

Forestry and Irish Economic and Social Development.

Frank Convery¹

INTRODUCTION

An attempt is made to indicate the role that the present and potential outputs of Ireland's² state³ forests can play in the achievement of the country's long-term social and economic objectives. This is an essential first step in the evaluation of forestry investment⁴ in the context of an overall macro-planning framework. This is not a highly quantified analysis, and no effort is made to justify (or otherwise) a particular level of expenditure on forestry.

Since Ireland adopted a formalized planning approach to economic growth and development in 1958, attention has been focused on the composition of public expenditure and on its role in the growth process. This concern has been cogently presented in the most recent plan (27) p. 184:

Particular attention will be paid to the composition of investment in the public capital programme, no less than to its actual level, since this is important in attaining the over-all investment target of about twenty three per cent of G.N.P. by 1972—a comprehensive appraisal of the public capital programme is at present in progress and the results may well indicate a need for changes in the pattern of expenditures.

The above appraisal aims at developing techniques of programming and analysing public expenditure, both capital and current, by reference to objectives and output, using a systematic method of quantifying future costs and benefits. In the spirit of this attempt to order expenditure in terms of priorities, the principal socio-economic benefits deriving from the forestry sector are examined.

Investment in plantation forestry is a long-term undertaking, with typically twenty years elapsing before the first returns accrue. In this situation, with a planning horizon that far exceeds the four to six years common in government medium term programmes, forestry

¹ Doctoral Candidate, Dept. of Forestry Economics, College of Forestry, State University of New York at Syracuse University.

² Although the data used in this discussion pertain only to the Republic of Ireland, many of the general remarks and conclusions have equal validity on both sides of the Border.

³ The main thrust in Irish forestry development comes from the government service. About 90% of the total forest area is owned by the state.

⁴ The words investment, spending and expenditures are used interchangeably throughout the discussion, except where otherwise indicated.

expenditure must be examined in a more extended perspective. For this reason, the long-term objectives, requirements and constraints of Irish economic and social policy outlined in the National Industrial Economic Council's (NIEC) **Report on Full Employment** (20) are used here as a frame of reference. These can be summarised as follows:¹

Objectives

- (a) Development of the national economy measured in growth in **per capita** standards of living.
- (b) Full Employment: "... the creation of sufficient new jobs on average each year to ensure that no one who is actively seeking work in Ireland and prepared to accept it at the terms currently being offered is unable to find it within a reasonable period."

Requirements

- (a) An equitable distribution of income and wealth, and an appropriate balance between the development of different regions and between private and community needs.
- (b) Efficient use of all productive resources.

Constraints

- (a) Price stability.
- (b) Reasonable long-term equilibrium in the balance of payments.

It is common practise when evaluating alternative investment projects to compute their discounted net worth, using an interest rate which reflects the marginal efficiency of capital in the economy. The difficulties of determining the appropriate interest rate continue to generate much discussion (12), and are not considered here. Low interest rates favour long-term projects like forestry, higher rates favour those with quicker payoffs. Most afforestation in Ireland takes place on land that is marginal for agricultural purposes. Johnston (14) reports that on such land, forestry can expect to earn an annual return of about 3%. Recent Irish experience indicates that an average return of approximately 5% can be expected, estimated using current prices (17).

The financial rate of return is not the crucial measure in evaluating the effectiveness of public enterprise. Indeed, if this return were sufficiently large there would probably be no need for government intervention. The gap between what expenditure on forestry

¹ For the remainder of this discussion all of these factors are referred to collectively and interchangeably as the nation's goals, objectives, aspirations, etc.

actually earns and this money's highest alternative rate of return is the real cost of providing the net non-financial benefits that result from this investment.

Some measure of the relative importance of forestry expenditures in the national economy can be judged from Tables 1 and 2.

TABLE 1 — TOTAL FORESTRY EXPENDITURES
AS % OF G.N.P., 1963-66

Year	G.N.P. (current prices) (£ Million)	Total Forestry Expenditures (£ Million)	Forestry ex- penditure as % of G.N.P.
1963	836.6	3.3	0.39
1964	946.5	3.6	0.38
1965	1,010.4	3.9	0.38
1966	1,061.0	3.9	0.36

Source: Tables 91 and 237. Reference 26.

TABLE 2 — ESTIMATE OF TOTAL PUBLIC CAPITAL
PROGRAMME, AND ITS FORESTRY COMPONENT,
1963-70 (in 1963 prices)

Year	Total Public Capital Programme (£ Million)	Forestry (£ Million)	Forestry as % of Total
1963-64 (Actual)	78.5	1.81	2.30
1964-65	96.11	1.75	1.82
1965-66	95.57	1.89	1.97
1966-67	94.23	1.95	2.06
1967-68	93.2	1.99	2.13
1968-69	92.82	2.00	2.15
1969-70	97.32	2.02	2.07

Source: Table 4, **Second Programme, Part II**, Government Publications, Dublin, 1963.

State-owned forests make up about 90% of the country's total, and over half a million acres, or just less than 3% of the total land area. Because of a very poor endowment of indigenous forest and the difficulties of natural regeneration, most of this area is in the form of even-aged plantations. A little over half of this forestry estate is less than 10 years old, and 95% of it is covered by coniferous species, with Sitka Spruce (40%) and *Pinus Contorta* (30%) predominating (19). The mild, humid climate, with its well distributed

rainfall and lack of temperature extremes favours rapid tree growth which for conifers averages between 100 and 120 hoppus feet per acre per annum (11). Government has been involved in direct forest establishment in Ireland since 1903, but an explicit statement of the benefits that should flow from this estate have not been formulated. Physical goals have been stated, such as the planting of one million acres, or the establishment of a forestry estate that could fulfil domestic needs (25). However, the benefits (and costs) of an Irish afforestation programme have been discussed in a number of quasi-official statements, such as the **Report of the Departmental Committee on Irish Forestry** (24), and various articles in *Irish Forestry*.¹ Some of these arguments are re-examined here in the context of national economic planning.

DEVELOPMENT OF THE NATIONAL ECONOMY

Economic growth is defined as the increase in real **per capita** income; economic development refers to the progressive refinement of the economic infrastructure, both physical and institutional. Attention in this section is focused on real **per capita** income growth. In all of the theories concerning economic growth, investment is regarded as a main propulsive parameter. Investment in Ireland for the period 1958-64 can be broken down as follows (20): Economic investments, which include almost all investments in agriculture and industry, and in services which perform a directly economic function make up about 50% of the total. The infrastructural category (electricity, gas, water, transportation, etc.) comprises about 32% of the total, while social investment (dwellings, hospitals, churches, social services, etc.) account for the remaining 18%. Expenditure on forestry falls into the economic category, but it has infrastructural and social overtones.

Direct Effect

As noted earlier, forestry investment within the constraints (mainly land quality and small operating units) under which it operates in Ireland is likely to earn an annual return of approximately 5%. This return is the direct income generating effect. In this respect the state forestry investment can be regarded as savings bonds held by the Irish people which have not yet matured. Present incomes per annum yields are low, averaging between 0.6-0.7 million pounds, or approximately £0.23 **per capita** per annum, from 1946-68 (26). The future time path of these (increasing) dividends is not

¹ Examples include: M. L. Anderson, "The Importance of Forestry in National Planning," *Irish Forestry*, 2, 1945; E. A. Attwood, "Problems of Forestry Development in Ireland, *Irish Forestry*, 21, 1964, and Johnston (14).

known, but should be facilitated by the new census of state plantations at present in progress, which will provide the basis for the first full long term production forecast for state forests (27).

Investment in forestry can be regarded as capital deepening or capital widening. Capital deepening increases the capital intensity of the productive process, and in forestry the annual growth accumulation is the most important component of this type. In 1963, 104,000 acres, or 28% of the total forest estate at that time was more than 20 years old (6). Assuming a net average annual growth rate of 100 hoppus feet per acre per annum, and an average per hoppus foot value (standing) of £0.05, this immediately exploitable part of the forest increases in value by over half a million pounds in one year. It is worth noting in passing that theoretically this increase in the forestry capital stock should be included as a contribution to the Gross National Product. Its exclusion, probably because of empirical difficulties, involves an underestimation of the forestry sector's contribution to current aggregate production. Other capital deepening forces include fertilization, thinning, pruning, drainage, etc. Expenditure on research can also be classified in this category. Capital widening extends existing capital or creates new capital. In the Irish case it includes most importantly the purchase of land and the consequent extension of the forestry estate.

Induced Effects

These include the inter-industry demand that is generated directly by the forestry sector, and its multiplier effect on the entire economy. Attention is focused in this discussion on the inter-industry linkages. Westoby (28) reports that (p. 193):

Forest industries can be considered a propulsive sector, that is, a sector the expansion of which is liable to induce spontaneous investment in the other branches of production. This is due to the fact that forest industries have a very strong forward linkage with other sectors. A high degree of linkage makes a sector a good starting point for industrial growth; investment then, by inducing demand and providing supplies for other sectors, widens investment opportunities in the economy as a whole, and has a multiplier effect—not in the traditional sense of the word, which is based on final demand and on the consumption of income by the newly employed, but in the sense of increasing inter-industry demand.

These conclusions are based on inter-industry coefficients derived from input-output tables for a variety of countries. Unfortunately, probably because of their small relative size, forestry and the forest industries have not been included as separate sectors in the most recent Irish input-output table, although O'Connor and Breslin (22) have done some very useful work on its agricultural component.

About 50% of total forestry expenditures go to wages, and many

inputs such as fencing posts, gravel, seeds, trees for planting, etc., are produced internally, so that backward linkage is not strong. Machinery (saws, tractors, ploughs) must be imported. O'Neill (23) finds (p. 61) that on farm households with less than 30 acres and with a weekly expenditure (1964-65) of £10.88, value of food consumed made up 57% of this total. Forestry workers' weekly expenditures would be of this dimension, so that over a quarter of total annual forestry expenditure flows back into the agricultural sector. Forward linkage is strong. Table 3 gives some idea of forestry's potential as a propulsive sector. It would neither be possible nor probably desirable to meet all the fibre needs of these industries from domestic sources. However, the performance of the industries using domestic wood is encouraging. Annual gross output of the native wood-using pulp and panel industries is now valued at between 2 and 3 million pounds, and they are expanding as quickly as the raw material supply will allow, with pulpwood consumption increasing from 20,000 tons in 1951 to 138,600 tons in 1966 (5). The lumber industry is at present very small, with production in 1964 reaching $1\frac{1}{2}$ million sawn cubic feet (6) with a gross value of about 1 million pounds. This industry absorbs all sawable material coming on the market from the Forest Service. These industries themselves have linkage effects. One chipboard plant makes furniture, the pulpmill manufactures newsprint from its groundwood plant, while hardboard, chipboard and lumber are used in construction. Their backward linkage in Ireland is poor, since the non-wood physical inputs, consisting chiefly of machinery and chemicals, must be imported.

All of these income generating effects presuppose a market for the outputs of the forest. For marketing purposes forests have important advantages¹ over more seasonal crops. The production function in forestry is flexible, so that output can be geared to the needs of industry. Thus the harvest can be delayed, storing the crop as it stands, or cutting can be accelerated temporarily, borrowing from capital. In addition, the output is very versatile, e.g., saw-log material can be used for pulpwood, and fuelwood can be used as raw material for chipboard. For Irish pulp, paper and panel products, future output increases must be sold on foreign markets. Already, with these industries at a very early stage of development, the home market for panel products is virtually fully supplied from domestic sources, and about half of their total output is exported, mainly to the U.K. In the U.K., from 1956-61, annual growth in consumption for panel products averaged 8.3% and the projected annual growth rate to 1975 is 8.2%.² Apparent income elasticity for panel products

¹ These advantages are listed by Westoby (28).

² Except where otherwise specified, the figures in this section are derived from *Unasylva*. Vol. 20, 80-81, 1966.

TABLE 3 — INPUTS AND OUTPUTS OF POTENTIALLY¹ WOOD BASED INDUSTRIES, 1965

	Net Output (i.e., value added to materials)				Remainder of Net Output £000	Average No. of Persons Engaged
	Gross Output £000	Cost of Materials £000	Total £000	Salaries and Wages £000		
Manufactures of Wood and Cork except Furniture	8,700	4,950	3,750	1,979	1,771	3,618
Manufacture of Furniture	7,210	3,634	3,567	2,287	1,288	4,300
Manufacture of Paper and Paper Products	16,657	9,950	6,707	3,382	3,325	5,167
Total (Wood based)	32,567	18,534	14,024	7,648	6,379	13,085
Total for all Manufacturing Industry	659,004	445,871	213,134	106,322	106,812	172,803
Industries that are potentially wood based as % of total	4.94	4.15	6.57	7.19	5.97	7.57

Source: Table 106. Reference 26.

Source: Table 106. Reference 26.

¹ At present much of the pulp industry uses waste-paster as raw material, while some furniture manufacturers probably use very little wood. All chemical pulp requirements must still be imported.

for the U.K. calculated from 1951 to 1961 was 4.8%. Pulp, paper and paperboard, with a somewhat lower income elasticity of demand, still managed an annual consumption growth rate of 5.1% from 1956-61, and the projected growth rate to 1975 for these products is 4.6%. It seems then as if the aggregate export market situation for Irish pulp, paper and panel products is satisfactory. However, Irish producers share free access to the U.K. market with all Commonwealth countries (including South Africa), the EFTA nations, and Sweden. Irish panel products, accounting for much less than 10% of total British consumption, have consistently been the most highly priced of the imported boards (1). The ability of the Irish wood processing industries to compete successfully on the British market is an essential prerequisite for further expansion of the entire forestry enterprise. So far, the principal factor limiting production has not been demand, but wood supplies, so that the future in this regard looks promising. If the reactivated Irish and British membership applications to the E.E.C. are accepted, this will have the dual result of broadening the competition while at the same time increasing opportunities for expansion, since the E.E.C. as it is presently constituted is a net importer of pulp, paper and panel products.

For lumber, the domestic market should offer the main stimulus to expansion. Imports of sawn-wood amounted to about 6 million pounds in 1966 (26). Although not all of this material can be replaced by the domestic product, this import figure does give some idea of the scope of the opportunity involved. Thus it seems that for all Irish wood-based industries the potential markets exist, if production costs can be kept competitive.

McGilvray (18), commenting on the Second Programme, suggests that (p. 34):

Perhaps greater emphasis might have been placed on priority planning for certain key sectors which could be regarded as potential long-term growth industries in the context of international free trade, rather than on the formulation of detailed targets for all sectors of the economy. Thus the major objectives of the Programme would have been the structural changes required to sustain long-term growth, and maximising the rate of growth of output (principally exports) of these key sectors.

Forestry seems to fit the bill as a "long-term growth industry in the context of international trade." The success of forestry's role as a growth point in the economy depends on its ability to deliver wood to the mills at a competitive price. Labour costs are a major consideration in this regard. Aggregate employment and its efficiency are now considered.

EMPLOYMENT

The total number of persons directly employed by the Forestry Division was 4,750 at March 1968 (27). In the Third Programme

(27) it is pointed out that despite the continuing increase in the workload for maintenance of plantations, the total number employed has been falling in recent years as a result of the introduction of mechanisation, incentive payments, and methods of operations research. It might reasonably be asked whether the fall in employment is not partly attributable to the 20% reduction in the most labour intensive of all forest operations, the planting programme. It does seem nevertheless as if labour productivity in the forest is being increased as rapidly as possible. Clear (4) estimated in 1966 that in addition to those employed directly, there were 2,500 men employed in the felling, transporting, and processing of home-grown timber. Kennedy and Dowling (15) show that output per man-hour in the "Manufactures of Wood (Except Furniture)" group of industries averaged an annual increase of 4.56 % from 1953-66. The "Furniture, Brushes and Brooms" and "Paper" groups show annual increases in output per man-hour of 2.92% and 4.47%, respectively, over the same period. These figures compare with an all industry average of 2.87%. It seems then as if the wood-using industries have kept pace at least with domestic rates of productivity increase.

No published estimates of the likely final long-term work force induced by the forestry sector are available. Assuming an annual planting rate of 25,000 acres, the provisional goal of one million acres of forest should be reached by 1990. If one man is employed per 100 acres (14), direct employment would amount to 10,000 men, or about 5% of the total anticipated labour force on the land at that time.¹ Since two men working in the forest now generate work for one man outside, when much less than half of the forest area is producing saleable material, it seems reasonable to assume that as full production is approached at least a one-to-one ratio will obtain, i.e., 10,000 men employed in the forest will generate 10,000 more jobs through direct linkages. The location and quality of these jobs is important, and this aspect of the labour situation is considered next.

DISTRIBUTION OF INCOME — WEALTH

The low value per unit volume of raw wood means that wood using industries are usually resource oriented, i.e., they tend to locate near the forest. The Irish experience reflects these locational forces. Most sawmills are located outside of the large urban centres. The other wood processing industries are located as follows: A chipboard plant at Scarriff, Co. Clare (Pop. 673), a hardboard plant at Athy, Co. Kildare (Pop. 4,069), a chipboard plant at Waterford (Pop.

¹ Using an extrapolation from the 1980 estimate of 236,000 made by NIEC *Report on Full Employment*, Table 9, (20).

29,842), and a groundwood pulp plant in Dublin (Pop. 650,153). The Dublin plant is integrated with a long established paper mill.

Despite a vigorous industrialization programme, total employment in Ireland fell from 775,981 in 1961 to 765,212 in 1966,¹ with an 8.7% increase in industrial employment not quite compensating for an 11.94% decline in agricultural employment. The reasons why fairly rapid economic growth in Ireland has not resulted in an increase in the labour force are quite complex. They stem from the fact that Irish industry must become increasingly capital intensive both to compete on the export market and to satisfy the sophisticated tastes of the Irish consumer. In addition, many of the production units recently established in Ireland have weak linkages with other Irish producers. The numbers employed in the four largest urban centres (Dublin, Cork, Limerick, Waterford) have increased substantially, while counties farthest from the large growth centres have sustained the greatest reduction in the labour force. Some contrasting examples are given in Table 4. There are conflicting ideas as to which is the best way to handle the very large disparities in development rates which are reflected in these employment figures. Two views predominate: The first claims that concentration of industrial development in a limited number of large centres is essential to achieve a fast rate of economic growth. The Buchanan Report (3) represents this point of view, claiming that large scale, highly technological industry is necessary for rapid expansion, and that these are best concentrated in a limited number of major growth centres. The other opinion, supported by sociologists and humanists such as Newman (21) and Healy (13) favours a more dispersed form of industrial development. They argue essentially that the rapid decay in much

Table 4.—CHANGES IN THE LABOUR FORCE, 1961-66
(Percentage Increase)

County	Agriculture	Non-Agriculture	Total
Dublin	-7.63	9.12	8.76
Kildare	-10.59	13.35	5.80
Wicklow	-8.73	10.45	4.29
Limerick	-13.46	14.63	4.18
Leitrim	-16.24	-3.27	-12.54
Mayo	-13.82	6.13	-7.37
Cavan	-13.55	5.01	-6.83
Roscommon	-12.30	5.82	-6.75
Longford	-12.70	2.64	-6.52

¹ The population and employment figures given in this section are taken from tables in a publication by Michael Ross, *Personal Incomes by County*, 1965, ESRI Paper No. 49, Dublin, Nov., 1969.

of the countryside which results from a policy of very large growth centres would be too high a price to pay for whatever increases in aggregate output this centralization would achieve. The Minister for Lands (8) has recently added his voice to this "rural renewal" school, indicating that he would prefer to move away from the idea of trying to provide "economic" units of land for full-time farmers. Instead, the effort should go into creating off-farm jobs which would enable the house-holder to remain a part-time farmer. Increased labour productivity in farming commonly results in a fall in the numbers engaged in it, because most agricultural products face markets which are both price and income inelastic. This fact heightens the pressure to provide off-farm work. Baker and Ross (2) show that while some formerly very poor counties (notably Clare and Kerry) have in recent years had very high rates of economic growth, others, such as Leitrim, Roscommon and Longford have consistently lagged behind. These counties are poorly endowed with natural resources and are badly located to participate fully in national growth. It is in such poor areas that forestry can be especially useful. At the time of forest establishment, people who can no longer earn a "satisfactory" living at full-time farming can work in the forest, either full or part-time. Thus forestry can be used as a mechanism for slowing the rate of population drift from the land, while at the same time creating a wood supply that will induce locally oriented industry. Government sponsored forestry work is one of the most ideologically acceptable ways of using tax revenue to support a rural economy. It seems to give rise to less urban taxpayer resistance than product subsidies, rates remission, or direct payments. For the poorest counties it could provide an important stimulus on the way to sustained economic growth. Lucey and Kaldor (16) document the direct effects of a chipboard plant in Co. Clare on the local economy. They found (1966) that the plant (using 36,000 tons of pulpwood per annum) gave direct employment in the area to 134 people, all of whom would have left the area otherwise, with an associated increase in total population of 318. They also found that of the 17 employees who were also farm operators, eight said that the value of their farm output had been increased as a result of their plant employment; a further six said that it had been unchanged, while only three said that the value of their farm output had fallen. These effects could be duplicated many times in the poorest areas if the wood supply were available. It seems then as if forestry can provide what these areas so badly need—a mechanism for slowing the rate of emigration from the area until such time as off-farm opportunities can be increased, and at the same time providing the raw material (investment opportunities) for wood-using industries. Forestry's contribution will be most useful if it is

coordinated with other programmes involved with area development,¹ i.e., infrastructural, agricultural, industrial and tourist development plans.

Labour receives over half of total State expenditures on forestry, while it also receives a high proportion of the income generated in the wood-using sector. The labour employed does not represent a cross-section of the national labour force. It consists of a disproportionately large number of low skilled workers with limited opportunities for alternative employment. Geary and Hughes (10) point out that it is among this class of workers that the problem of unemployment is most critical, and that the problem is most severe in the poorest areas. Thus forestry has the effect of helping chiefly the most disadvantaged members of the labour force.

EFFICIENT USE OF ALL PRODUCTIVE RESOURCES

This requirement indicates that resources should be combined in a manner that maximizes the net return to society. This paper has been undertaken with the intention of identifying the part that forestry can play in the achievement of this objective, so that the idea of efficiency underlies the entire discussion. In this section, only the land resource is considered.

As was noted in the introductory remarks, investment in forestry can expect to earn an annual rate of return of 5% on the type of land presently being planted. Furness and Whatmough (9) use a case study approach to provide the most complete study to date on comparative net returns to agriculture and forestry on land that is marginal for agricultural use in Ireland, using a range of interest rates. As the quality² of the land improves, returns to both agriculture and forestry increase. Conceptually land should be devoted to those uses that contribute most to society's goals. As the discussion so far has indicated, this contribution can be extremely difficult to assess. National goals may be contradictory, e.g., the easiest way to increase *per capita* income in a region may be to reduce its population. Many goals are also unquantifiable;—to what extent should the rights of ownership (e.g., an absentee owner) be compromised for the good of society?—how can conservationist, wildlife, ecological and recreational benefits be measured? The rate at which society discounts future benefits (rate of time preference) vitally affects what is regarded as the "most efficient" way of using land. The greater the

¹ For government departments with regional offices, T. J. Barrington outlines a plan to facilitate interdepartmental coordination, in an Addendum to the *Report of Public Services Organisation Review Group, 1966-69* (The "Devlin" Report), Government Publications, Dublin, 1969.

² "Quality" incorporates considerations of nutrient status, drainage, topography and exposure.

concern for long-term future welfare, the more will forestry and other long-term projects tend to be favoured. Because of these difficulties, attention has been focused on the quantifiable financial costs and returns of different uses. The State Forest Service has introduced (1969) a land pricing system based on the potential capacity of the area to produce timber, and on the assessed costs of developing it for this purpose (27). Previously the Forest Service was permitted only in exceptional cases to pay more than £10 per acre for land. The internal rate of return earned by forestry varies directly with the quality of the land planted. The increased flexibility in land purchase could dramatically alter the net return on the forestry investment, both by increasing physical rates of growth (increased revenue) and by allowing forest consolidation, which would achieve economies of scale (decreased costs). However, this valuation system does imply that all acres of land that have the same production and cost functions have the same social utility if devoted to this use. As has been pointed out already, this frequently will not be the case. This is intuitively recognised in the political sphere, being reflected in the remarks of the Minister for Lands (S. Flanagan) (8) to *An Dail* (p. 1425).

I have plans for certain areas which I regard as being particularly suitable for forestry. I refer in particular to County Leitrim, and I should like to inform the House that I have directed the Forestry Division to make an all-out drive to acquire land in County Leitrim, to plant it and thereby give employment to as many people as possible in that area. This perhaps involves acceptance of the fact that most of the land in Leitrim is not suitable for development in agriculture. It is as well to face realities in regard to matters like this and to abandon the effort to make a living where a living is not to be got.

Within the forestry sector, land-use problems also arise. It could be argued, for example, that it would be in the best national interest to manage all of the forest lands near Dublin exclusively for recreational purposes, and that many of the western peatland plantations should be grown on a pulpwood rotation. There are no definitive answers to these questions. The land use pattern that best serves the needs of the country cannot be a static phenomenon, and will change as markets, technology and consumers' utility functions change. Defining forestry's role in this ever-altering matrix is particularly difficult because of the need to predict the distant future. The trend in Ireland is towards more refined regional planning. More data are becoming available on the production functions associated with different types of land uses. Intensified planning and better information should help direct the land of Ireland to those uses that are most consistent with its needs.

PRICE STABILITY

Theoretically, forestry expenditure should be detrimental to short-run price stability. Over half of these expenditures are paid out as

wages (i.e., to consumers) but this outlay does not result in any immediate corresponding increase in marketable output. However, as was noted earlier (23) about half of the wages paid to forestry workers are spent on food. Farm produce in Ireland should have a high price elasticity of supply because of existing unused capacity and the competitive structure of the farming industry. This factor should mitigate forestry's short-run inflationary effect. In the long-run, if it can provide goods (and services) which are cheaper than substitutes and imports, forestry will contribute to price stability.

BALANCE OF PAYMENTS EQUILIBRIUM

From the remarks made earlier concerning the markets for wood products, it is clear that the net foreign exchange earning potential of Irish wood using products is considerable. The importance of this import-saving export-earning potential is emphasized by the following points:

- (a) The country has few economically exploitable natural resources. Substitutes for wood must be imported.
- (b) Economic growth cannot be sustained unless there is a continuous process of increasing net investment. Most of this essential plant and equipment must be imported, financed in large part by the foreign exchange earnings of the exporting industries.

The contribution of forestry to the maintenance of balance of payments equilibrium is not considered further. In the summary and conclusions which follow, an effort is made to integrate the threads of the discussion into a cohesive pattern.

SUMMARY AND CONCLUSIONS

The reasons for looking at State expenditure on forestry as it relates to the over-all investment picture and stated national goals were first explored. The impacts of forestry on these goals were then described, with the emphasis on the benefit side of the cost benefit equation. Costs directly related to the forestry effort, such as the very poor conditions under which much forestry work must be undertaken, and the pollution induced by wood-using industries, have not been included. Estimation of the opportunity cost of the investment in forestry in Ireland is beyond the scope of this paper. However, it should always be borne in mind that the "goods" flowing from the forestry sector are being created at the expense of either current consumption or increased spending on industrial and agricultural productive capacity, tourism, housing, roads, etc. Many other effects of forestry investment have not been considered. These include water conservation, the prevention of erosion, shelterbelt effects, and the influences on climate and wildlife. Recently concern has centred on

the continuing deterioration of the environment and the role of forestry in maintaining ecological balance. The continuing growth of the Irish urban population and the increasing number of pollution-inducing industries being established indicate that these factors are becoming increasingly important.

With regard to the present and potential contribution of forestry as considered under the NIEC headings, it seems to me that it is in the domain of regional development that forestry can make its most distinctive contribution. Aggregate employment, income, and foreign exchange earnings could in all likelihood be equally increased by using the money now spent on forestry to intensify the industrialization of the larger urban centres. Forestry seems to be one of the best ways of increasing investment opportunities in the poorest areas. There is adequate government funding available for investment in these areas. The problem is to find or to create self-sustaining income and employment-generating investment possibilities. Forestry helps create these opportunities, while it is also a politically and socially acceptable means of maintaining a watershed of labour in the area. This permits a "breathing space" while other efforts such as tourism, fishing, and the small industries programme are developed. Although its other contributions to the national well-being are not as distinctive, the entire forestry effort does seem to result in a "positive sum" outcome, to use the current jargon. In an increasingly competitive environment for public funds, the explicit identification of the role that forestry can play in the achievement of national goals becomes important.

References

1. *Annual Statements of the trade of the U.K.* Vol. 2, 1959-64.
2. Baker, T. G. and Ross, M. 1970. The changing regional patterns in Ireland. *The Economic and Social Review* I.
3. Buchanan, Colin, and Partners, in Association with Economic Consultants Ltd, 1968. *Regional Studies in Ireland*. An Foras Forbartha, Dublin.
4. Clear, T. 1966. *The development of a Forest industry in Ireland*. Society of Chemical Engineers A.G.M., Dublin.
5. Convery, F. 1967. *An economic analysis of the wood-using industries in Ireland*. Unpub. M.Agr.Sc Thesis. University College, Dublin.
6. F. A. O. 1965. *Year book of forest products statistics*. Rome.
7. Fitzpatrick, H. M. (ed.) 1965. *The Forests of Ireland*. Society of Irish Foresters, Dublin.
8. Flanagan, S. 1969. *Dail Eireann. Parliamentary debates* 242, 9, 20th Nov.
9. Furness, G. W. and Whatmough, R. 1969. *Economic features of Agriculture and Forestry on marginal land in Northern Ireland*. Paper read to Irish Agricultural Economics Society, Belfast.
10. Geary, R. C. and Hughes, J. G. 1970. *Certain aspects of non-agricultural unemployment in Ireland*. Paper No. 52. Economic and Social Research Institute, Dublin.
11. Grayson, A. G. 1967. *Forestry in Britain*. Agricultural Adjustment Unit, The University of Newcastle-on-Tyne.

12. Harberger, A. C. 1967. Techniques of project appraisal, in *National Economic planning* (Max Millikan, ed.) NBER Columbia University Press, New York.
13. Healy, John. 1968. *The death of an Irish town*. Mercier Press, Cork.
14. Johnston, D. R. 1964. Potential and Economic aspects of Forestry in marginal and submarginal land. *Irish Forestry*, 21.
15. Kennedy, K. A. and Dowling, B. R. 1970. Productivity earnings and the composition of labour: Irish manufacturing industries, 1953-66. *The Economic and Social Review*, 1.
16. Lucey, D. I. F. and Kaldor, D. R. 1969. *Rural Industrialisation*, Geoffrey Chapman, London.
17. McEvoy, T. (August 1970). Personal communication, Inspector General Forest Service, Dublin.
18. McGilvray, G. 1968. Economic planning in *Economic policy in Ireland* (G. A. Bristow and A. A. Tait ed.). Institute of Public Administration, Dublin.
19. Mooney, O. V. 1966. *A review of Forestry in Ireland*. Timber Seminar, Dublin.
20. N.I.E.C. 1967. *Report on Full Employment*. Government Publications, Dublin.
21. Newman, G. 1967. *New Dimensions in regional planning: a case study in Ireland*. An Foras Forbartha, Dublin.
22. O'Connor, R. and Breslin, M. 1968. *An input-output analysis of the agricultural sector of the Irish economy in 1964*. Paper no. 45, Economic and Social Research Institute, Dublin.
23. O'Neill, Sile, 1969. Farm Family Expenditures. *Irish Journal of Agricultural Economics and Rural Sociology*, 2.
24. *Report of the Departmental Committee on Irish Forestry, 1908*. H.M.S.O., Dublin.
25. *Report of the Minister for Lands on Forestry for year ended March 1943*. Government Publications, Dublin.
26. *Statistical Abstract of Ireland, 1967*, Government Publications, Dublin.
27. *Third Programme: Economic and Social Development 1969-72*. Government Publications, Dublin.
28. Westoby, G. C. 1962. Forest Industries in the attack on under-development. *Unasylva* 16.

Erratum

Vol. 27 No. 1

page 13, line 31. For ss read s_s

page 16, line 12. For $\bar{x}$ read $\bar{\bar{x}}$

page 19. Last four lines should read:

Since the standard deviation of a distribution of values of w is σ_w the standard deviation of values of R is $\sigma_R = \sigma_w \sigma$, σ_R may be estimated from a sample as s_R and, similarly, σ as s . Then $s_R = \sigma_w s = \sigma_w \bar{R}/d$, since $s = \bar{R}/d$. Control limits for range can be set at