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An Economic View Suggests that the Concept of Sustained Yield Should Have Gone Out with the Crosscut saw

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"... foresters should encourage thoughtful analysis of the alternatives to sustained yield."

Abstract

Some economists and many forest economists have analysed sustained yield concepts and found obvious deficiencies. Objectives of sustained yield forest management are not explicit, have limited value for modern decision making and may significantly retard economic growth and development, yet sustained yield is cherished by most forest managers.

Following examination of the advantages and disadvantages of sustained yield concepts it is concluded that controversy should be encouraged with the hope that improved understanding will develop. New and better ideas must be evolved. Nautiyal's economically efficient objective of maximization of the present worth of net benefits from forest lands deserves wider recognition and full implementation.

Résumé

"Du point de vue économique, la notion de rendement soutenu, en aménagement, aurait dû disparaître avec la sciote."

Des économistes et de nombreux forestiers-

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économistes ont étudié la notion de rendement soutenu et ont découvert des lacunes évidentes. On constate que les objectifs ne sont pas explicites, qu'ils n'ont pas tellement d'utilité dans l'application des théories modernes de décision, qu'ils peuvent même retarder la croissance et le développement économiques, et que la notion tient encore au coeur de nombreux administrateurs forestiers.

De l'étude des avantages et des inconvénients inhérents au concept de rendement soutenu, on conclut: il faudrait stimuler une controverse dans le but et l'espoir d'élucider cette notion. Des idées nouvelles et meilleures s'en dégageraient. L'objectif économiquement efficace de Nautiyal, d'aménager la forêt en maximisant la valeur actuelle des profits nets, mérite d'être plus connu et d'être appliqué intégralement.

Introduction

Only when we begin to look forward carefully in our efforts to intensify forestry, or when we become deeply concerned about the slow pace of economic growth and development in a region, do we begin to appreciate the limitations of the sustained yield concept. Since our session is concerned about new management techniques I hope that what I

say will lead you to critically consider sustained yield and its implications, and to join with me in the struggle for improved understanding and wider acceptance of the best possible goals for forest land management.

Perhaps, I am giving this paper because I can appreciate the arguments of both sides, the forest economists as well as the forest managers. It is obvious that sustained yield is not ideal. Actually it is just a vague idea that confuses decision makers. Yet because continuous production has advantages, and confused objectives often provide wide political and administrative flexibility, sustained yield concepts are firmly entrenched in Canada today.

Because economic growth and development must be encouraged by the best possible management concepts I think that controversy should be stimulated now to create new and explicit objectives.

Sustained yield is not ideal

Many of us have seen crosscut saws replaced by power saws and these in turn threatened by new technology in the form of clippers or shears for tree felling. With evidence of change all around us we ought to wonder about how long and how well can our ideas concerning sustained yield continue to serve us. Sustained yield principles were developed in an era when trees were felled and bucked with axes. I have seen that axes still are economically efficient in some underdeveloped regions of the World today. Yet, in North America most forest economists seem to believe that the axes in use when sustained yield was best suited to the needs of society must have been primitive — stone or, at best, bronze.

Joking aside, it is tempting to agree with forest economists such as Haley (1966), Waggener (1966) and Nautiyal (1967) who have argued successfully that from an economic point of view sustained yield is not ideal. They have thoroughly analysed the topic and drawn conclusions with which I agree. Their objective of **maximization of the present worth of net benefits from forest land** appears to be much more in keeping with modern ideas about forest land management (Nautiyal and Smith, 1967).

On the other hand I sometimes wonder if, perhaps, sustained yield is such a powerful concept that its advocates will simply absorb and incorporate in a renewed and strengthened body of wisdom the flexibility needed to preserve it. Many challenging questions are involved. Perhaps, the most nagging one is: How much attention should forest managers pay to forest economists? How important are economic views to those who control the power structure? Is it ethical to rock the boat? Does sustained yield have so much political appeal that it ought not be challenged? What does sustained yield really mean, what have foresters accomplished with it, could we have done better without it, do we need new and better concepts now?

My first awareness of the fact that economists do not regard the concept of sustained yield forest management with enthusiasm came as a distinct

shock. I felt challenges to its universal validity almost as deeply as the loss of an old and dear friend. To me sustained yield was a trusted idea that had withstood the test of more than a decade of seminars and technical sessions. My first real awareness of its shortcomings came when Moore (1957) questioned our conventional wisdom about sustained yield in his study of Canadian forest tenures and taxes. This occurred near the end of the golden age of innovation in sustained yield tenures in British Columbia. Farm Woodlot Licences had been offered to bona fide farmers, Taxation Act tree farm status conferred tax relief on those dedicating their land to sustained yield forestry; Forest Management Licences (later Tree Farm Licences) had evolved as partnerships of Government and Industry to encourage forestry in perpetuity; Public Working Circles and Sustained Yield Units had supplemented and replaced the Forest Reserve approach to perpetual forest management.

I remember well the disbelief and mild concern with which Moore's views were received by informed members of the forestry community in Vancouver in 1958. Even today, and in many ways, the Canadian professional forestry community ignores or resolutely resists the views of anyone who questions the idea that sustained yield should dominate our professional behavior.

Some managers insist that economic views just represent those of one kind of staff specialist, to be used or ignored simply as opinions advanced in his specialized role as advisor to the forest manager. Some foresters like to think that the forest manager is the one who really holds the power and uses it to make final decisions. Others tend to dismiss economic thinking by suggesting that many economists assume away the real world and appear to live quite happily making perfect decisions that have no place in the world as it is. A few foresters might suggest that forestry has such a special claim to a unique position in the public sector that general economic criteria need not be applied in forestry. Even forest economists take some interestingly contradictory positions on the question of sustained yield. I know of at least one who holds that the battle is won, that sustained yield has outlived its utility as a concept, that it therefore can simply be ignored, and that economists ought to concern themselves with better things.

Judging from our experience in British Columbia I cannot agree with his view. I think that we must maintain and encourage the dialogue between forest economists and foresters, especially forest land managers. We should often ask ourselves how well the concept of sustained yield has served us. Has it met the goals of forestry? Above all just what are the goals of forestry? Is there such a thing as an unchallengable ethic of good husbandry? Is it right to put the forest ahead of society? What must we do to improve the quality of living while striving for full employment, sound economic growth, and rapid economic development?

The Division of Forest Economics and Policy of the Society of American Foresters had an excellent

session on sustained yield at its Annual Meeting in Seattle in 1966 (SAF Proceedings p. 95-125). Canadian foresters are behind the Americans in recognition of problems in sustained yield. In a Forest Management Forum held a few weeks later at the Canadian Institute of Forestry meeting in Banff in 1966 there was little awareness of the economic shortcomings of sustained yield. None of the Forum speakers appeared to know anything about these issues. Although such panels seldom make good use of the literature, I still found it disappointing (For. Chron. Mar. 1967, p 49-83) that the members of the Forum either did not know, did not accept, or had forgotten that there might be anything wrong with sustained yield as a concept.

In Munich last September a Norwegian forester summed up our dilemma very well. He said that informed North Americans view traditional Central European forestry as a "relict" of the dark ages. Many Central European foresters in turn look on North American forestry as an evil art practiced using heavily transistorized boxes filled with black magic.

It will be quite difficult for our International Union of Forest Research Organizations Working Group on use of Operations Research Methods in Planning Forest Land Management to identify, and harmonize or reconcile those points of view.

Sustained Yield is a Vague Idea

Sustained yield forest management can be interpreted to mean "the management of a forest area in such a way that an equal, or near equal, volume of merchantable wood can be harvested annually, or periodically, in perpetuity" (Haley, 1966). To this often is added the idea of yield maximization and with it the belief that rotations should maximize the sustained yield capacity of the forest to grow usable timber.

U. S. National Forest policy has broadened and formalized the concept of sustained yield to include all benefits from forest land. Multiple use and sustained yield ideas are used together there to assure "the greatest good of the greatest number in the long run". On-the-ground application of this policy involves complex management decisions of both immediate and long-term significance. Legislative recognition of a fundamental administrative policy in effect since 1905 was provided by the Multiple Use — Sustained Yield Act of 1960, Public Law 86-517. This statutory policy directive now underlies management of all National Forest resources.

In defining multiple use the Act stressed "harmonious and co-ordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output." Sustained yield of the several products and services was taken to mean the achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the national forests without

impairment of the productivity of the land. Sustained yield was interpreted to mean that current actions and uses should not preclude or limit future uses and benefits. Management by these concepts insists on co-ordinated use, and continuous high level production, but includes no specific basis for decision making.

Sustained Yield Confuses Decision Makers

One deficiency of the sustained yield model that is impossible to refute lies in the assumptions implicit in the European origin of the concept. In North America land is not limited (labour and capital are), the economy is not static (society is great or dynamic and expected to grow), and the economy is not closed. Therefore, Gould (1962) saw a need for balanced forest land management as an alternative to sustained yield.

In its narrowest sense the idea of sustained yield implies only continuity of production and contains no implications regarding level of yield. The idea of maximum yield was introduced in the mistaken belief that land is more limiting than labour, capital, or technology. The introduction of equal or increasing annual or periodic yields came into vogue as an attempt to encourage stability and to encourage an orderly transition to maximum yields.

Sustained yield gives few clues as to how decisions should be made to implement it. It has no economically explicit criteria to guide constructive decision making. Often, as an alternative to exploitative forestry, it has been suggested that timber harvest simply be sustained at the low level possible with extensive forestry. Acceleration of the transition toward intensive forestry is difficult to plan without explicit goals, having substantial economic content. The level of production often is largely determined by the traditional levels of input of land, labour, capital, and technology and sustained yield by itself provides few clues to what investments should be made to achieve the goals of land owners and society.

Another element of considerable importance is the substantial risk of loss to fire, insects, disease, and storm associated with maintenance of large inventories of forest wealth over any period of time. Add to this the risk of losses due to war or depression and the uncertainties about future markets and it is quite literally amazing that foresters have managed to make a case for sustained yield. Most economic analyses have shown that rigidly applied or narrowly interpreted sustained yield regulations actually have accelerated the conditions they were expected to ameliorate. Pearse (1967) observed that a fixed supply of timber in the face of changing market demand causes timber values to fluctuate more widely than if supply were permitted to respond to price.

Many foresters appear to be interested in resources for their own sake. They insist that only wood is good and continue to argue that economic criteria are not relevant to investments in forest production. They allow only physical criteria, such as culmination of mean annual increment, to be used

for definition of rotation length, one of the most important elements in planning cuts. Ignoring values, costs of management, costs of capital, trends in technology, trends in markets, and various possibilities of improvement in yield and value through management, should seem intolerable but actually represents established policy in many forestry administrations.

Pearse (1967) took a reasonable point of view when he insisted that criteria used in allowable cut calculations should be able to pass the tests of elementary economics. In his words "naive preoccupation with the numbers of cubic feet regardless of its value . . . undoubtedly results in a most serious misallocation of public resources". In his view we must recognize that wood left on the ground is not necessarily waste. "Quality of non-utilizable wood should be determined by economic restraints, i.e. the lowest grade or smallest size harvestable at cost. To take out lower grades without reference to the cost of extraction and investment return involves a waste of society's other resources, namely the labour and capital used in logging".

Continuous Production has Advantages

Many real, and some fancied, advantages have been suggested by enthusiasts in support of sustained yield forest management. Most of these have been argued from the point of view of timber production forestry, but some also apply to yields from sustained forest land management.

Continuous production of renewable resources with equal annual or periodic yields from forest land increasing toward the high yield goal often described as ultimate sustained yield capacity provides an attractive alternative to exploitation, liquidation, or "cut-out-and-get-out". It is easy to administer once society has imposed the necessary regulatory, zoning and/or allowable harvest constraints. It spreads the flow of mature or overmature timber over a reasonably long adjustment period, creating an even flow of resources and hopefully avoiding a hiatus. Utilization standards can be forced, and enforced, land and timber values can be maintained or even inflated, an orderly process of liquidation proceeds slowly, is conservative, reduces risks, and always leaves something for the future including many big decisions. Adjustments usually are slow, mistakes can be corrected, wood costs can be stabilized under full development; the forest land manager is comfortably in control.

There must be much merit in these arguments because they are advanced so frequently and held so dearly by forest land managers.

Economic Growth and Development must be Encouraged

New concepts are needed to guide the planning for plantation forestry and for acceleration of economic growth and development (Nautiyal and Smith, 1967). Development planners often are understandably skeptical about the weight of evidence on the side of tradition. The ill effects of liquidation

are widely talked about but seldom documented and analysed economically. In our enthusiasm for saving for the future we miss many excellent opportunities for today. I think that more of us should be interested in the here and now than in the hereafter aspects of forestry.

The time span of forestry is so long that high quality forward-looking decisions are essential. We cannot afford to rely on tradition and should make much more effective use of new tools (Hall, 1967).

October 1967 at the SAF/CIF meeting in Ottawa I summarized my ideas about the implications for forest industries and management of an expanded role for North American forestry in meeting World wood needs (Smith, 1967). At that time I drew attention to the following ten points:

1. Forestry progress depends on policy.
2. North American wood can be a World resource.
3. Economic and total inventories are needed.
4. Height growth governs tree harvest.
5. Concentration of ownership reduces costs.
6. Linear processing rates limit profits.
7. Close utilization increases unit costs.
8. Classification of land capability will reduce uncertainty.
9. Some excellent timber investment opportunities exist.
10. Location decision factors need more study.

The first of these is most important. Foresters must help define and create better policies. To help do this we should carefully consider adoption of maximization of the present worth of net benefits as our guiding concept for land management.

We also need to recognize explicitly the deficiencies in our belief that, having decided upon the desirability of continuous forest production in equal or increasing amounts, some clues are given as to what level of harvest is allowable in the transition period approaching ultimate sustained yield capacity.

At this point the problems of creating a smooth transition become painfully evident (Smith (1965). Allowable cuts usually are calculated for products currently salable from desired species growing on lands that can be logged with current technology. The conventional procedure either ignores the trends in technology that will change utilization standards or it creates several arbitrary classes of allowable cut volumes described as e.g. close utilization, or pulpwood, or non merchantable species. Our decision making process should recognize explicitly that land is just one of the inputs, that the consumer is king and fickle, and that technology is changing so fast that our ideas of species, utilization and accessibility become quickly out of date.

A valuable compromise position has been adopted recently by the U. S. Forest Service. Rotation length in National Forests is set now by the number of years expected to be required to grow trees of the species, size and quality likely to be needed in the future. This procedure can include all of the important elements. Analysis of present data and trends in markets, harvesting and manufacturing

technology, and in methods of management can be used to show the kind and size of trees likely to be most profitable in the future (Smith, Ker and Csizmazia, 1961). The number of years required to grow such trees can provide an excellent guide to rotation length because it is based on analysis of all relevant issues.

Controversy Creates New Ethics

Although economists seem to enjoy asking each other "What are the alternatives?", it takes an unusual type of forester to admit that there may be an alternative to sustained yield. In fact some traditionalists would place those who look objectively at sustained yield in a rather uncomfortable ethical position. Academicians can insist that the implications of sustained yield for society are largely unknown and therefore legitimate areas for study (Lammi, 1968). But administrators who have relied on sustained yield principles to regulate harvests at an unnecessarily low level, to literally force consolidation of ownership and liquidation of marginal producers, could also become quite uncomfortable when required later to plan the transition to increased harvests. There is little doubt that imposition of quotas for cutting of sawlogs, buying and selling of quotas, definition of unrealistic bids, persuading sawmillers and pulpmillers to cooperate with each other, requiring improved protection and reforestation, all involve complex political and ethical issues. There also are many social, political, and ethical problems of rural development that must be resolved. Unless full consideration is given to economic and social factors in addition to technical information, decisions cannot be adequate.

I think that foresters should encourage thoughtful analysis of the alternatives to sustained yield.

I cannot improve on the view expressed by Bernard L. Orell. At the recent North American Wildlife Conference in Montreal he observed:

"There is no place in the conservation movement for blanket indictments of whole industries or of

whole groups on the record of a few . . . Resentment becomes the order of the day, facts become distorted, and instead of working closely together in the solution of problems, the opposite is true. There is no place here for personal prejudice, suspicion, backbiting, dishonesty or evasion.

There is a place in conservation, however, for controversy, criticism, straight talk, and direct action.

Many people decry controversy. Actually, it is good. It causes men to think, to develop better methods, and to draw sound conclusions. After all, adversity is the ladder up which men climb to greater achievement. We should look at controversy as healthy and as a proving ground for the ideas of a host of independent thinkers."

It is hard to develop such informed consideration of the merits of sustained yield. At the Commonwealth Forestry Conference in India in 1968, Nautiyal could not stimulate any discussion of the need to harmonize technical and economic objectives for forestry (Nautiyal and Smith, 1967).

Conclusion

Because forest land management is so important to all of us we ought not to settle for less than the best. I think that you now can see that the sustained yield concept is as out of date as the crosscut saw. Surely we should spend much effort now to develop, test, and accept fully modern ideas. These must stand the tests of elementary economics and provide sound guidelines for space age forest land management. If forests are to continue to be an important part of life in future then the way is not by "conserving" forests through outmoded policies like "sustained yield" but by making the technology of growing, and utilizing trees better than that in the industries which threaten to capture traditional forestry markets. I expect that careful analysis will show that in most cases the policy of sustained yield should be replaced by one that maximizes the present worth of all future net benefits from forest land.

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