relevant financial items are the total costs involved in providing the public goods to, at least, the minimum level regarded as acceptable. And with many of these services being regional and
national in scope and some being or becoming global public goods, the society whose acceptance or otherwise counts goes well beyond the State in which the forests are located.

Hence, in State forestry, as far as time as input is concerned, two matters have to be considered. The first is, of course, the appropriate discount rate at which to charge time in the accounts. The second is how much time is involved. This means that the rotations that count are not those associated with timber production, but rotations that produce the services needed in the quantity, quality and locations needed. This, in turn, means that the production functions for these services against time as the independent variable have to be quantified. Without these quantified functions, it is hard to say how important time is likely to be as a factor in the economics of State forestry. The one thing that can be said with confidence is that the importance of time as an input in State forestry cannot be automatically extrapolated from its unquestionable dominance in the production economics of timber as being of equal significance.
15. SURE, TIME IS MONEY, BUT HOW MUCH?

The output of forests as a function of time

Production functions, with respect to time for the public goods services of forests, are basic quantitative information for a managerially operational economic analysis in State forestry. For timber production management, the fundamental nature of the time relationship was recognised quite early in the development of forestry. And, being relatively easy to quantify, if not entirely accurately, at least well enough to allow the building up of usable and fairly reliable, working level yield tables. The result is that timber, or more generally, wood, as an output over time, now makes up by far the greater part of the quantified, verified and constantly improving equipment of forest management. By contrast, there is next to nothing comparable, either from research or simple observation, about how the quantity or the quality of the output of any of the public goods or the services of forests changes as a function of time. Certainly some rather broad generalisations are obvious enough. For instance, the quality of the output achieved with services such as soil conservation or watershed protection undoubtedly improves gradually over time as a result of reforestation of previously bare land.

At the same time, the effectiveness (a surrogate, perhaps, for quantity) of soil conservation may also improve, but water yield, on the other hand, may decline. Or, conservation as a public good in itself is
perhaps best served by intact and long established old growth forests, although the conservation of some of the component species is probably not. With recreation neither the quantity nor quality, recreation is quite easy to specify even in such broad terms, because both quantity and quality depend as much on the perceptions of different classes amongst the clientele for forest recreation as on the forest type, its age, and the treatments to which it has or can be subjected. Landscape is similar in that the ‘yield’, in terms of quality at least, depends largely on individual perceptions, so that afforestation or reforestation on a large scale with a single species can be and often is, to many people, a reduction in landscape quality.

That the generalisations, however, cannot go much further than this, is painfully evident from the brilliant condensation and critical analysis of the economics of sustainable multiple use forest management by Ferguson (1996). Certainly, it can all be presented, as Ferguson does so well, in a series of general curves covering the range of possible production functions of output against time and of the trade-offs between various sets of different outputs or between different sets of inputs. Numbers are, however, embarrassingly scarce. Embarrassing first, because this is a dismal record for several centuries of so-called multiple use forest management. And secondly because lacking the numbers, guess work and faith have to be substituted for the quantified relationships needed in management for public goods, and decisions are guided by hope and prejudice rather than by objectively derived standards or norms.
Whether this matters much depends, however, on how big a factor time is in the production of the services that constitute the public goods. As noted at the end of Chapter 14, it does not follow that, because time is the dominant input in timber production, and that it must also be so for the public goods services. Provision of the services of forests through restoration may not require anything like the long production periods common in timber production. Combine short time periods with low discount rates and it may be that time can be ignored as safely as it is in the standard neo-classical theory of production. Thus the present net value of a service, which takes 30 years after afforestation to develop fully to the levels of quantity and quality, which the society regards as acceptable, is, at a discount rate of 1%, still 74% of what it would be if the production process were instantaneous. This is a much less of a significant loss of value than the 30% that it would be under a 4% discount rate. But with a production process requiring say 100 years to reach its full socially acceptable output, the present net value, even at a discount rate of 1%, is reduced to 37%, compared with the near instantaneous value. Time in this case can no longer be safely dismissed as negligible.

The production period and the discount rates are thus tightly linked and mutually interacting. But this only constitutes a major problem in management when the production functions with respect to time for the various public goods services are not quantified, even roughly. The minimum needed is to be able to say, with some confidence, that in a specific situation, investment in the reforestation of a deforested catchment would show water quality over time, improving relative,
say, to the flow from a fully stocked, mature, natural forest, as shown in Table 15.1 below, or the response over time of water yield to thinning in a forested catchment as summarised in Table 15.2.

**TABLE 15.1 Hypothetical water quality yield table for reforestation with a mixture of three species.**

<table>
<thead>
<tr>
<th>Time since planting (yrs)</th>
<th>Relative water quality (100 max)</th>
<th>Time since planting (yrs)</th>
<th>Relative water quality (100 max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>40</td>
<td>88</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>45</td>
<td>90</td>
</tr>
<tr>
<td>10</td>
<td>8</td>
<td>50</td>
<td>91</td>
</tr>
<tr>
<td>15</td>
<td>25</td>
<td>55</td>
<td>92</td>
</tr>
<tr>
<td>20</td>
<td>45</td>
<td>60</td>
<td>93</td>
</tr>
<tr>
<td>25</td>
<td>70</td>
<td>65</td>
<td>91</td>
</tr>
<tr>
<td>30</td>
<td>80</td>
<td>70</td>
<td>89</td>
</tr>
<tr>
<td>35</td>
<td>85</td>
<td>75</td>
<td>96</td>
</tr>
</tbody>
</table>
TABLE 15.2  Hypothetical change over time in water yield after thinning in a domestic water supply reserve.

<table>
<thead>
<tr>
<th>Thinning Intensity (% BA removed)</th>
<th>Percentage Change in Water Yield for Years since Thinning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>2</td>
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Even with such rough quantifications of the time input/output relationships for the supply of public goods and knowing the costs of the reforestation and of the thinning operations involved, some progress would be possible in investment appraisals relating to the public goods services of forests. However, approximations, even as rough and elementary as these, are for the most part beyond the capacity of the present level of quantification. And this situation seems likely to persist for quite a while yet. Certainly there are plenty of pieces of information around that could be fitted together to compile production functions for specific forests (e.g. Megahan and Kidd, 1972; Malmer, 1996). But with the production function needed for each forest type, allowing forest type to be a valid first approximation and with watershed calibration periods of not less than ten years needed before it is worth starting stand manipulation experiments, many years would pass before even moderately reliable quantified time dependent production functions would be available for
management purposes. In practice, however, the period involved would be much longer as the massive research program could not and would not be mounted immediately.

**The discount rate as the price of time**

Fortunately, things are not quite as bad with quantification on the discount side of the link. In principle, the range of possible discount rates runs from negative to positive infinity. However, what may be fairly safely called the reasonable segment of that range is knowable, although there is far from unanimity over what that range is. All the same, some degree of partial quantification of the time - discount relationship is, thus, conceivable, at least.

It may, however, be worth pointing out at this stage, something that ought to be obvious. This is that there is no such thing as ‘the market rate of interest’. This point needs to be made because the market rate is still at times recommended as the appropriate rate for forestry, although not as commonly as it was twenty or thirty years ago. Rather, there is, as the previous paragraph indicates, a range of rates in the financial markets at any one time. It is this range that is the one quantitative thing known with any real degree of certainty, about the discount rate-time link.

While market rates and their range vary between countries and fluctuate, sometimes wildly as well as widely over time, they are, at any given time and in any given place, fairly precise public
knowledge. But from there, the next step in how to use this information is less clear-cut. The first point of departure from that relative simplicity is whether there is such a thing as a social rate of discount, either within the market range or distinct from that range. Economists of all persuasions differ widely and vigorously over this. Three possible sets of views are tenable, namely and they are:

(1) there is no such thing,
(2) there is such a thing, but it lies within the market range and, usually implicitly, at the lower end, or
(3) there is such a thing, but it is outside the market range and lower than the low end of that range.

Each is put forward and strongly urged as the only valid approach to the choice of a discount rate for taking time and timing differences into account. Price (1993) gives a thorough, comprehensive and, in view of his open dislike of discounting, an objective critique of the debate. It would be hard to improve on his analysis, so that all that may be worth adding here are a few points possibly having some special significance in a managerial context.

If the first position is accepted and some forceful and compelling arguments are advanced in favour of it, then the problem of the choice of the appropriate discount rate is simply that of which one to select within the range of market rates. But this is exactly the same solution if the second view is accepted, while all that changes with the third view is that the range of choice is extended at the low end.
All of the statements, unequivocal as many are, firm as they all are, about the correct, the best, the most appropriate or even just an appropriate discount rate to apply in the appraisal of public investment possibilities, are therefore no more than the personal, although no doubt the considered, opinion of the authority making them. This point was conceded, inadvertently perhaps, by Marshall (as quoted by Robinson, 1978) a century or so ago, although little notice seems to have been taken of it at the time or since. But what it means is that in reality, the choice of an social discount rate to apply in State forestry relating to the supply of its public goods services is just somebody’s guess.

This means that whenever time is a major input into the production process, neither the sophistication of the mathematics behind the analytical technique nor the accuracy or completeness of the cost and revenue data is of much significance. In the end, it is the guess about the discount rate that most affects the value of the benefit to cost relationship. It is no wonder then, that the practice of choosing a discount rate, which produces the wanted result, is so common. In fact, it is the rational thing to do. Provided the rate is neither ridiculously (another intrusion of subjectivity) high nor ridiculously low, it is as justifiable and defensible as any other rate. Of course, the funding or financing authority may think otherwise and insist on its rate, but the only thing that makes it right is its might not its logic.

The problem of the cost of time and the appropriate discount rate in the economic analysis of the supply of public goods can thus be made
to disappear quite easily and yet with rationalisation equally credible as any other. Almost all analyses and discussion of pre-investment decision making, whether in the mainstream neo-classical version or otherwise, accept that the discount rate is and must be positive, even though it can be quite small. This implies that the present is and should be always be given priority over the future. But why should it? It could be held and with no little justification that the interests of future generations, or at least some of those interests, are of as high a priority if not higher than those of the present generation. This, in essence, is the core of the argument of the conservation and environmental movements. The role of the government to protect the public interest, as referred to by Hoos (1972) amongst many others, probably applies more in theory than in practice, but it is nevertheless true. Governments, as much as they try to evade it, do have a responsibility to future non-voting generations as much as they have to the present voting one. This means, in effect, that the social discount rate for some public goods is zero. The theoretical possibility of zero and negative rates of interest has long been recognised (Marshall, 1920; Keynes, 1936; Robinson, 1978). Practically, however, this could be dismissed as unrealistic, as it could well appear to be. But before going that far, it is well to remember that there is plentiful, empirical evidence of zero and negative real (net of inflation) interest rates in capital markets, in both recent times as well as in history (e.g. Hill, 1981).

Now if the social discount rate is zero, inter-generational or inter-temporal choice (to give the investment problem its modern and more
imposing academic name) is of no great relevance. This is, in effect, the forest rent solution, which its proponents were seeking in the forest rent/soil rent controversy that followed after Faustmann dropped his revolutionary bomb. But their argument was different in being based on the cost of timber production and thus vulnerable to criticism from the re-investment angle (e.g. Chapman, 1951). That criticism does not and cannot apply to the provision of the public goods services. Up to the level of the minimum essential supply of a service, cessation of its production is not an option. And that minimum is as essential to future generations as it is to the present one. The relevant interest rate, in other words, is zero.

The implications of zero being the relevant, correct or appropriate rate for State forestry could have some drastic implications for the role of economic analysis in State forestry. These implications are the subjects of the next chapters.
16. WHAT IS LEFT OF FOREST ECONOMICS?

One almost obvious implication is that there can hardly be much left for the economics of State forestry to be concerned about. The zero discount rate removes investment analysis. The joint production of timber as a by-product of public goods outputs or the public goods nature of timber production whenever it is a valid function of State forestry eliminates most of timber production economics. Then, with the safeguarding of the public goods services of forests being the sole legitimating function of State forestry, neither comparisons with alternative land uses or with the alternative uses to which the capital stock tied up in otherwise saleable wood could be put, are relevant. So is there is anything left of much significance? The costs involved in providing and maintaining the services are, of course, very significant, but costs alone are not all there is to economics.

At first sight then, it might, therefore, appear that the economics of State forestry is no more than another one of economics’ empty boxes. But such an argument is flawed in at least two respects. For a start, it is valid only for the Category 1 public goods as identified in Chapter 9. That is, to those public goods from whose benefits it is totally, or almost totally, impossible to exclude those people who cannot or will not pay specifically for the supply but which are, at the same time, essential for the wellbeing and, perhaps, even for the survival of the relevant society and for which there are no or very limited possibilities of substitution. The classical examples are the functions of forests in respect of watershed services in water supply, of erosion control, of
climatic stabilisation or the amelioration of micro-climates and the benefits of fire protection. The category could also include landscape, although it can rarely be counted as an essential service, except in circumstances such as in the Swiss and Austrian Alps, where forested scenery is part of the infrastructural base of the national economy. With the other two categories of public goods, excludability is not so total or near total. Some forms of forest-based recreation, for example, involve entry into the forest for them to be enjoyed. These could be charged for and the fees collected at the points of entry to the forest. Those unable or unwilling to pay the fee would thus be excluded.

A second qualification is that even for the essential services, i.e. the Category I services, the eliminations apply only up to the point of providing for the reservation and management of the minimum areas and types of forest required to assure the infra-structural base for survival of the society in question. If, for instance, the watershed protection requirements of the society the subject of the hypothetical example in Tables 15.1 and 2 can be satisfied by 0.5 million ha. of montane and upland rain forest and 1.3 million ha. of lowland deciduous mixed tropical forest, then neither the absence of alternatives between forestry and other forms of land use or between alternatives within forestry to watershed management (the economic problem at the first and second of Duerr’s three levels) nor the zero social discount rate, applies, to watershed public goods outside that 1.8 million ha.
The third qualification follows almost automatically from the second. The economic problem may thus have been partially and perhaps largely eliminated at the first and second levels. However, it still remains at the third. That is, choices could still be available between alternatives ways of doing things within State forestry. For example, experimental plantations may indicate that the watershed services described in the previous paragraph could be met and eventually enhanced by replacing the montane forests with plantations of Himalayan Fir. In such a situation, investment appraisal through a social benefit/cost analysis of the plantation option relative to the present natural forest cover would be both a legitimate and an appropriate application of the economics of State forestry.

The managerial economics of State forestry is therefore summarised by the following elements:

1. It is concerned primarily with the social benefit to social cost relationships of protecting, maintaining and managing forests for the services of a public goods nature that forests can provide.

2. Up to the levels of area, types and locations of the forest cover needed to supply these services in the minimum quantities and qualities consistent with the security, in perpetuity, of the society in question (the socially essential minimum), the matter of alternative uses for the resources involved does not arise, or if it is raised, it has no validity. Up to that point, investment appraisal does not apply.

3. With some services such as global climatic stabilisation through forests as a carbon sink, or the protection of the
watersheds of streams serving more than one State, the relevant society extends beyond the State or political unit that owns the forests.

(4) Up to the point of the socially essential minimum, the economic problem of resource allocation occurs only at the third level of choice between alternative ways of doing things within forestry.

(5) The social discount rate for State owned and State regulated forests is zero, but only for the essential, non-substitutable and non-tradable public goods services and, even then, only up to the socially minimum essential levels.

(6) Timber or wood, generally, is an inevitable by-product of forest management aimed at the public goods services, so that the only relevant economic decisions regarding timber production are whether the returns from timber sales are likely to more than cover the costs of harvesting the timber without damage or detriment to those public goods.

(7) Timber production can be justified as a legitimate function of State forestry only on the grounds of the social or political ends it serves. That is, it qualifies on its services as a public good, not on the timber produced.

(8) Those services that do not come, either totally or partly within those limits, may or may not be treated in a way particularly different from production in the private sector.

(9) Investment possibilities involving extension of the forested resource beyond the minimum socially essential level must be
appraised relative to technically feasible alternative uses of the land and other resources involved.

(10) The same applies to those public goods that do not come within the socially essential category and are not unavoidable by-products of forest management for those that do.

In effect, no especially different analysis of the economics of State forestry applies outside the range of the socially essential minima. Within that range, the rules, e.g. zero social discount rate, are clearly and radically different. But even outside of that range, the techniques, if not the rules, may be different enough to warrant the inclusion of the rest in the managerial economics of State forestry. The fact, for a start, that all of the outputs are jointly produced, means that none of them can be treated on their own, even as a theoretical simplification. This may be almost enough on its own to make the point, were it not for the fact that, while nothing can stop the mixture of services and goods being produced, there is still the choice of not using or harvesting all or even more than one of them. There is, for example, no economic compulsion on the State forest authority to harvest the timber unavoidably grown as a joint product of the watershed services for which a forest is managed. There may, however, be social and hence political reasons for harvesting it, if the timber is regarded as providing a public good through the employment generated or the well being of local communities dependent. Nor does all or any of the recreational potential of forests managed for watershed services have to be developed unless warranted or forced by social pressures. Institutional economics ought to be able to incorporate these sort of
non-economic motivations. All that the mainstream version can do is to ignore them or deplore them.

**The modes of economic analysis in State forestry**

Two modes of economic theory thus seem to be involved in managerial economics in State forestry. The first and possibly the most fundamental is a mode in which only the third level of the economic problem is relevant. That is, the only comparisons are between alternative ways of managing the forests so as to supply the public goods already decided upon. It may draw on mainstream economic theory to the extent of setting the choice criterion as at the minimum social cost. But it does not necessarily also borrow the maximisation criterion.

This mode, however, only applies to the socially essential minimum level of forest resource dedicated to this end and only up to that point. Beyond that point, the first level of the economic problem comes into play. That is, forests as a form of land use, even if the aim is to provide more of or a higher quality of public goods output, are then in competition with other forms of land use. But the second level of the economic problem, involving choices between different things to do within forestry management decisions, are again limited to choices between public goods only. So this second mode of economic analysis in State forestry, though wider than the first, does not entirely return to the full field of economic analysis.
As a result of these two modes, the economics of State forestry might seem to be rather more complex than in private or industrial forestry. With them, only one mode applies, and it is simpler in that this mode covers all three levels of choice. This may be counter-balanced, to some extent, by the fact that the economics of State forestry is, in the first mode at least, simpler, as up to the socially essential minimum; there are no alternative investment options or wide disagreement over the social discount rate. But the fact that there are two modes to be considered in the economics of State forestry while neither, nor both together, covers the three levels of the economic problem, probably makes for a rather more complex analytical situation.

Nevertheless, it is an open question at this stage, whether either of these two modes as a managerial tool is operationally affected by the verdict reached earlier in favour of institutional economic theory over the mainstream neo-classical version. Institutional economics does recognise that other criteria can replace profit maximisation and that these could be determined or established by or for the institution concerned with forest management, on non-economic grounds. The socially essential minimum forest resource owned or regulated by the State is one obvious example. Another could be the adoption of a satisfactory non-negative value rather than the maximum value of the benefit minus cost relationship as the choice criterion. But for economic analysis in either mode or on any economic theoretical base, the costs and benefits still have to be identified, listed, measured, evaluated and summed. Hence, any difference in the theoretical base
may only be significant at the end of the analytical process rather than during it.

Implications of sustainable forest management

There may, however, be a more fundamental source of a discrepancy between the economic theory of State forestry and the standard treatments of the economics of forestry in general. This possibility arises from the idea of sustainable forest management and the operational requirements it implies (c.f. sustainability in general as analysed in Jeroen et al. 1994). To some extent, sustainable forest management may be little more than just another fashionable, politically correct slogan of the 1990s. However, there is, in fact, much more to it than that. Slogan or more, it has become an institutional imperative to which there is a good chance that all forestry, not just that of the State, will probably have to conform eventually, and sooner rather than later. Sustainable forest management is simply the standard for the use and management of forests, which follows from those set for resource use generally by the conventions and agreements adopted at and following the UN Conference on Environment and Development in 1992. While no legally binding international agreement covering all forests and their use is yet in force, some partial, formal agreements are in place, such as the Objective 2000 of the International Tropical Timber Council for its members’ tropical forests and the pressures for one are growing. In any case, it hardly matters. The convention on the conservation of biodiversity is almost strong enough on its own to have much the same
effect. Combined with the consumer resistance being marshaled by global and national environmental and conservation groups against what they claim are the unsustainable practices of forestry and the forest industries, it could bring about a de facto international stand (O’Riordan, 1994) on forests much more quickly than waiting for a formal convention to be negotiated.

With the likelihood or even just the possibility that sustainable forest management will become the internationally recognised and imposed standard for forest management, its implications for forest economics are worth some thought. The catch is that, at the moment, there is more confusion than agreement over the operational meaning of sustainable forest management. Ferguson (1996) seems to adopt, although with considerable reservations, the (1994) definition of sustainable forest management as ‘the multipurpose management of the forest so that its overall capacity to provide goods and services is not diminished’. As a statement of intent this is almost impeccable, but it is not of much use as an operational guide. Nevertheless, it does give a clue as to why virtually all the environmental groups, despite their differences in detail, have a common element in their view that timber production is, at best, a tolerated use, not an essential one. And it is they, through the influence they can bring to bear on the final end consumers of forest products, who are likely to be the ultimate judges of whether forestry involving timber production management is sustainable. This view then is, ipso and de facto, the imperative in sustainable forest management. This means that forests, untouched and undisturbed, apart from the use made of them for subsistence
hunting and food growing or gathering, are the ideal to which all forest management must conform. If timber production management on a commercial scale can be conducted to meet, very closely if not entirely, that standard, then it has a good chance of being accepted. If it cannot, then it will not be. In other words, timber production in forest management and the associated timber harvesting is a conditional use, allowed as long as it is in no way detrimental to the non-wood, non-commercial services of the forests.

From this point of view, sustainable forest management then is, at the very least, forest utilisation and management, which, if it includes timber production, must:

1. be sustained yield timber management,
2. do no permanent irreversible damage to the forest ecosystem, its environment or the environments and social structures dependent on it, and
3. regenerate those parts of the forest eco-system opened by the timber felling and logging operations in such a way that the ecological integrity and dynamics of the forest eco-system are quickly restored and thereafter maintained.

As an operational guide, it still suffers from its fair share of vagueness. For instance, what exactly is meant by ‘the forest eco-system’ or its ‘integrity’ or ‘dynamics’? They all sound impressive and up to date, but are they of any operational use? The inclusion, for instance, of the ‘dynamics of the eco-system’, allows for the modern view (Stott, 1997) of eco-systems as in change rather than in or
tending to Clementsian equilibrium, but that is about all. Sustainable forest management requires those natural dynamic changes to be anticipated so as to avoid them being adversely affected by what is done in forest management. But we rarely have the knowledge of ecosystems and their behaviour under known conditions, let alone unknowable future conditions.

Nevertheless, there is not much room for doubt about what has to be done. What the global society is, in effect, saying, is that if timber production forestry and the forest industries cannot afford to meet the near-zero impact standard, then the world cannot afford timber production at all. Even if it has the facts wrong, as Stott (1997) and the authors he cites imply, in managerial economics, it is not what the facts are that matters. Rather, what counts is what people believe or can be persuaded to believe are the facts, and on that basis, sustainable forest management is the imperative.

If this were to imply an end to timber production, it would, probably, be as unrealistic as it sounds. But it does not mean an end to timber production, although it certainly heralds the need for a drastic change. Plantations are a limited exception to the most stringent standards. Timber is admitted as their primary purpose. Some relaxation of the bio-diversity standards is therefore recognized as necessary and unavoidable, but not the environmental and social standards. In effect, the drastic change is that of the world eventually shifting to a plantation based forest economy. But, as pointed out earlier, forestry primarily for timber production is not, under a strict interpretation of
the role of the State in a mixed economy, an appropriate function for the State. A tenuous case for State timber plantations can, perhaps, be made up under the guise of providing for a public good, where social and political considerations trigger action by the State to ensure essential future wood supplies. But in reality, all of the world’s timber markets could, in a technical sense, be easily supplied eventually from plantations, with most of those plantations established and managed by private investment and effort. The economics of State forestry would then apply to little more than the first mode. In effect, it would consist of the economics of providing and managing the socially essential minimum forest resource at the minimum social cost, plus a few ancillary things. Extension beyond that minimum, even for the enhancement of the public goods function, would bring this extra part of State forestry into a similar economic frame as private and industrial forestry.

Beyond all of this, however, there are a few other implications that could have even more managerial significance. The first is that sustainable forest management is a holistic concept. That is, it requires eco-system management rather than forest management for any one output or any one set of outputs. Now there are all sorts of complications about holism, not the least being, as Popper (1935) demonstrated, that it is impossible to practice. But even though this means that the management techniques used have to be reductionist, they have to fit into a holistic view of the forest ecosystem. Now the easiest and most effective way to do this is to leave the forest untouched and undisturbed, except in the course of its natural
dynamics. All but the timber products would be conserved and supplied permanently in accordance with the dynamics of the eco-system. That is, to do exactly what the environmentalist movements say should be done. Some of the old style manual and manual-animal logging systems were near zero in impact, but the scale on which, and the circumstances in which they can be applied, almost rule out high volume output operations. But with helicopter logging now a technically feasible system, large scale near zero impact, commercial scale, timber harvesting is no longer an impractical ideal. At the technical level, eco-system management can thus incorporate timber production as a subsidiary and conditional use. The important thing is the condition: near zero impact logging.

Its economic feasibility depends, however, on the effect that the presumably higher cost raw material supply associated with near zero impact logging, whatever way it is done, would have on the markets for timber and wood products. Higher costs may lead to higher prices, higher prices may lead to lower sales volumes or higher costs for logging may have to be offset by lower costs elsewhere, such as lower wages or lower royalties or absorbed by lower profits. The possible economic effects have not yet been explored in any objective way, partly, I suspect, because the need for near zero impact logging has been dismissed rather than considered, let alone accepted. Instead, the emphasis has been directed towards reduced impact logging, logging that has a lower impact on the environment but no marked impact on costs. As long as this palliative, rather than drastic correction, is considered to be all that is needed, the economics of sustainable forest
management will continue as business as usual, requiring, perhaps, slight modifications, but nothing fundamental.

But sustainable forest management is a drastic change, there can be no doubt about it; timber as a conditional rather than a primary use is, on its own, enough to guarantee that, and the arbiters of what is accepted as sustainable forest management are not the members of the forestry profession or the timber industries and interests or the politicians. Those arbiters are the final consumers of forest products and they are not going to believe that forest practices, which the environmental groups tell them are unacceptable are good enough, because they are as low in impact as the forest industries say they can afford. Sustainable forest management as eco-system management is the norm demanded. Apart, to some extent, for plantations, it would be a dangerous piece of self-delusion to expect much in the way of compromise on that standard. This implies that there is a big research program ahead for the production economics of timber or wood in general, just to adjust to the drastically different emphasis of wood, even from plantations, as a conditional forest use.

The situation is less traumatic with the economics of State forestry. Management for the public goods services of forests implies, virtually by definition, that forests are left intact or, at the most, subjected to no more than temporary, light and scattered disturbance only whenever and wherever management interventions are called for or warranted in order to protect or improve the flow of public goods. Eco-system management, in other words, is, institutionally, already the norm.
Within the socially essential minimum resource, there is really no alternative to sustainable forest management. Thus, with timber a by-product, there is no compulsion in State forestry to harvest and utilise it, even if the expected return from timber sales seems likely to exceed, by a considerable margin, the financial and social cost of near zero impact harvesting. The fundamental research program for fitting timber into a multiple use management system may come in handy some day. But it is by no means the essential pre-requisite that it is from the perspective of timber production per se.

Several interesting consequences follow from these findings regarding the economics of sustainable forest management under State forestry. One of the most surprising is that it could mean that, if efficiency is defined in terms of profitability, the State rather than the private sector is the more efficient producer of standing timber. This heretical idea follows from the fact that production of standing timber, as a by-product in State forestry, is a no cost process. The cost of timber harvesting to the near zero impact standard could (‘would’ according to the free market dogma) be higher if the State does it directly, although probably not by much if the State carried it out through private contracts. As a result, the net residual value available for stumpage (or royalty) provided it is greater than zero, would, relative to the cost of production, represent a near infinite rate of return over cost. Few private or industrial growers could come near this level of profitability.
There is, of course, another obvious proviso. This is that the timber produced as a by-product has to be that, no more than and no different from that, which is unavoidably grown in forests managed solely for the Category I public goods. Any additional costs incurred in specifically producing timber of a higher value or in higher volumes or at faster growth rates does not qualify for treatment as part of the no cost process. The investment thus involved would, in principle, be subject to the same sort of appraisal as it would be in a private or industrial forestry context. Or it should be, unless there is some case for the additional silvicultural treatments under the public goods rubric. And this is, I suspect, even more dubious than the already dubious case for treating timber production in State forestry as a public good.

The convention on the conservation of bio-diversity, however, completely rules out any special silvicultural or management treatments aimed specifically at timber production. It takes no especially strict or excessively literal interpretation of the convention to deduce that this follows from the requirement under sustainable forest management to maintain the integrity of the forest eco-system. In effect, in State forestry there is no option but to accept whatever timber is grown as a by-product without special effort, regardless of what the public goods status of timber production may suggest to the contrary.

With plantations a limited exception to the bio-diversity requirement, there may thus be some justification for the State to invest in
plantation development and management in order to fill the gap left by inadequate volumes or qualities from the natural forests. The characteristics of the economics of State forestry, especially the social discount rate, which makes for a low cost if not a no cost process, may then be applicable. Whether it is depends on the validity of the case for timber production being treated as a public good. And only institutional considerations can give that proposition any credibility. But where they do, then there is another dimension to the economics of State forestry.
Plantations as public goods

The possibility that plantations for timber production may be regarded in some circumstances in some States as public goods extends the economics of State forestry beyond the socially essential minimum forest estate. Nevertheless, whatever the circumstances whereby timber production plantations are accorded a public goods status, they hardly qualify as a Category I public good. The principal characteristic of public goods in that category lies in their role as part of the permanently essential infrastructure of the economy or in support of it. In contrast, the determination that timber production plantations are a public good is a politically determined decision and can be over-turned at any time by another political decision. The circumstances propelling the policy could be social - the maintenance of employment or of regional stability. Or timber resources may be regarded as an instrument for accelerating economic or social development, nationally or in specific backward areas. On the other hand, the circumstances could be macroeconomic - the high significance of the wood based industries to the national economy, or they could be strategic - to ensure the adequacy of timber supplies for defence works in time of war or to reduce dependence on foreign sources.
None of those reasons alone or in a combination would make timber production a permanently essential public good. Timber production as a public good is actually a relatively temporary reaction to a relatively short-term state of affairs. Economies, even more so than eco-systems, are in a state of more or less continuous change, under the impetus of their own development or under pressure from other countries’ development or from the diffusion of general technological change. Although there is likely to be a rather prolonged lag in the response time, eventually the political perception of timber production as a public good could be cancelled (New Zealand being the classical example) with changing economic conditions or a changing dominance in political ideologies. When this happens, State plantations for timber production may continue in State ownership long after they have served any original public purpose they may have had, but by then, any special economics of them by virtue of their public goods values would have long lapsed.

At the most, therefore, the concern prompted by the special and temporary circumstances justifying State timber plantations is with a Category II or III public good, not a Category I essential. Timber production as a public good is just another example of a set of lower caste items, which in the domain of public goods are, in effect, second-class citizens. How far into the future the justification might last for the State to supply or ensure the supply of lower caste public goods depends on the specific circumstances in the State concerned. However, it is rarely likely to be so long as to warrant an SDR reflecting equal priority applying to the present and to all future
generations. That is, a social rate of discount may apply, but it is not necessarily zero, as it can be with Category I public goods.

Two qualifications must, however, be registered. The first repeats a point made in Chapter I. While the State must ensure the existence of forests to guarantee the supply of certain public goods, there is no necessity for the State to own or provide those forests. State regulation of private forests and/or State assistance to private forest owners may be enough. But if the State does choose to establish and manage all or some of the plantation resource required by timber production as a public good, the relaxations to standard economic analysis valid for Category I public goods no longer apply. Some may, partially if not fully, but never all.

This leads on to the second qualification. The economics of State forestry in relation to Category II and III public goods is much closer to the type of economic calculation appropriate for private and industrial forestry than it is to appraisals involving Category I public goods. Nevertheless, in applying this to State timber plantations, two big differences have to be accommodated. They are:

i) the end product is not the timber itself but the public goods services that the timber produced can eventually provide, and consequently

ii) a value for the public good service provided by the plantations has to be credited on the benefit side of the calculation.
The economics of second caste public goods

All that is needed, therefore, for economic analysis involving the categories of public goods that could be collectively described as second-class or second caste public goods, is to incorporate those two differences into the standard techniques of production economics and investment appraisal. The modification should then fit timber production as public good since it is clearly within this class. Timber production plantations as a public good have, however, some characteristics that may justify them being treated as a special case of public good.

At first sight, they seem to have a much greater potential to be fully self-funding. Some other Category II and Category III public goods, such as hunting, could, in fact, be almost completely restricted to those who are prepared to pay for access to the forest for such a use. The charges too, could, in principle, reflect the full cost of providing the wildlife resource. Others, such as forest-based recreation, also have a potential for excludability and therefore for imposing charges for the corresponding use of the forests. Hiking, fishing, camping, wildlife and scenic viewing, relaxation and picnicking, for instance, involving access within the forest, are examples. And they, again, could be priced to reflect the full cost of providing the service. The problem is to estimate, even roughly, the full cost of the public good. As joint products of the provision of Category I public goods, there are no cost outcomes, except for any special measures deliberately taken to enhance the quantity or quality of the service. These costs
could, however, be identified, isolated and measured, and fees assessed for full cost recovery.

But with some services, it is either physically impossible to exclude those not prepared or not able to pay for the service, or it is not a feasible proposition to try. Viewing of the forest landscape from outside the forest or the benefits of the public safety effects of fire protection are typical examples. While both may, in some circumstances, be counted as Category I essentials, they are, in any case, a rather different sort of second-rate public good from those in which excludability is feasible.

**The efficiency of State plantation forestry**

With timber production plantations, there are no such complications. Even though the timber is grown only for the public purposes, it is expected to serve, and not for the timber itself, all of the measures undertaken are specific to the growing of timber. The costs are clearly separable and the outputs identifiable, measurable and conspicuous. Those who do not want to pay for the timber grown can be totally excluded at all points in the production chain. Full cost prices can be calculated precisely, fairly accurately and simply from recorded costs and measured output. State owned and managed timber production plantations as public goods are, therefore, feasible in all respects, as fully funded self-financing investments, once they reach a merchantable stage of development.
Moreover, they could have the further financial advantage of being more than competitive with comparable private sector plantations. Two reasons underlie this possibility. The first is that, as their purpose is entirely social, profit is not a necessary component of pricing of the timber sales as it has to be, either directly or indirectly, in the private sector. The second reason is that the cost of time is much lower if it is calculated on the basis of an SDR lower than the range of market rates of interest. Some idea of the magnitude of the combined effect of these lower cost advantages is given by the following comparison.

The not entirely hypothetical calculations in the following table are made on the basis of:

1) Accepting but not endorsing the article of faith that holds that the public sector is inherently less cost efficient than the private, its costs of plantation establishment and management are assumed to be 25 to 30% higher.
2) The before tax required rate of return on investment in the private sector is 15% p.a.
3) Both adopt a rotation of 30 years and expect a final growth of 15 m$^3$ per ha.
4) The market discount rate is 8 to 9% corresponding to a real (net of inflation) rate of 6 to 7%.
5) The social discount rate is 0.5 to 1.0% lower than the lowest market rate.
6) The cost per m$^3$ of growing the timber is estimated as the compounded cost, to 30 years divided by the volume grown over the rotation. (For simplicity in exploring the point,
intermediate silvicultural treatments such as thinning, pruning or fertilising are omitted.)

In those circumstances, the cost per m$^3$ of growing timber under the two ownership and management tenures are calculated as in Table 17.1.

**TABLE 17.1** Costs of State and private plantation grown timber.

<table>
<thead>
<tr>
<th>Item</th>
<th>Compounded at interest rate (% p.a.) of</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.0</td>
</tr>
<tr>
<td><strong>Private Plantation</strong></td>
<td></td>
</tr>
<tr>
<td>Establish. @$1000/ha</td>
<td></td>
</tr>
<tr>
<td>Ann. maint. &amp; mant @ $50/ha/yr</td>
<td></td>
</tr>
<tr>
<td>Total (equiv.invest.)/ha</td>
<td></td>
</tr>
<tr>
<td>Profit required (15% on investment)</td>
<td></td>
</tr>
<tr>
<td>Total growing cost</td>
<td></td>
</tr>
<tr>
<td>Total growing cost / m$^3$</td>
<td></td>
</tr>
<tr>
<td><strong>State Plantation</strong></td>
<td></td>
</tr>
<tr>
<td>Establish. @$1250/ha</td>
<td>4682</td>
</tr>
<tr>
<td>Ann. maint. &amp; mant @ $65/ha/yr</td>
<td>3965</td>
</tr>
<tr>
<td>Total (equiv.invest.)/ha</td>
<td>8647</td>
</tr>
<tr>
<td>Total growing cost</td>
<td>8647</td>
</tr>
<tr>
<td>Total growing cost / m$^3$</td>
<td>19.2</td>
</tr>
</tbody>
</table>
The example can hardly be claimed to prove, beyond all doubt, the greater efficiency in terms of the cost of growing plantation timber of the State. But it cannot be dismissed as an impossibility, even allowing for it being less cost effective in any of the component operations. The proposition is so politically incorrect that it must be attacked by the orthodox. The cost advantages, especially the social discount rate, could and probably would be advanced, not as an argument for the State undertaking a plantation program, whatever the social or political purpose underlying it is, but against it. After all, it can be easily represented as a clear case of unfair competition, a crime of which all lower cost competitors are always presumed guilty. In the case of the State, the crime is doubly heinous; the State, by the dogmatic definition, cannot be more efficient than the private sector. If it seems to be, it must be cheating.

Much of this cost advantage comes through the social discount rate. Hence, it is the case for or against the use of an social discount rate lower than the range of market interest rates is crucial. Actually, an social discount rate lower than the range of market rates is simply an indirect way of bringing the value of the social benefit from a public good into economic calculations. The alternative is to add in directly a sum representing that value. There are difficulties with both, but either way, they can only be avoided by denying that an investment can produce a social value over and above the strictly financial values. In other words, to rule out the existence or even the possibility of public goods and externalities. Very few economists of any persuasion seem prepared to go that far, although some do seem to rate them of
relatively minor significance. The problem then is not whether to use an social discount rate. Rather, it is whether to use an indirect valuation of the social benefit via the social discount rate or to make a direct estimate of the sum of the flow of services from the public good that produces the social benefit.

**Social discount rate or not? If yes, what?**

Typical of the view that an social discount rate is not a valid way of allowing for social valuation is that of Fuchs & Zechauer who advocate, as quoted by Price (1993), increasing the values on the benefit side. This means adding on the benefits side a value for the sum of the flow of the non-monetised services from the public goods and/or, implicitly, on the cost side, to add in the sum of the flow of the external costs of not providing the public goods or of the external costs of what are identified as public ‘bads’.

This would mean in the example of Table 18.1, adding an estimate of the per ha. value of whatever social purpose is served by the State plantation. The implicit amount in the example is $289 per ha. at the 0.5 % social discount rate differential or $391 at the 1% differential. However, it is not likely that the valuation would be worked out as a single hectare figure in the first instance. A total value is more likely to be that assigned to the whole program and the hectare figure derived from that. On a program of 100,000 hectares, the derived value from the social discount rate differential would be around $30 to 40 million. How close this level is to the politically based estimate is
anybody’s guess. The chances are that the figure would be estimated so as to justify the program at a less disputable discount rate. Taking this as a 6% real rate (the lower end of the market range assumed in the example), then the social value, which would need to be added in for the public plantation to break even with the private, is around $120 million. It seems from this example that a much higher valuation of the social component would be needed for the State to appear as the lower cost producer.

This approach would clearly be favoured by those who believe that the State cannot be more efficient than the private sector. And since it is the social discount rate that gives the opposite result, it vindicates their view that the social discount rate is an invalid technique. But it is still only a matter of opinion. Some less subjective way of estimating the total social value of the State plantation program is needed. But is there one?

**Value of State plantations as a public good**

The public good value of a State plantation program is derived from the services it is expected to provide. To put a monetary value on strategic reasons such as defence or security of control over raw material supplies is really a matter of guesswork. Strategic reasons lend themselves to manipulations, which will produce the desired predetermined conclusion. The acceleration of national economic development is, perhaps, a little less subjective, but its quantification as a monetary value is still largely a matter of guesswork. But with
employment, regional or community stability and, perhaps, development, some relatively objective monetary quantification seems possible.

The several levels of implied social value for the plantation program in Table 17.1, namely $30 to 40 million on a social discount rate basis to $120 million on a total sum basis are the sums over the whole rotation. On an annual basis, they amount to $1 to 4 million. Against this, the program could be expected to generate direct employment of around 7500 as calculated from the employment ratios in the (Australian) Ministerial Council document (1997) ‘The 2020 Vision’. By comparison with most forms of investment for the generation of employment, the investment of $5,000 to $16,000 per job generated is relatively inexpensive, especially if the employment multiplier is added in. The equivalent rural population effect would probably amount to at least 20 to 30,000 so that the public good result in terms of rural community stabilisation or development would also appear to be worth the annual public cost.

The catch is, of course, that the employment and associated social and developmental benefits do not eventuate until the end of the first rotation, which, in this example, is thirty years into the future. In the meantime, any employment effect is quite minor, perhaps little more than 200, judging from the employment norms in the Ministerial Council document. An investment of $4 million dollars a year to employ 200 people, giving an investment cost of $20,000 per job generated during this period, is nothing like as attractive as that for the
program once the wood starts to flow. But it is still relatively inexpensive compared with most employment creating investments. And if the 200 would have otherwise been on unemployment relief payments, the additional public cost would actually be much less. All of this, however, has to be set against the very real possibility that by the end of the establishment rotation, the situation that initiated the social objective of the program may no longer be obtained. By then, the social needs on which the social benefits of the program were based may no longer exist or it may not be so big or, if it is still there, it has surfaced somewhere else in the country. On the other hand, if the outlook for employment generally is as Rifkin (1995) fears, then even bigger work creation programs may have become necessary. But if over the same time the markets for forest products have changed so that demand has not developed as anticipated thirty years earlier, timber production plantations may not be a useful solution.

So the problem of time comes up again. It could be argued that the thirty years, hence benefits, should be discounted to find their present value or to give an estimate of the equivalent number of present day jobs. But then, the problem of the appropriate discount rate re-emerges. If the valuation of the social public good is estimated indirectly by an social discount rate, then the appropriate rate is a partly arbitrary, bounded guess. If it is done directly by adding in an annual or total sum, it involves a largely arbitrary guess. If it is done seemingly objectively through whatever quantified calculations are possible, the result turns out to be a camouflaged, partly arbitrary guess. And to eliminate the waiting time before the quantifiable
results can possibly eventuate, a discount rate has to be invoked. It all seems to finish up in that irresolvable circularity of round and round the mulberry bush.

The problem is not so acute with the other second caste public goods. As a rule, the forests to supply them already exist. The problem associated with the long establishment periods no longer arise. While there may certainly be prospects for investment to enhance the quality or quantity of the non-wood public goods they supply, these do not introduce any comparable difficulties if the choices concerned are at the third level of the economic problem as listed by Duerr (1949). But with the second and third levels, the difficulties return. Adjustments have to be made for any differences in timing, and the time profiles between investment possibilities involving choices between forestry and other forms of land use or between the alternatives available within forestry. And here the discount rate comes back in; in the end, it is just unavoidable. So the economics of State forestry for the supply of other second rate public goods is only partially simplified relative to that for timber production as a public good.
18. END OF STORY - WELL ALMOST

Where have we reached?

The story started out with the commonly felt dissatisfaction of foresters with the direction that an economic analysis of forestry seemed to be pushing them. The answer they found was, in effect, to ignore it. But the story they were getting comes from only one of a number of plausible explanations of economic behaviour and phenomena, and it is, moreover, a misapplication of that one anyhow. Other versions of economic theory seemed, on examination, to have the possibility of being less antagonistic to ‘sound’ forestry. A combination of two of these in managerial, institutional economics seemed to be less contradictory of the reality underlying the economics of State forestry.

However, in the neo-laissez faire political philosophy now (the 1990s) prevailing, the institution of State forestry itself could be an anachronism. But unless the concepts of public goods and external effects are dismissed entirely, even the bare minimum recognised, as perhaps, in Adam Smith’s (1776) three ‘duties of the sovereign’, still leaves a place for State forestry as safeguarding the supply of protection forestry services. They are, in effect, like defence and law, part of the social and economic infrastructure. Timber production, held by many foresters over the last half-century or more to be the main purpose of forestry, cannot be counted as one of those services. Nevertheless, the almost co-terminus expansion of the economics of
forestry has developed as largely as the economics of timber production forestry. It may, therefore, be almost irrelevant to State forestry in which timber production, per se, has no place. Moreover, forest economics has developed from the same neo-classical theory base as the currently dominant version of economic theory, in which the State as a producer of commercial goods is an undesirable aberration. This is hardly likely to provide an appropriate basis for exploring the economics of State forestry.

There is an even stronger additional reason for rejecting neo-classical (mainstream) micro-economic theory as the theoretical base for a managerial economics of State forestry. Managerial economics is obviously a normative form of economics. If it has a purpose, that purpose must lie in helping managers decide what they should do in situations where they have some choice. Yet amongst the various superiorities attributed to neo-classical micro-economic theory is its positive orientation. That is, it is concerned with what is, not with what ought to be. In other words, it has nothing to do with the main concern of management. Almost automatically, it disqualifies itself as a basis for managerial economics.

Another almost automatic disqualification arises from the criterion whereby alternatives are compared. In mainstream micro-economic theory, the choice indicator is profit, with the preferred alternative being that which maximises the expected profit. But profit is not a main objective in State forestry. It is not, in fact, even a relevant one. The objective is to make sure that the service or services that
constitute the public goods requiring State intervention in forestry are supplied in the amounts and qualities and locations needed. On the other hand, in the private sector with which the neo-classical theory of the firm is mainly concerned, goods or services are produced, not for their own sake, but in order to make money. In State forestry, the public good, not the profit, is the objective. An analytical structure based on maximising profit hardly seems to be an appropriate basis for an economic theory of State forestry.

These differences are now reinforced by the internationally promulgated imperative of sustainable forest management. This is most fully and most easily achieved by leaving forests intact, or at least imposing on them no more disturbance than would occur in nature. As a result, timber production is reduced to a conditional use, permitted as long as it occasions no permanent or irreversible diminution of the quality or quantity of the services provided by intact forests. Timber is no longer the primary or even just the important forest use that it is in forest economics derived from the neo-classical tradition. It is an unavoidable by-product arising in the course of the joint production nature of forests for the provision of the public goods services. The fact that it has been grown does not mean that it has to be harvested and utilised. Only if the revenue generated is expected to be considerably greater than the cost of harvesting to the near-zero impact standard required under sustainable forest management does timber production become a possible part of State forest management.
Plantations established and managed specifically for timber production are accepted, but even then to a limited extent only. Simplified eco-systems with the consequent reduction in bio-diversity and the accordance of a high priority to timber production are recognized as necessary and unavoidable, but only on the condition that there is no diminution in the other non-wood services.

The implications for an economic theory of State forestry are, therefore, rather drastic. First, what to produce, the initial question in production economics, has no significance. There are no optional outputs to choose from. The public goods services to be produced are given by the infrastructural needs of the economy. What they are and the combinations in which they are required may differ between economies and even within a given economy, but whatever they are, they have to be provided in specific quantities, locations and to specific qualities.

The second question in production economics of how to produce is also given, albeit within broad limits, by the sustainable forest management imperative. The requirement to make no permanent irreversible changes to the dynamics of the natural forest eco-systems limits choice in silvicultural and management systems for natural forest management to those that are almost identical to what happens in nature. But with timber production plantations, the relaxation of the bio-diversity requirements allows greater flexibility in the choice of silvicultural regimes. The choice of species is less constrained, whilst the methods for stand establishment, regeneration and intermediate
treatment are not subject to the imperative of maintaining the integrity of a natural forest eco-system.

Inferences that might be drawn from this to the effect that the economics of State timber plantations is somewhat different from that of State forestry in natural forests and closer to the mainstream version are, however, only true at the most. The sole economically valid justification for State timber plantations derives from any public good value they may have as solutions to social or strategic problems, which may, for the moment, be perceived. The reservations about mainstream economic theory in respect to natural forests as suppliers of public goods, therefore apply, almost equally, to plantations.

But all public goods provided by forests are not the same. The force of the public goods argument varies with the intensity of the need served by the service. Category I public goods comprise those services that would be almost universally and unanimously regarded as socially essential, but even then, only up to the minimum forest resource required to meet that need. These are the only ones to which the reservations about mainstream theory apply in full.

Many people would claim that the Category II public goods are also essential, but the recognition accorded them is nowhere near unanimous or universal enough for them to be ranked as equivalent to Category I services. Some and perhaps all of the local public goods (Category III) could, however, be regarded as essential in the local context. Nevertheless, even if the claim is admitted, the needs that
rank as locally essential could well be transitory. Local economies tend, with economic and social development, to become more closely linked in with the broader national and international economy. As a result, they become less dependent on local subsistence resources, while, at the same time, those resources become more open to the wider population and to commerce. So in the economics of State forestry, it is probably better to rearrange the three categories as priority classes. These have no more than a rough degree of correspondence to the Categories. Category I is certainly priority one in State forestry, up to the point at which the socially minimum resource is firmly established. But any extension of the forest resource for the supply of Category I services beyond that socially essential minimum, at best, joins the Category II services in priority two. However, Category III services can become priority one, if national and, especially, international pressures for the local community, human rights are politically strong enough and severe to force action, but in all probability, this high priority status is a temporary affair.

The economics of State forestry for the priority one public goods is fairly simple. Some large areas of economic theory have no place. Costs are important, but not revenues. The appropriate discount rate is an social discount rate of zero, but this is of little importance, as investment analysis in which the discount rate is a major factor is not applicable up to the socially essential minimum level of forest reserve. Pricing of merchantable forest products may have some significance, but not in any profit making sense. Its only place is to guide decisions about whether the sale of jointly produced forest products should be
made, and if so, what is the minimum acceptable selling price to set or from which to negotiate upwards? Then the limits set by sustainable forest management on the extent to which the forest eco-systems can be manipulated leaves little room for choice between different ways of managing the resource to improve the flow of the specified services. In effect, the scope for choice is so narrow that economics or economic theory as ‘the science of Choice’ has almost no room to operate.

On the other hand, there may be more scope for choice within the priority two public goods, and hence, for economic theory in this sense. For example, choice, to some degree, can and has to be exercised between different recreational uses of forests or between different bio-diversity or conservation values, whenever they are competitive and involve no risk of undermining the long-term infrastructural viability of the economy. Investment analysis could then come into play in relation to choices between alternative things to do and alternative ways of carrying out the selected option, provided that there are feasible options within the limits of sustainable forest management. This would make the question of the appropriate discount rate a relevant issue. While there is nothing like the same case for an social discount rate of zero as there is with the priority one services, there may still be a case for an social discount rate. The debate over social discount rate, market rates and lump sum allowances as ways of allowing for the value of non-priced services would thus become a significant component of the managerial economics of State forestry where priority two services are an issue.
Excludability is also a possibility for some of these services, e.g. recreation inside the forest can be restricted to those willing and able to pay for access and use of facilities, so that pricing in this respect has a place in the economics of State forestry. Revenues thus become a factor as well as costs. But the same qualifications about profit as a criterion and about the pricing of jointly produced commercial forest products apply just as strongly here as it does to the priority one services.

**Where is the institutional economics in this?**

At this point, it is almost obvious that no mention is made of the substitution of institutional economic theory for the mainstream neoclassical version. Yet so much fuss was made to develop this point that it occupied the first half of this tome. The reason is that while a managerial economic theory of State forestry does differ profoundly from the standard treatments of the economics of forestry, the difference, in practice, is more in terms of underlying philosophy than in the analytical techniques. The philosophical difference is that the institution of State forestry itself is outside the private net gain focus of mainstream theory, and that getting rid of the State intervention cannot accommodate its purposes. This institutional approach imposes a different criterion. Profit is not the choice indicator; it is not even relevant. Hence profit maximisation, the basic decision tool of neoclassical theory, is meaningless in State forestry. Nevertheless, the techniques are much the same. For example, stumpage appraisal as a means of estimating the maximum price buyers would be prepared to
pay for standing timber is still a valid technique. The real difference lies in the purpose for which the estimate is used. In State forestry, it is part of the triggering mechanism for whether to sell or not; in commercial timber production, it is also a guide as to whether to invest, reinvest or continue in forestry. No such choice is open in State forestry. The option is whether to sell, not whether to grow.

The priority two services offer some scope for pre-investment analysis involving production alternatives. There are some options, but timber production is not one of them. It is still no more than an unavoidable by-product of forest management for public goods services and its pricing subject to the same considerations. But options can arise between different priority two services out of the competitive segment of the range of the corresponding output/output relationship (Clawson & Held, 1966). With the output of one decreasing as the output of the other is increased, a management decision is required to settle where the balance is to be aimed for. Options can also arise from the complementary output/output relationship, where the output of one service can be enhanced without affecting the output of the other. If the enhanced output involves additional expenditure in forest management, a management decision is then called for as to make the investment in the appropriate treatment or not. And similarly where different treatments are possible for enhancing the output of a specific service. All such options are, of course, subject to the limits of sustainable forest management, and that greatly narrows the number and range of the options. But in any case, where options do survive
that test, the choice between them depends on a pre-investment appraisal.

In principle, the technique of the appraisal is unchanged by the different institutional setting of State forestry. Subtract the sum of the discounted costs over the duration of the investment from the discounted sum of the benefits and compare the net result with the pre-determined criterion and rule for acceptance or rejection. The real differences compared with standard investment appraisal lie first in the choice of the discount rate, and secondly in the fact that all or nearly all of the benefits are non-monetary and therefore have to be converted to shadow prices for comparison with the costs, which are mostly in monetary values already. The first difference involves a matter of principle: does a social discount rate apply, and matters of fact: what is the SDR if it applies or the appropriate market rate if it does not?

The second difference regarding the valuation of the public goods outputs, is on the other hand, largely a matter of degree rather than of principle or of fact. With the essential services comprising the priority one public goods, the valuation problem is irrelevant, partly because there is no alternative but to provide them, or under sustainable forest management, for how they are to be provided. But within the second priority group, there is not only the possibility of choice between competing services and ways of supplying them, but opportunities also exist for, at least, partial market pricing. Within the group, there is a great deal of variation in the extent to which these opportunities
apply to any specific type of service. Thus, some will resemble priority one public goods in having none, or very few alternatives, or very limited potential for excludability. Others offering a wider range of choice or potential for excludability could have some resemblance to private goods.

This means that the managerial economics of State forestry has to be quite flexible in the techniques it uses. No one method will suit all situations either in general or in particular circumstances. Thus in assessing alternative regimes for the maintenance of landscape values in Switzerland, the limits on choice for a priority one good apply. That is, the relevant discount rate whereby time and timing differences are taken into account is an social discount rate of zero, while the silvicultural and yield regimes are restricted to those that have no visual impact on the scenery. Where, on the other hand, forested landscape, although significant, is less fundamental to the national economy, as in, say the U.K. or parts of Australia, an social discount rate may be appropriate, but with a rate of zero, could hardly be justified. In this sort of situation, small scale clear felling with artificial regeneration or shelterwood type natural regeneration systems might be valid alternatives, provided there was no blanketing of hillsides with monocultural plantations of non-native species. Benefit/cost analysis similar to those in the private sector could be appropriate, but with additional sums to allow for any vastly different social impacts that might be expected.
The inconclusive conclusion

It is easy enough to concede that there are some very big differences in principle between a managerial economic theory of State forestry and the standard neo-classical version applied to forest economics generally. But in spite of all the fuss made in the first half of this work, the practical effects are relatively minor. The differences in principle combine with the requirements of sustainable forest management to take the major area of concern in State forestry, the priority one public goods services of forests, almost entirely outside the scope of economic analysis as a theory of choice. But beyond the socially essential minimum forest resource, a wider though still narrow range of alternatives does exist. Here, with appropriate and adequate allowances for operational differences, the choice analytics of mainstream economic theory is applicable. The allowances to be made are, however, fundamental. They are the result of the differences in principle; the differences between a normative, institutional approach to the supply of a mixture of pure and quasi-public goods compared to the positive (allegedly) neo-classical approach to the supply of and demand for private goods. The basic techniques in summing benefits and costs may be much the same, but the decision criteria and rules are miles apart. And therein lies the need for a different theoretical approach to the economics of State forestry.

There are, however, some other differences that need to be recognised, and, if possible, incorporated in managerial forest economics. The first
is that each decision in State forestry is in some degree unique. The scope and composition and location of the socially minimum forest resource show this country-specific nature to perfection. The combination of services that make up the socially essential minimum resource varies very much between and within the economy in question. In south-eastern and south-western Australia, the hydrological services of forests provide the main justification for State forestry. They are much less significant in the moist tropical regions of Australia or in the alpine regions of New Zealand. But the focus of the interest in catchment hydrology can differ between different parts of the regions where it has this general importance. The services of the forests in south-eastern Australia are valued mainly for the quality of domestic water supplies from the forested catchments for Melbourne, for the maintenance of summer stream flow in the forested catchments of the Murray-Darling rivers system, for the reduction and control of salinity by forests in the downstream reaches of that river system, and in the rivers of south-western Australia. In Central European countries, the landscape values of forests in combination with agricultural and alpine landscapes as viewed from outside the forests are now added to their original value in catchment hydrology and avalanche control, but to justify State control over largely private forests more than State forestry itself. In New Zealand, most of the high country catchments are above the sub-alpine forest zone so they are of relatively minor importance in catchment hydrology, but they are regarded as having an essential value for soil stabilisation (McKelvey, 1994). But in the USA, the Organic Forests Act sets the safeguarding of navigation in the inland waterways as the prime
purpose of National forest reservations and management (Dana, 1957). But in sahelian Africa, hydrological or landscape services are of little significance. Afforestation along the southern edge of the Sahara is seen as essential as a means for combating the southward spread of the desert, and it is recognised that, if it is to be done, it will have to be done by the States concerned or largely at their expense and with their continuing support and, perhaps, under their control.

This sample of examples brings back a point that was made much earlier in this work. This is that State forestry is not necessarily the only feasible instrument for ensuring that the public interest values of forests are supplied or safe guarded. In Europe and Japan, for instance, it is clearly evident that State regulation of private forestry can be highly effective and possibly less risky politically (an institutional consideration). Or, as advocated by the many community forestry and public participatory groups, that promotion and support by the State to private or community forest programs may be more effective than direct action and, in fact, essential for success. These, in turn, confirm that Duerr’s second level at which the economic problem of choice occurs in forestry, i.e. between alternative ways of doing whatever has been decided, in this case, to provide and manage the socially minimum forest resource is fully relevant, even for the priority one public goods.

But what appears to hold in principle is not so evident in practice. The balancing of costs against returns on which a solution to the economic problem depends in mainstream economic theory hardly comes into
play at all. Instead, the solution to the problem of how to organise resource allocation so as to ensure the supply of priority one public goods seems, more often than not, to be worked out in an institutional context. Habit, culture, public sentiment and dogmatic conviction are much stronger forces than the simply conceived economic factors.

For instance, the controversy over State regulation of private forestry, which engaged the forestry profession of the USA during the 1930s to the early 1940s, finished with the proposition being, on the whole, rejected. The individualistic sentiment, which characterises public opinion in the USA, apparently overwhelmed the fairly convincing case based on sustained yield principles for some control over the misuse and mismanagement of much of the private forest resource. In fact, as Gaffney (1957) argued, from the economic point of view whatever mismanagement there was, was more likely to lie with state and federal forest agencies. Yet the logical extension of this finding to the privatisation of public forests has been barely proposed let alone heeded in the USA, although that is where the modern push for a return to laissez faire originated. Smaller and less government apparently does mean no interference with private management, but does not apply to a change of status for the National forest estate. Nevertheless, the management of that estate is constantly under strong attack from conservation and industrial and even professional groups.

In Sweden, on the other hand, with little more than a third of its forests in State ownership but with a heavy dependence of the economy on its forest industries, has a long tradition of State
regulation enforcing sustained yield management on the non-industrial, private forest owners, in the national interest. Moreover, the State does not hesitate to strengthen measures when the raw material supply to industry looks like it’s being threatened. It even imposes a low interest SDR for investment analysis in private sector forestry.

By contrast, New Zealand, which for almost as many years, had a similar socially sensitive public policy has, in the name of the public interest, virtually abandoned the very big State owned plantation forest resource that had been built up, also in the public interest, but retains State ownership, virtually without active management intervention of the State native forest resource. The privatisation was a manifestation of the neo-laissez faire doctrine - less and smaller government - but the Resource Management Act, which came in around the same time, imposed wide ranging and powerful government controls over the management of private forests and the State plantations, quasi-privatised through the device of ‘sale of cutting rights’. In the U.K., whose government became another early ardent reviver of laissez-faire and strong advocate of privatisation, a few smallish State plantations were sold to private interests, but the government backed off selling, as it had intended, the bulk of its one million hectare plus State plantation resource. And this litany of contradictory mixtures of State and private ownership, of conflicting philosophies and ideologies and straight-out political horse-trading, extends well beyond those examples. Russia, a free market convert, seems to be sticking firmly to State ownership, but is not averse to joint ventures in forestry with foreign, private forest industry
companies. Australia, with most of its forests in State ownership, oscillates, depending on the state concerned and the State and Federal governments of the day, between partial privatisation, joint venture development, State regulation of the private forests and full old style State forestry.

All of the turmoil, hesitation, compromise, contradiction and illogicality, so clearly evident in the real world, just confirms that forest resource allocation is a matter for positive institutional economics. That is, for the economics of things as they are and not for normative neo-classical economics, i.e. things as the neo-classical economist thinks they ought to be. This reversal of proclaimed stances is perhaps another exemplification of the reversal of the alleged inefficiency of State forestry as a timber producer that comes when the joint production economics of State forestry are examined without prior commitment to the dogma of either the free market fanatic or the social true believer.

There are, however, several catches with this. The first is an apparent contradiction between the two pillars - institutional economics and managerial economics - of a managerial economic theory of State forestry. How can the positivism underlying the above view of institutionally determined resource allocation to forestry be consistent with a simultaneous and inherently normative stance of managerial economics? The second is that, for the most part, the controversy and the resulting illogical combinations of forest ownership, management
and regulation, have arisen out of timber production forestry, which is rarely, if ever, a valid justification for State forestry.

Any explanation for these paradoxes must have its source in the fact that the positive orientation concerns and decisions relating to the priority one services. These resource allocation decisions are institutionally determined; they are not managerial decisions. Certainly they set the framework within which forest management has to work, but with priority one public goods, especially under sustainable forest management, there is little scope for managerial choice. That scope does not really come in until priority two services become the issue. Even then, under sustainable forest management, the options are much narrower than they might be in private forestry.

The second difficulty about timber production forestry is a bit harder to handle. There was a time when timber production did provide an adequate and legitimate basis for State forestry. The post World War I forest policy in the U.K. could be such a case, as World War II demonstrated. But now, as a general rule, it is hard to see many instances where timber production can be validly accorded the status of a public good, even at priority two. That it has, nevertheless, been a dominant factor in the institutional structure for forest resource allocation, must therefore have a large component of historical accident in it. The first accident is that this, being the way that it has traditionally been organised and operated, must therefore continue to be. And secondly, perhaps as a result, most State forest agencies still see timber production as their principal responsibility. Although there
is no justification for the first and very little for the second, history and tradition can be powerful institutional constraints. New Zealand broke both of them, but no other country has followed that lead.

The greater efficiency of the State in timber production that comes from it being a by-product of forestry for the supply of public goods seems to provide a good reason for the State to continue in timber production. But the case only holds as long as timber production is not an objective. For the State, the standard philosophy in forestry, which treats the non-wood services as constraints in a management equation to maximise some aspect, be it volume or profit of timber production forestry, is completely erroneous. The boot is really on the other foot. The non-wood public goods services are the objective; timber production does not come in even as a constraint. Instead, such stringent conditions are imposed on timber production that it becomes a conditional use, not a necessary realisable factor in the equation. A managerial institutional economic theory recognises this reality; the mainstream version regrets it, and consequently, ignores it or condemns it. It is, indeed, as Goundrey emphasised almost forty years ago, ‘always dangerous to apply economic theory direct to the real world’ (Goundrey, 1960).
The previous chapter, as its title says, is not quite the end of the story and for two good reasons. The first is that too much is left out. Almost nothing, for instance, is said about macro-economics or new developments in macro-economic theory or about that significant feature of forest economics - international trade in forest products. The omission of trade is a fairly straightforward matter. After all, the essential public goods, which are the concern of State forestry, are not, on the whole, tradable services. Only one of the services - recreation - could, through tourism, be regarded, in a sense, as a tradable commodity, and it is hardly an essential service.

Macro-economics is another matter. Being concerned with the functioning of the economy within which the firm has to operate, it is of obvious and vital interest to its managers. Setting, as it does, the economic environment to which they have to adjust, or to the extent that they can, alter ideas about what the economy is doing and what it is going to do, have, unavoidably, an almost daily influence on management decisions about production levels and methods. And in the longer term, they constrain, if not largely dominate, decisions about future investments. Any theory of managerial economics, which did not refer to this as an important factor in business, is hardly likely to be much of a practical guide.
Macro-economic considerations in State forestry

However, a failure to give attention to macro-economic consideration is nowhere near as serious an omission in the economics of State forestry. The public goods, which are the objective of State forestry, are a part of the infra-structural foundations of an economy. Up to the point of the socially minimum resource, they have to be provided or safeguarded, more or less regardless of the state of the economy or its direction. Of course, in a crisis such as a large scale war, which threatens the survival of the State, the forests that provide these services can and probably will be temporarily sacrificed. Afterwards, however, investment in restoration and rehabilitation of the depleted public good forests has to be a high priority in any post-crisis reconstruction program. However, beyond the requirement for a social minimum resource and in the analysis of a sales policy for joint products, the future health of the economy plays the same role as it would in the private sector. Neither of these exceptions involve the core business, to use the modern jargon, of State forestry; in reality, they are no more than conditional outputs (optional extras, in effect). They are of no great significance to its managerial economics.

On at least two accounts, this is a bit of luck. First, the functioning of the economy is still somewhat of a mystery. At least, there is no fully accepted version of how it works and why it does the unexpected things it so often does. Certainly there is a dominant view - the free market doctrine - or, perhaps more accurately, several varieties of the dominant view. But these change almost as rapidly as changes of
fashion, and there are also plenty of strongly held opposing views. Davidson (1978) gave a convenient comparative summary of the versions then current, and there have been several additions since then. All of them seem to work at times, but there are plenty of times when they do not and even times when none do. In those circumstances, it seems pointless to attempt to give managers of State forests a usable guide to macro-economics, especially as they do not need it and it could not be conclusive anyhow. Actually, there is probably, as Drucker (1981) pointed out, a crying need for ‘a new economics’. So until one comes along, it hardly seems worth giving forest managers, even in the private sector, anything more than a slightly skeptical summary of one or two of the mainstream versions. At present, they would, perhaps, gain more from reading on the global politico-economic structure, than from studying any of the standard tracts on macro-economics.

So the second omission is that there is nothing about what this ‘new economics’ might look like, or indeed why Drucker believes that it is needed. As with the first omission, this may not, at first sight, seem to be all that serious. It is, after all, a matter of macro-economics, which, as just argued, is not especially relevant in the managerial economics of State forestry. A closer look, however, puts the matter in a different light. Drucker (1981) sees this new economics as having to combine the micro-economics of the firm, the intermediate economics of the nation and the macro-economics of the world. However, some years later, when Drucker (1986) expanded on the world economy component of this combination, he did so in a way that has come to
have special significance for State forestry. One of the points that he makes is that it is not the fact that the world economy is changing that matters, but rather that it has already changed. The world is well on the way to becoming a single global economy. Consequently, the power of States to influence domestic economic affairs and to protect, let alone advance, their own interests in international economic affairs, has already been eroded and seems likely to continue to decline. This is certainly the case with forestry.

For the fact is that forests have become very much a global resource. But this has come about not so much by the globalisation of the world economy that Drucker sees, as by the political pressures of international environmentalism. To no small degree, the UNCED in 1992 came about through the urging and continuing pressure exerted by national environmental movements and their mobilisation of public opinion against logging in the tropical forests. The conference adopted sustainable development as the global imperative in resource use and management. Sustainable forest management is no more than the application of sustainable development to forests. Although no legally binding agreement on forests came out of the Conference, some of the binding international Conventions subsequently ratified, especially the Convention relating to the conservation of bio-diversity, providing a legal context for its enforcement. It is this conservation based international agreement on sustainable forest management, which has made forests a world resource, not economic globalisation. But the results are much the same. Forests as a global resource, rather like the global economy, remain in national control for the use and
management of national forests, but only to the extent allowed by extra-national forces. In effect, performance is required to meet the standards of sustainable forest management set by the formal international community (those States party to the Conventions linked in the United Nations and other inter-governmental agencies) and by the informal international community (the environmental and conservation non-governmental organisations).

The development component of the UNCED means that timber production is a necessary part of multiple use forest management. But it is conditional on doing no permanent damage to or diminution of the non-wood services. The incompatibilities in this formulation are reflected in the inability of inter-governmental bodies to reach an agreement on an operational definition of sustainable forest management. A legally binding Convention on forests, if one can ever be devised and adopted, will have to satisfy economic considerations associated with timber production, the timber industries and the timber trade and, at the same time, the political influence of conservation interests. The intense international activity that the legal aspects of sustainable forest management have generated hides, however, their relatively minor practical significance. Ultimately, it is the final end consumers of forest products who will determine the extent to which timber production continues as an important component of multiple use forest management. Their version of what constitutes sustainable forest management is the one that counts, not the one that may or may not be formally and officially decided. And at the moment, their version appears more likely to coincide with what the non-
governmental bodies determine than to be derived from official and industrial communiqués.

Positive economics and State forestry

Another reason for claiming that the narrative to this point is incomplete is that it is obviously a normative theory of the role of State forestry. A positive view might be quite different. After all, most of the world’s State forestry authorities still see timber production as an important function in its own right, if not as their most important role. The surprise expressed at the general public having a different and implicitly wrong view of the purpose of State forests from that of the foresters was a common reaction among professional foresters when the environmental attack on forestry commenced. And it also is still the dominant, though less overtly expressed view of the purpose of forests. The positive view of economic theory is that it is concerned with things as they are, not as they ought to be. Therefore, a managerial economic theory of State forestry must concern itself with the economics of the State in timber production as a principal product, because this is how State forestry agencies see it, not as a jointly produced but optionally saleable output of multiple use forest management.

From such a viewpoint, the economics of State forestry would be little different from the economics of forestry in general. Certainly there would be differences in detail, such as the accounts having to include credits for the non-marketed and non-marketable outputs and for the
beneficial externalities and debits for the disexternalities. There would, however, be no difference in the way that timber production alternatives and operations were to be evaluated and compared. The main thrust of the economics of State forestry would therefore be directed towards the valuation of the non-cash costs and returns in order to carry out social cost benefit investment analysis.

But this approach runs up against a fundamental contradiction. Since, almost by definition, publicly funded and conducted business operations must be less efficient than privately conducted ones, the State has no place in timber production. The policy conclusion, which then flows from positive economics, is that timber production forestry should be left to the private sector. The State should therefore withdraw from timber production and transfer its forests that are primarily devoted to timber production into private ownership. And since the remaining forests cannot help producing timber, that timber should not be utilised. But these are normative consequences. The positive view of the economics of State forestry thus leads to the extremist environmental opinion that public goods forests should be single use forests or, more correctly, multiple use forests from which commercial timber use is excluded. However, with helicopter logging, there is no technical reason for the total exclusion of timber production. Hence, the implication follows that if the timber is utilised, it should not be disposed of in competition with privately produced timber. This implicit acknowledgement that State forestry could be a lower cost form of timber production and thus, more efficient, runs counter to the market doctrine. If the public interest
does not allow State forestry to be discarded entirely, far better for the free market theory to prohibit the use of any timber jointly produced in State forests.

This is, in effect, the New Zealand solution. Good, no doubt, for the peace of mind of free market dogmatists and satisfying to those activist environmentalists who cannot accept logging, even near-zero impact logging. But how good is it for the economy to lock up resources simply to eliminate the possibility of embarrassing evidence or to quieten fanatics? That there is an opportunity cost involved seems to have had no bearing on the normative prescriptions drawn from the allegedly positive stance of the mainstream economic analyses of State forestry. Some might question whether economics is yet a science and could be right in deciding that it is not. Moreover, it might even give some support to those critics of mainstream economics who see its principal, though covert, purpose as providing a pseudo-scientific justification for the existing inequities in the social structure.

Whether these are justifiable explanations or criticisms of neo-classical economic policy does not matter much. What does matter is that managerial economics is inherently normative. An economic theory, one of whose key virtues, according to its practitioners, is that it is non-normative is thus automatically disqualified as an economic tool for the management of productive enterprises. The fact that, as Emmer (1966) demonstrated, the separation of positive from normative in neo-classical economics is neither sound nor successful
is, therefore as instructive as it is interesting. Suppression, distortion or manipulation of unfriendly evidence can be seen as legitimate tactics in the defence of an established position. They are not, however, science.

Criticism of this managerial account of the economics of State forestry on the grounds that its normative stance leads to an incomplete and probably inadequate account does have some validity. Certainly from the point of view of positive economics, the fact is that most State forestry agencies do, in practice, have timber production as a principal objective. But the prevailing policy consequence of this fact is that they should divest themselves of that function. The illogicality of this entanglement of a positive description with a normative prescription to change the structure is symptomatic of the inherent contradiction outlined above and discussed in detail by Emmer (1966). It simply goes to confirm that a normative and public goods orientation in the managerial economics of State forestry is both valid and logical.
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