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Potential and Economic Aspects of Forestry on Marginal and Submarginal Land

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Introduction.

BEFORE discussing forestry on marginal land it is necessary to have a clear idea of the type of land we have in mind. I understand that we are concerned with land which has been judged to be marginal or submarginal for agriculture and which comprises, very broadly, raised bog, blanket bog and degraded heaths with varying thicknesses of peat. The bogs may have been cut for turf either by hand or by machine and there are likely to be physical and chemical problems in the shape of drainage difficulties, nutrient deficiencies, the presence of old tree stumps and the risk of wind blow. There may also be some indigenous woodlands dominated by various broadleaved species. I am going to assume that the problems of afforestation can, to a greater or lesser extent, be solved by drainage, cultivation, fertilising and the choice of suitable provenances and that tree species such as the coastal strain of lodgepole pine, Sitka spruce and Norway spruce can be made to grow, although they may only achieve a low quality class.

The problem can be regarded as a series of alternatives. First, should the land be used for production or abandoned? Secondly, if it is used should the form of land use be forestry or agriculture. Thirdly, if it is to be forestry what should be the intensity of management and what rate of interest should be used in economic calculations?

To Cultivate or to Abandon Marginal Land.

There is no *a priori* reason why a potential resource should be used. For example, the air contains nitrogen. If a very cheap supply of electricity is available it is profitable to fix the atmospheric nitrogen and convert it into nitrate for fertilising the soil. Without a very cheap supply of electricity such an operation would be very unprofitable and would not be considered. But even if we are not prepared to spend money in utilising the nitrogen in the air that does not mean that it is valueless. Life would be extremely hazardous in an atmosphere of pure oxygen.

Land is another resource which can sometimes be used profitably,

for example, rich arable land, and sometimes is obviously not worth investing in, for example, mountain tops. The poorest land may nevertheless have a value for recreational purposes and may possess great beauty. The point at which a resource ceases to be worth exploiting is always difficult to determine and in the case of land the difficulties are enormously complicated by man's attitude to it. Let me quote from a report on land use in Europe :

"The problem of rational land use is urgent but is enormously complicated by tradition, prejudice, conservatism, ignorance, and sentiment."

Any country has limited resources of manpower, skill, capital and raw materials. The country as a whole and the individuals within it will be prosperous if people are able to employ themselves in highly productive work and poor, if the people have to engage in unproductive tasks. For example, the economic miracle of Italy in the 1950's was achieved by transferring people from unproductive agricultural work in the south to productive industrial work in the north. Switzerland, with limited resources, has to sell processed goods rather than raw materials, but she is prosperous because her workers are highly skilled and their work has a high hourly value. In contrast, Spain, a relatively poor country, has a very high proportion of her working population—46%, engaged in relatively unprofitable agriculture which produces only 25% of the country's wealth.

Therefore, it is important to be critical of employing manpower and capital in working a resource as inherently unprofitable as marginal or sub-marginal land. If a man can create £20 of wealth in a week in industry, but only £5 in cultivating marginal land, it may be argued that he should go into industry, and the country should import the food and wood from a country able to produce it more economically.

A government or a private investor has many opportunities for investment. I shall concern myself principally with governments which always have greater calls upon their funds than they are able to meet. Governments rarely invest purely for profit. The first calls upon revenue are for defence, public order, the judiciary and then if money is available, for education, housing, public health, roads and the development of national resources. Governments generally take a rather longer term view than individuals, but there is a limit to the time they can afford to look ahead. If a government were to plan for a century ahead it would have to divert so much of the national wealth to purposes which would benefit neither the present generation of voters nor their children or even grandchildren, that they would not stay in power for very long. Governments therefore take a medium term view and rarely undertake investments unless they are likely to produce a benefit within 30 or 40 years. As soon as the essential services have been provided a government begins to become increasingly critical of expenditure which cannot directly or indirectly show a reasonable return on the capital required.

How can the profitability of working marginal land be calculated and compared with other forms of national investment? There are several ways of estimating the return from land; one way is to consider the value of annual production, for instance, one acre may produce 60 hoppus feet of timber per annum, worth £6 or, mutton worth about £2-£3. Such estimates are valueless, however, unless they take account of the capital required to obtain the return. If it were possible to borrow money without paying interest the cost of capital could be ignored, but if such a situation were possible, capital would either be valueless or would rapidly become valueless because we would all live on borrowed capital and no one would do any work. Two methods of estimating profitability are commonly used in practice. The first is to calculate the rate of return which can be obtained from the capital invested and the second is to discount to the present day all future returns and future costs at some agreed rate of interest, and to express this as a net discounted revenue per acre or per £100 invested. As an example, let us suppose that a bank is prepared to lend money at 5%. If money is borrowed to establish a plantation the establishment costs will create an overdraft which will increase annually due to the costs of annual maintenance and protection, together with interest at 5%. When revenue is received in the first thinning, the overdraft will be reduced, but will increase between thinnings. With luck the overdraft will be extinguished by the end of the rotation and the final felling will leave a credit balance. This balance discounted back to the present day is the net discounted revenue.

Comparison between Forestry and other Commercial Investments.

There are considerable difficulties in making meaningful comparisons between the profitability of forestry and industry. The average returns in Great Britain on all investment after tax between 1919 and 1963 were 6% for equities, 1% for preference shares and -1% for gilt edged securities. These yields are measured in real terms, that is, after the effect of changes in the value of money have been eliminated. It will be seen that the fixed interest investments have suffered severely from the effects of inflation whereas neither equities nor investment in forestry would be at this disadvantage because of the (untaxed) gain in capital values. It is appropriate to consider returns net of tax since companies pass on both profits tax and, effectively, shareholders' standard rates of tax in fixing prices. If there were no taxation, product prices would be fixed at lower levels, and returns on investment would probably be at similar levels to those quoted.

The stumpage price of wood is tending to rise, relative to other commodities, at about $1\frac{1}{2}\%$ per annum. Allowing for this rise in price forest investment on marginal land may be expected to earn something like 3% on the capital invested while on the normal run of forest land the return will be of the order of 4% to 5%. Taking into account the long history of safety in forestry a return of 4% to 5% on a long term

project represents a very reasonable Government investment. Clearly, however, investment on marginal land is a more doubtful proposition if undertaken on purely financial grounds. Unless capital were abundant and opportunities for investment limited there would need to be reasons additional to the purely financial objectives to justify expenditure on such land.

A Comparison between Forestry and Agriculture.

The profitability of forestry on marginal land depends primarily in four broad factors :—

- (1) The volume production.
- (2) The cost of production.
- (3) The length of the production cycle.
- (4) The price received for the product.

DIAGRAM I

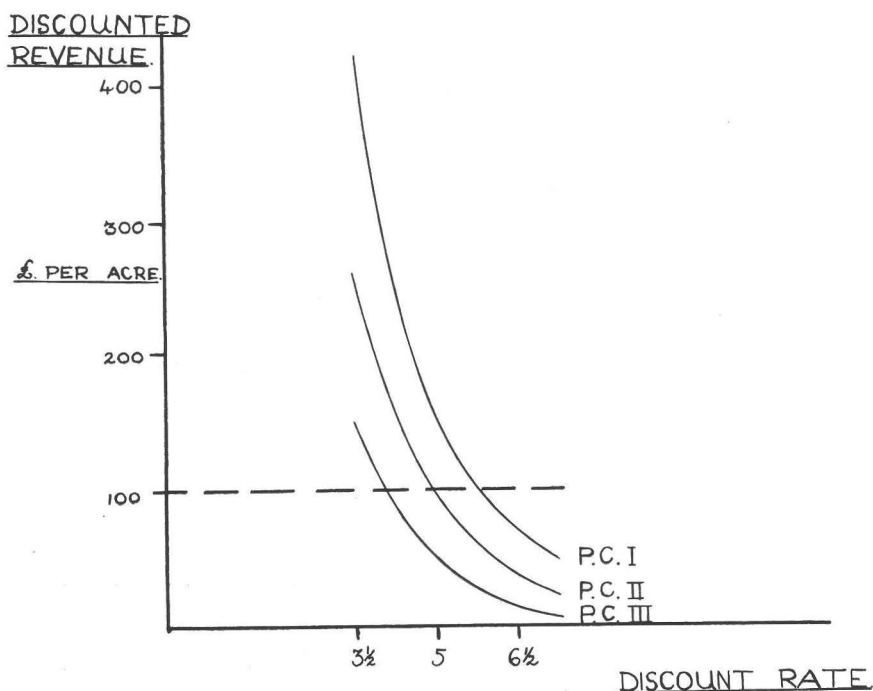


Diagram I compares the discounted revenues, for a range of quality classes, calculated at three rates of interest. [These calculated revenues incorporate the assumption that the price of wood relative to other commodities will rise at about $1\frac{1}{2}\%$ per annum.]

The very great effect of interest rate and of quality class on discounted revenue is immediately apparent. If we assume that *Pinus contorta* will achieve Q.C.II on marginal land the discounted revenue is likely to be £105 at 5% or £300 at $3\frac{1}{2}\%$ while Q.C.III will yield about £45 and £150 respectively. Without a $1\frac{1}{2}\%$ rise in the real price of timber these revenues would be very much lower.

The costs of establishment, capitalised maintenance and capitalised roading can hardly be less than £100 and will probably be more. Therefore the first conclusion must be that forestry on marginal land cannot be a profitable enterprise at normal commercial rates of interest, although it can reasonably expect to break even or to make a profit at 3% or even $3\frac{1}{2}\%$.

Agriculture is not practised intensively on marginal land. The normal pattern will be extensive sheep or cattle grazing. The carrying capacity of such land is small, and in Scotland a stocking of one ewe to three or four acres is typical. The capital requirement is small but the return per acre is also very low and a large farm of at least several hundred acres is necessary to provide a reasonable living for one family. With a very small net annual income a small change in costs or prices can mean the difference between a profit or a loss.

By contrast forestry is a capital intensive industry employing one man to 80 or 100 acres. If we assume the capital investment to be of the order of £100 per acre the amount of capital required to sustain one worker permanently will be about £8,000. This compares with less than £2,000 in marginal agriculture.

Therefore from an economic point of view marginal forestry differs in three important respects from marginal agriculture.

- (a) It requires far more capital per man and per acre.
- (b) Due to the long period between establishment and harvesting and to the high capital investment forestry is greatly affected by the rate of interest charged on capital.
- (c) Forestry employs many more men per unit area.

Diagram II indicates in a diagrammatic form the relationship between rate of interest charged on capital and the relative profitabilities of forestry and agriculture.

In general, farming is more profitable than forestry with high interest rates while forestry is relatively more profitable with low interest rates.

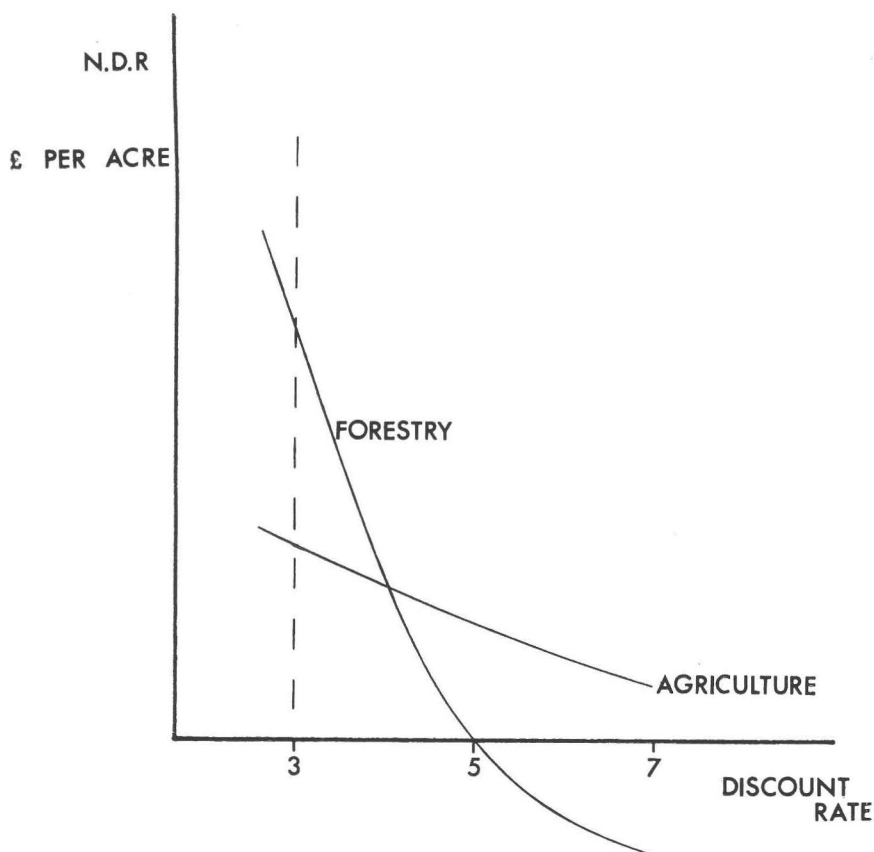
I do not know anything about agriculture in Ireland but in Great Britain there is a considerable area of marginal agricultural land which would make a loss without agricultural subsidies. If these subsidies

were removed prices would rise but not sufficiently to counter balance the loss of the subsidies. On some of these areas agriculture would make a loss whatever the rate of interest whereas at low rates of interest forestry will nearly always make some profit.

The Case for Forestry.

It is apparent that no government is likely to invest money in marginal forestry as a purely financial investment. The case for forestry must depend upon other considerations. The traditional or sentimental

Diagram 2



idea that land should not be allowed to lie idle is insufficient to justify the considerable expense of afforestation, because 2,000 acres could be used to support one sheep farmer with a minimum of capital expenditure.

The state as well as private companies in Finland and Sweden are prepared to invest money in growing trees on which they expect to earn 3% or less. They are willing to do this because without wood they could not sustain their highly profitable wood processing industries. It may be argued that they should import their raw material and invest all their capital in building pulp mills and paper factories capable of earning 10% or more. They prefer, however, to ensure that a proportion at least of their raw material supplies are under their own control. This gives them a better bargaining position in the face of rising stumpage prices and moreover they envisage increasing difficulty in obtaining unprocessed wood. As countries become more industrialised they prefer to earn the profits of processing themselves instead of exporting it in the round for other more advanced countries to process. The Scandinavians regard paper making, for example, as one integrated process capable of earning say, 10% rather than as two independent processes, the first of which—the production of wood—earns 3%, while the second—the conversion of wood into paper—earns say 15%.

Nevertheless, the case for marginal forestry must depend very largely upon social considerations. The phenomenon of a declining rural economy is common throughout the more developed countries in the world. Ireland has some particular problems of her own. First of all the Irish population is unique in that it has declined in modern times. This is due to a complex of historical and economic factors but is primarily due to emigration and to a low marriage rate, which in turn are due to the inability of the rural economy to support an expanding population at an acceptable standard of living. Not everyone wants to or is able to emigrate from the countryside but with little local employment many people have no other alternative and the residual population tends to become culturally, socially and financially impoverished. Forestry is the enterprise, par excellence, for sustaining or expanding a rural population. It is capital intensive and most of the capital is in the form of wages which are spent locally, it employs a large number of workers per unit area, and it brings in its train wood processing industries which offer a variety of jobs for the wives, sons and daughters of the forest workers. A visible proof of this can be seen in the prosperous rural communities of Scandinavia whose economy is based to a considerable extent, on forestry.

Recreation is another important aspect of forestry. Fortunately there is still plenty of space in Ireland but as industrial populations increase there is an ever growing need for outdoor recreational facilities in the form of camping, picknicking and walking. These facilities can be a very considerable tourist attraction as many Europeans are turning more and more to camping as their traditional form of holiday. It is

important also that foresters should bear in mind the aesthetic aspect of forestry, especially in a country which depends very largely upon tourism for its foreign exchange.

Much has been written about the indirect effects of forestry and, in particular, about the beneficial influences of forestry in regulating water supplies, in preventing erosion and in providing shelter for animals. I am very sceptical about the first two benefits in our part of the world, but several examples have been reported from Wales and Scotland of the sheep and cattle population of an area increasing after an appreciable proportion of the area has been planted with trees.

I should sum up the case for forestry on marginal land as follows :

1. If there is a need to provide rural employment or to boost the rural economy forestry will probably do it more effectively than any other activity.
2. Forestry will at the same time earn a modest return on capital.
3. Forestry will provide an essential raw material which is becoming relatively more scarce and expensive and which can support profitable processing industries.
4. Forestry can be an asset to a tourist country.

If there were no need to provide rural employment or otherwise to aid the rural economy I would hesitate to invest money in the poorer marginal land, although the Scandinavians do so in order to provide raw material for their profitable wood-using industries.

The Management of Forestry on Marginal Land.

It is no use providing low grade employment in rural areas. Although one of the advantages of forestry is the relatively high employment per acre, it would be wrong to employ one man on 50 acres if he could be employed more profitably on 100 acres. The ways of increasing profit are to increase revenues or to decrease cost. There is a limit to the production that can be gained from one acre of poor land and foresters should examine critically the traditional methods of planting and managing forests.

Many of the costs in forestry are the same per acre on poor land as on good land but whereas good land may justify intensive management, poor land probably will not. For example, the potential discounted revenue from Q.C.I. Sitka spruce may be about £500 whereas that from Q.C.III *Pinus contorta* may be about £60. There is clearly a relatively low limit to the money that can usefully be spent on one acre if the most that can be expected in return is £60. Although some cultural operation will be necessary to get trees to grow at all, the site will not justify elaborate and expensive management techniques. In the same way one can afford to spend less per acre on fire and other protection if the standing volume is 2,000 h.ft. than if it is 6,000 h.ft.

The cost of plants, planting and weeding will often be much the

same on poor sites as on good sites. If a reduction in the number of plants saves £9 per acre and results in a decrease in discounted revenue of 5% this represents £25 in the case of Q.C.I Sitka spruce but only £3 in the case of Q.C.III *Pinus contorta*. Therefore the economy would be worth making on poor sites but not on good sites.

In the same way a more mechanical approach to thinning involving less supervision and less time spent in marking may depress production by 5%. This saving of 5% may be more than offset by potential losses in high Q.C. crops but may well exceed the potential loss in low Q.C. crops on poor land.

Another economy that may be justified on relatively wind firm but low Q.C. crops is to lengthen the thinning cycle but to remove a correspondingly greater volume at each thinning. Such an operation may possibly lead to a slight reduction in timber quality and total production but could well lead to greater profitability on poor sites.

I know little of conditions in Ireland so I must generalise by saying that the optimum intensity of management depends upon the productive potential of the site. Good land can profitably absorb a large volume of capital investment but on poor land one must invest much less and receive less in return. One would not spend as much money in polishing and mounting a piece of glass as in polishing and mounting a diamond.

A number of management decisions cannot be made intuitively but need to be supported by economic calculations, e.g. optimum rotation length, intensity of management, optimum roading intensity, optimum time at which to replace an unsatisfactory crop. All these calculations involve discounting future costs and returns and the answers will vary greatly with different interest rates. If the decision is taken to provide money for forestry, at some particular rate of interest, say $3\frac{1}{2}\%$, the logical implication of that decision will only be achieved if the same rate of interest is used in economic calculations made to guide management.