

SUPPLY AND DEMAND FOR FORESTRY GRADUATES IN NEW ZEALAND*

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The Forestry Council, through the 1981 N.Z. Forestry Conference, has brought together and presented to the public the developments which will take place in exotic forestry until the end of the century, the implications these have for other sectors of the economy, and the calls they will make on resources of trained manpower, on land, and on the infrastructure of New Zealand society.

These developments are large scale and widespread. They envisage the development of new sophistication in the industry, of new types of wood and new types of processed products, of large-scale export activity in the face of international competition, of major companies undertaking the processing of raw materials produced on their own land. But they also envisage the establishment of a large number of privately owned small forest production units, and the creation of a new generation of owner-foresters, who must be wooed by the assurance that forestry will enhance their way of life both economically and culturally, and will be complementary to their established agricultural interests and philosophies.

Trained manpower, equipped to deal with the many facets of such an enlarged and re-oriented industry, and to create an informed public, understanding the costs and benefits of the developments taking place, is the very basis of the programme. At the graduate level there are five areas of activity which must be staffed adequately if progress is to be smooth and efficient. These are:

- (1) Production of foresters trained in forest management and in the manufacture of forest products.
- (2) Production of research scientists with necessary forestry skills and research knowledge to anticipate the problems and provide the information basic to the developments.
- (3) Provision of opportunities for postgraduate study for forestry graduates and for graduates in other disciplines who wish to apply them to forestry.

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- (4) Creation of expertise in advice and extension to the large number of small-scale owner/foresters for whom these developments are new experiences.
- (5) Enhancement of means of public education by which sound information flows freely both ways between the industry as a whole and the people of New Zealand under whose sanction it operates.

Though the production of trained professional manpower is a long-term undertaking, planning to produce this most essential resource seems to lag behind planning for land acquisition, physical facilities, and financial resources. There must be an urgency to ensure that trained people are available when they are needed so that New Zealand does not have to depend on importing overseas professionals to meet needs that should have been foreseen well in advance.

1. FORESTERS TRAINED FOR FOREST MANAGEMENT AND FOR PROCESSING OF WOOD

The Forestry Conference Working Party on Training and Employment estimated in their report (Forestry Council, Wellington, 1981) that the total number of new and replacement foresters required over the 1981-1995 period will be about 350, but considered this a very conservative figure. This figure includes 78 with bachelor qualifications estimated to be required for research by 1995. Hence the working party's conservative estimate of foresters required for forest management and wood processing is $350 - 78 = 272$.

The working party refers to "a force of foresters who, while possessing a knowledge of the forest resource and silviculture, need to have specialised expertise in harvesting, wood properties, chemical and mechanical conversion and the principles of marketing". This indicates a "sophistication factor" which should be included in the time span under consideration. It seems likely that the proportion of highly qualified staff employed in forestry will increase as operations become more mechanized, as capital investment in equipment increases, as the range of wood products increases, and as the full force of international competition on the export market demands highest efficiency from the initial design of the forest to the ultimate sale of the processed product.

The estimate does not appear to include provision for enlargement and replacement of the force of pulp and paper chemists or "other professionals" some of whom would preferably have forestry

qualifications. It does not incorporate a factor for some loss to the international professional market nor make provision for the increasing man-years of international consultancies being undertaken by New Zealand foresters.

For these reasons a figure of about 350 trained foresters required by 1995 (23 per year) for these fields would be more realistic than the conservative figure of 272 suggested by the working party.

The School of Forestry of the University of Canterbury states as its aim for the B.For.Sc. course: "to give each student a good understanding of the biological, social and economic factors of forestry, and how these need to be synthesised to solve forest management problems." This is an excellent basis for forest management and, though it is neither desirable nor practicable that all professional foresters should be trained in the one School of Forestry, it would be appropriate in New Zealand's circumstances for the great majority to come through the Canterbury School, especially if its training could be complemented by overseas experience a few years after graduation.

TABLE 1: CANTERBURY UNIVERSITY SCHOOL OF FORESTRY

	<i>Roll of 1st Professional and 2nd Professional Years*</i>		<i>Graduates B.For.Sc.</i>	
	<i>Total</i>	<i>Overseas Students Excluded</i>	<i>Total</i>	<i>Overseas Students Excluded</i>
1971	36	35	19	19
1972	43	38	16	15
1973	50	43	25	24
1974	50	42	22	19
1975	56	51	26	24
1976	49	45	25	25
1977	51	49	18	16
1978	63	58	32	31
1979	51	45	28	23
1980	40	35	20	17
1981	46	43	17	16
Average	48.7	44	22.5	20.8

*Note: The B.For.Sc. course at Canterbury comprises two years of basic science courses followed by two "professional" years of forestry science.

Table 1 indicates that even if the whole present output of graduates went into forest management it would be insufficient to meet the needs of that aspect of the projected development of the industry.

2. RESEARCH SCIENTISTS WITH FORESTRY TRAINING

The B.For.Sc. degree is not specifically designed as a training for research. But there is a generally accepted view among directors of research units that a substantial proportion of research staff should have qualifications in forestry science, ideally supplemented by qualifications in basic science disciplines. Approximately 40% of scientists employed by the N.Z. Forest Service have degrees in forestry.

Forestry research, expected to be greatly expanded during the current decade to meet the needs of the rapidly developing industry, will therefore require an increasing number of graduates from the School of Forestry. The Forestry Conference Working Party on Research in Exotic Forestry (Forestry Council, Wellington, 1981) advocated an increase of 154 scientists over a ten-year period. To this must be added normal replacements of existing staff *i.e.*, $1/3 \times 170 = 57$ scientists. Many of these new scientists are likely to be employed by industry and in various forms of jointly financed government/industry research programmes. But there seems no reason to anticipate that the proportion of graduates with forestry science degrees will be very different from the present proportion in the Forest Service.

In addition there are 22 scientists in the Protection Forestry Division of FRI which were not within fields covered by the Working Party on Research. Even if this field of activity did not expand in the next 10 years, about 7 replacements will be required for this division.

The demand for research staff with degrees in forestry science will therefore be 40% of $154 + 57 + 7 = 87$ scientists over the 10-year period.

Though the B.For.Sc. is not designed for research training, it is a high standard generalist degree, and a proportion of graduates who are motivated by research interests have been able to move readily into research training in specialised fields. The keenness of research directors that a substantial proportion of their scientists should have a basic qualification in forestry science is good evidence that this transition is being achieved successfully.

3. POSTGRADUATE STUDIES

Not all those entering forestry research with forestry qualifications will gain them through a B.For.Sc. degree. Some will have taken an initial degree in a relevant basic science such as physics, chemistry or botany, and will follow this with a postgraduate forestry degree at either masterate or Ph.D. level. This will enable

them to focus their basic discipline on to forestry. This is especially important in research on processing in which specialist expertise is required, but is made more effective by a broad technical understanding of the industry at reasonable depth. The postgraduate programme in forestry science is therefore potentially of great importance to the adequate staffing of the expanded research programme.

The School of Forestry has had a postgraduate programme since 1972 but its impact on New Zealand forestry has been small in relation to its effort because a high proportion of the students involved have been from overseas. Until 1982 there have been 21 M.For.Sc. graduates, of whom only 5 were New Zealand students, and 5 Ph.D. graduates of whom 2 were New Zealand students.

Most professional foresters enter the industry with a bachelors degree and build on to this with work experience and job-related training. In present circumstances of manpower supply and demand it is probably best, from the point of view of the industry, that immediate continuation from the B.For.Sc. to a masterate should not become the normal progression. Greater value to the industry would probably be gained by the graduate spending time in a work situation between the degrees.

However, there are some students, who enjoy their study experience, who find satisfaction and success in case study and dissertation work, and who have no immediate employment commitment, who see continuing study for a higher qualification as an opportunity not to be missed which might not be available to them again when they have entered their careers. There have in fact been only 3 B.For.Sc. graduates from the School of Forestry who have continued immediate study at the same School for a masterate. But it could become more common if there were a change in the type of entrant to the School, if there were a decrease in the immediate availability of jobs in relation to the number of graduates, or if there were a change of policy by employers in recruiting staff or sponsoring students.

There is great value for the industry and for the School of Forestry for graduates to return for postgraduate study after a few years' experience of work in forestry. At this stage they will have identified fields of interest and topics for further study related to the needs of the industry and to their own future careers. This process, involving feedback from the practical situation, can play a big part in ensuring the relevance of the School's research programmes, in the stimulating and updating of staff, and in the

constant reappraisal of the quality of the teaching in producing foresters.

In practice there are real difficulties in implementing a programme of this type. The release and support of a promising young forester to "return to school" for a year or more is an expensive operation for the employer. For the forester himself it may involve domestic upheaval and removal from a competitive situation in his employment at a stage when relativities with contemporaries are being established and career prospects are opening up: he can generally only undertake it with substantial support from his employer. On the other hand, this is a substantial co-operative investment for the future by both employer and employee after they have each had the opportunity to assess the other. It also provides the means of working on a problem of importance to the employer under the specialist guidance of university staff, and it leads to a qualification of high professional standing.

This type of postgraduate experience could well become an important element in a training package for producing the management and research skills needed for the progressive industry of the 1980s and 1990s.

To cope with the professional manpower needs of the industry during its forthcoming phase of rapid expansion, special efforts will be required to have highly trained people in position when they are needed. The postgraduate programme of the School of Forestry is of high reputation and standing. It should now be used by more New Zealand students, with its work focused on New Zealand needs, to play a very important role in staffing the stepped-up forestry programme.

An enhanced postgraduate programme would enable the School's research activities to be further developed in line with the recommendations for university research of the Working Party on Exotic Forestry Research. Well supervised research undertaken under the impetus of a postgraduate degree programme, provided it is designed in appropriate segments, can be very productive for the industry, and could be a major factor in further enhancing the reputation and international standing of the School.

4. THE CREATION OF EXPERTISE IN ADVICE AND EXTENSION

The Forestry Conference Working Party on Afforestation (Forestry Council, Wellington, 1981) proposes a second planting boom to be completed by 1990, which would raise the exotic

forest estate from 0.9 million ha to 1.315 million ha, at a new planting rate of 43 800 ha per year. Of this it is proposed that 24% of the total planting should be by small growers. The present rate is 5500 to 7500 ha/yr. It is envisaged that this might be raised to 12-16000 ha/yr by the end of the decade *i.e.*, between 30 and 40% of the total planting in 1990 would be by small growers.

These changes cover two fundamental developments in the forestry sector — a greatly increased area under forest, and a substantial number of new independent owners without experience, making a long-term commitment of their land to a new (to them) land use. This substantial change to rural life will require much more than financial incentives. It will need technical extension and advisory services to the new owners; it will need the establishment of systems of crop insurance, harvesting, marketing and processing suited to the large number of dispersed small owners; it will need the understanding and endorsement of the general public and the planning authorities to ensure that the development and its infrastructure are accommodated smoothly into the rural scene, complementing and enhancing rather than competing with and replacing traditional forms of land use in the region.

When the growing of production forests was virtually the prerogative of the N.Z. Forest Service and a few big private companies or local bodies, extension in forestry had little in common with the highly developed extension services of the agricultural sector. It was essentially the professional-to-professional transfer of technology from research to management. However, now that the afforestation programme for the next decade postulates a very substantial proportion of planting to be carried out by small owners, mostly farmers, the situation changes completely, and the extension/advisory requirements take on many of the characteristics of the agricultural situation. Success of the programme could depend quite heavily on an effective professional extension system. The Working Party on Research specifically recommends that "in co-operation with appropriate agricultural organisations, a research and extension programme be developed to meet the needs of farm forestry".

Extension implies the transfer of information from a source to a user. This process involves translation, interpretation and assessment, and should lead into a feed-back process from the user to the source, establishing a continuing dialogue. For the small forest owner situation the sources are professional, used to thinking and speaking in professional terms: but, as envisaged in the afforestation

tion programme, many of the users will be farmers with little experience or confidence in their own ability with forestry. As farmers, they are used to having independent professional advisory officers at their disposal, able to talk on a "whole farm" basis, to draw expertise from a wide range of sources, and to assist the farmer in developing his management system in considerable detail.

The postulated targets involve a substantial change in New Zealand's farming pattern extending throughout New Zealand, which must take place very quickly to achieve the objective by 1990. Farming has accepted some dramatic changes over recent years — deer farming, maize fodder growing, and farm tourism are examples — but none so dramatic as is now envisaged. By 1990 the postulated target for small owner-growers is 16% of a total estate of 1.315 million ha = 210 000 ha.

Present planting is mainly by "farmers who like trees" or by those who are planting for shelter or for soil erosion control and see the wood crop as a desirable by-product. To achieve the targets proposed much more production-oriented operations will be necessary.

There are two phases to this development, both requiring skilled investigator/advisers. The first is the establishment of the conditions necessary for this type of small-owner forestry to be sufficiently economically attractive to justify long-term commitment of land to this end use. This would involve establishing means of complementing farming operations with forestry operations in a concept of integrated land use; devising systems of financing compatible with farm finance arrangements; making provision for insurance against loss from disasters, arranging harvesting and marketing procedures that are efficient and ensure reasonable returns to the small grower who on his own has very little bargaining strength (possibly harvesting/marketing agencies or co-operatives or even processing co-operatives).

It would also involve establishing with those planning authorities who have designated forestry as a conditional land use the conditions which, while necessary for major forests, may be unnecessarily restrictive for small forests.

The second phase is to provide guidance and advice to the grower on how he can plan, establish, and manage his forest for optimum return in much the same way as the farm adviser of MAF suggests management programmes for the rest of the farm. This will require advisers with skills in forestry in a wide variety of situations, with understanding of farming systems, with ability

and willingness to integrate a forestry programme into a farming programme, and with facility to advise owners who lack experience or training in forestry. This is a new undertaking on quite a large scale for which there are few precedents to follow.

In agriculture the farm advisory process is based on the state-funded Advisory Services Division of the Ministry of Agriculture and Fisheries, supplemented by professional management consultants, and by conferences and short courses provided by the agricultural universities, the research centres, the technical associations (*e.g.*, Grasslands Association and Animal Production Society), and the farm training institutes. The most progressive farmers who participate in these activities lead their colleagues, and generally apply pressure and stimulus to research and advisory officers.

A similar type of service for the small forest owner can be readily envisaged. A state-funded professional advisory service could be developed from the Extension Group of the N.Z. Forest Service, the professional consultants are already available, the Farm Forestry Association already provides the basis for the technical society's input, the School of Forestry could readily link forces with the Forest Service and with Lincoln College to develop extension type courses for leaders in farm forestry corresponding to and possibly being associated with the Lincoln Farmers Week.

Whatever the administration involved, it is clear that the development of the small privately owned forest as a major component in wood production will require advisory services, manned by staff well trained in forestry, with breadth of outlook to cover related land uses, especially agriculture, and ability to co-operate on professional level with agricultural extension services and soil conservation staff.

This need will increase the demand for graduates, and broaden the range of application of their training. It will also involve some consideration being given as to how the skills of effective extension can best be developed in those seeking to specialise in this facet of professional forestry.

5. ENHANCEMENT OF PUBLIC EDUCATION IN FORESTRY

A large number of young people, seeking vocational training for a career in farming or closely related industries, undertake diploma courses in agriculture and horticulture at Lincoln College

and Massey University. Apart from the direct instruction they receive, this training is particularly effective in introducing the students to new ideas and in inculcating progressive attitudes which make them more receptive and responsive to extension and advisory services throughout their careers as farmers.

With the projected increase in numbers of small forest owners there could well be a sudden demand for practical training in forestry at the diploma level. The present undergraduate diploma courses at Massey and Lincoln do not include forestry and new specific training would be necessary. Whether this were achieved by extending the present diploma courses to include forestry, by establishing a forestry diploma course at the School of Forestry, or by establishing a special course in small forest management at the Forestry Training Centre at Rotorua, additional teaching staff, professionally qualified, would be necessary.

The public are closely involved in forestry — as owners of much of the land, as co-users of the roads, as shareholders in the companies, as suppliers of energy, water, and services, and as the source of the work force. People are entitled to expect forestry to do as much as possible to account for its use of its considerable share of natural resources, and to explain and fully justify its claims for further resources. In the future, as the industry seeks to increase the participation of the small private owner, it is even more essential that understanding and enthusiasm are developed for forestry as a wise, economic, and responsible form of land use.

The school system, especially the secondary schools and the teachers training colleges, provide a very effective route for public education. Information presented by teachers, accepted by children, and conveyed to parents at home is one of the most effective ways of arousing public interest and of influencing public opinion — and supportive public opinion for forestry could be a critical requirement in the expansion phase being planned for the short-term future.

It is common at present for students entering university to be antagonistic to forestry, picturing it as a destructive activity. Relatively few seem to have any concept of the positive constructive roles of forestry. Much more attention must be given to public education if forestry is to establish a more constructive image of itself, if it is to take its full part in the development of resource use planning, if it is to secure the participation of a large number of landowners to grow small forests, and if it is to ensure that forestry becomes known as a challenging, useful and satisfying professional career.

There should be professionally trained foresters working in the media — press, TV and radio — just as many other sectors have specialists strategically placed. There should be advocates trained in both law and forestry, gaining the confidence of planning authorities and tribunals, expressing the positive values and opportunities of the industry. There should be forestry expertise focused on creating an understanding among young people in the education system that forestry is a constructive use of resources. These applications should be recognised as legitimate uses of professional forestry expertise — essential if forestry is to realise its full potential in New Zealand's future development.

It is to be expected that, in the future, foresters will take their places in a wide range of top management positions which require professional management experience. Professional foresters who have been successful in forest management, will, by their training in integration, be well equipped to take up leading positions in other industries involved with resource management and with other government agencies such as the Department of Trade and Industry, the Prime Minister's Department, the Treasury, State Services Commission, the N.Z. Planning Council, the Commission for the Environment, and the National Water and Soil Conservation Organisation. Such highly trained people would be sorely missed from forest management, but they will have a very important contribution to make to New Zealand in these other roles.

TABLE 2: GRADUATE REQUIREMENTS

<i>Field</i>	<i>Total Requirement</i>	<i>Annual Requirement</i>
Management	350 in 15 years	23
Research	87 in 10 years	9
Advisory, consultancy, advocacy	40 in 10 years	4
Public education—journalism, radio, TV, continuing education, diploma teaching, schools	10 in 10 years	1
Replacement of losses to wider top management	10 in 10 years	1
<i>Sub-total</i>		38
Additional University Staff to: produce 38 graduates/year	5 in School of Forestry	
increase postgraduate training	5 in other Universities	
increase research output	10 in 10 years	1
<i>Total</i>		39

Further, they will, by spreading their influence in this way, create a much wider understanding of the role of forestry in the national scene.

FORESTRY GRADUATE REQUIREMENTS

Converting these concepts into requirements for new and replacement graduate staff for the forthcoming expansion period gives the figures shown in Table 2.

This involves nearly doubling the present output of the School of Forestry.

There is a danger of linear thinking in estimating the future manpower needs for forestry — of simply calculating the minimum number of people necessary to establish, tend, harvest and process the forest resource in the manner we operate at present. A much broader view than this is necessary. It is to be hoped that this will be recognised in any “comprehensive manpower study of the forestry sector”, which the Forestry Council undertakes in response to the recommendations of the Working Party on Training and Employment. Manpower planning should aim at discovering the best combination of well-trained men, well-grown trees, and well-designed processing plants operating in communities which are well-informed, enthusiastic, and supportive.