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RESEARCH AND EXTENSION NEEDS OF WOODY PLANT GROWERS:
A HISTORY AND SURVEY TO DESCRIBE THE WOODY PLANT
INDUSTRY

A thesis presented in partial fulfilment of the requirements for the degree
of Master of Horticultural Science
in Horticultural Management
at Massey University

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1993

ABSTRACT

Woody plant growing businesses are a major part of New Zealand's nursery industry. Neither these businesses nor their participants have been well described. Research and extension services have been provided at low cost to the growers.

Farming Systems Research and Extension methodology was used to describe the membership of the woody plant industry and their businesses. The constraints to growth, and opportunities for business development were also described. An initial identification of the research and extension priorities was also made. The method used to obtain this information was by postal survey.

The industry was found to contain many more participants than previous estimates had indicated. The industry was also found to be very diverse. Businesses ranged from those employing no additional staff to those employing more than 100. Although the mean business size was 1 hectare, the smallest business was based on a small laboratory (0.1ha) and the largest covered more than 150ha.

Almost half the respondents were specialist woody plant producers involved only with woody plant production. However, many of the more diversified businesses, which were involved with other nursery crop enterprises, earned more than 76% of their income from woody plants. Within each woody plant enterprise growers described a wide range of crop specialisations.

Few businesses were more than 15 years old and most had been set up by the respondents. Although many growers had good educational background many had trained in other areas before entering the woody plant industry. The more recently established businesses were more likely to be involved in many enterprises.

Most of the growers traded solely on the local market and only 10% reported upon the direct export of their crops. The local market was described as being over-supplied with inferior quality products.

Although few growers declared they had any debt many described finance as the factor most likely to inhibit expansion of their businesses. Most growers described business, managerial, market and personnel issues as being the most serious challenges to their businesses. Although these business management challenges provided the issues which were of the highest priority in terms of research need, most growers thought a range of technical issues should be on their research agenda.

Business management needs were likely to be of the highest priority for industry participants. Since business information is available cheaply from many sources, the provision of such information is not likely to be financially rewarding for research and extension providers.

In a user pays environment, to ensure that the needs of both woody plant industry participants and research and extension service providers are met, research and extension activities should be targeted to the needs of growers. Growers must be prepared to pay the full cost of research and extension services provided for them.

Proposals for the development of strategies for mutually beneficial research and extension are made using the principle of FSR/E methods, ie., by involving the growers to a larger extent in the development of the research agenda. Hence growers are more likely to be willing to pay for work that is tailored to their needs.

ACKNOWLEDGEMENTS

This study programme was supervised by Professor Frank Anderson, of the Department of Agricultural and Horticultural Systems Management and Dr John Clemens, Director of the New Zealand Nursery Research Centre. Thanks to their excellent supervision, stimulation, patience, support and perserverence, I have finally completed this work.

The assistance is appreciated of the growers who responded to my survey and of Mr Palle Olsen, Mr Doug Simpson, Mr Vern Harrison, Ms Lyn Bishop and Mr Eddie Welsh, who provided comments on the questionnaire design. The helpful comments and encouragement provided by some respondents with their responses made the onerous task of coding and checking questionnaires less monotonous and somehow more meaningful.

Thanks to Alan McRae, Rob Brazendale, Janet Reid and Alistair MacDonald, for putting up with my ramblings on the methodological issues related to this study. Assistance for the statistical analysis was provided by Dr Ian Gordon, Mr Ted Drawneek and Mr Bob Lambourne.

Special thanks to my parents for their hours of searching through the Auckland public library's historical records for nursery industry information.

My partner Dr Heather Meikle, deserves special mention for the assistance she has provided. Without Heather's support this would not have been completed.

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1.0 INTRODUCTION

The traditional focus of the New Zealand Government's public funding for primary industry research and extension activities has been on two groups of industries.

- (a) Industries such as dairy, meat and wool that export most of their production.
- (b) Industries such as wheat, poultry and pork that export insignificant proportions of their total production.

Prior to 1984, participants in both groups had publicly-funded research undertaken on their behalf, and received extension services from the Ministry of Agriculture and Fisheries (MAF), the Department of Scientific and Industrial Research (DSIR) and Universities on a free-to-user or heavily subsidised basis.

Most of the public funds for research and extension were allocated to the dairy, meat and wool industries. These industries also sponsored some research and extension activities with funding from their own participants, but the amounts so raised were small relative to the Government contributions. The rationale for the heavy subsidies for these industries was mainly political and was associated with concepts such as national self-reliance and food security. Notwithstanding these concerns, contemporary economic studies showed that these high rates of support were not sustainable (Johnson, 1989).

Since 1984, public funding for both of the industry groups was significantly reduced when the newly elected Government enacted policies to restructure the New Zealand economy. The restructuring has required all primary industries to be more responsive and open to international market conditions.

Primary industries not in these two groups have traditionally received only incidental public funding for their research and extension needs. Characteristics

of these "lesser" industries were that they produced mainly for the local market, that domestic production by them did not compete with imports (although this is changing as barriers to trade are being removed), and their products were not considered to be essential to the national goals of self-reliance and food security. Examples of these industries include specialist horticultural groups such as the viticulture and nursery industries.

The New Zealand nursery industry is relatively small in comparison to New Zealand's main agricultural commodity groups. However, recent estimates indicate the nursery industry accounts for a retail trade of \$170M on the domestic retail market. Some \$4M worth of plants are also exported (NRC, 1991).

The New Zealand nursery industry is subject to minimal regulation. There are no specific restrictions on entry to the industry. Once local zoning regulations and by-laws are met, anyone who can produce a plant and can trade it can call themselves a plant nursery¹. Small nurseries, such as backyard growers sell small volumes locally, while the few big businesses may sell millions of plants each year. Many of the small growers are reputed to be involved in undeclared cash transactions, to avoid paying tax on their earnings. Nursery businesses can be found which specialise in supplying the nation's forestry, fruit and vegetable growing industries with plants, or which grow ornamental trees and shrubs for sale to home gardeners. A characteristic of the industry is the absence of recognised and accepted product standards and the large range and number of industry products. These factors have combined to weaken collaboration among producers.

The ornamental sector of the industry illustrates its diversity. In Auckland, it is dominated by a major retail garden centre chain, whereas in other areas the

¹ A nursery grower is defined in the New Zealand Standard Classification of Occupations, 1992, as being *an individual who performs a variety of tasks in the management and/or working of a nursery to propagate, grow, and/or sell trees, shrubs and plants.*

businesses tend to be smaller, privately owned operations. Wholesale trading by the ornamental sector is dominated by one corporate business.

Nursery industry businesses produce a wide range of plants from vegetable seedlings to amenity trees, and are located throughout New Zealand. These businesses may be solely retailers or they may be vertically integrated, involved in propagating, growing-on and selling plants.

Although there is reported to be a large potential for export activities, most of the nursery businesses are involved solely with local market activities (NRC, 1991). Of the \$4M of export earnings, more than half are earned by one company.

In spite of the difficulties resulting from the small size of the industry, differences in market power of the participants, and the diversity of products (and presumably the diversity of researchable problems associated with the situation), some initiatives have been taken by the industry to provide research and extension for its needs. In 1975, the New Zealand Nurserymen's Association (NZNA), the main nursery industry trade organisation, and Massey University made a modest step toward the provision of research specifically for the nursery industry. These two organisations jointly established the New Zealand Nursery Research Centre (NRC). This is located on the Massey University Campus in Palmerston North. In the 18 years since the establishment of the NRC, no other substantial nursery industry initiatives to fund research or extension have been made. The funds provided by the NZNA for operating the NRC have diminished with time. Currently, the costs of maintaining and operating the NRC are met by commercial contracts and Massey University.

The progressive application of the *user pays* philosophy has markedly reduced the funding for research and extension to all New Zealand's primary industries. Government funding has been withdrawn where no public good benefit is expected from research, or where the beneficiaries of research can be easily

identified. As a result, research and extension agencies, and to a lesser extent other organisations such as Universities, must now compete openly for the residual Government funding available for research and extension. At the same time, these organisations are seeking to derive more funding directly from product-based industry groups.

Since its inception, the NRC has been a research venue for Massey University's staff and postgraduate students. Until recently it has not been necessary for the University to account at project level for research costs. Indeed in the past there have been few limits to funding for these activities in horticulture. However, this situation has changed rapidly in the 1990's. Real funding by government for tertiary education has been reduced and greater emphasis than before is being given to diploma and undergraduate education and training. This is obliging Massey University to examine carefully its contribution to the costs of postgraduate education, and where possible to enter partnerships with funding facilities to underwrite the research. To survive, the NRC must respond effectively to these new and demanding circumstances.

Research and extension organisations appear to be expecting this competitive funding situation to continue and they are attempting to better focus their operations on their clients' needs. The recently formed Crown Research Institutes, for example, espouse client-driven research agendas and reorganisations of staff and their functions to produce adoptable results. A few of New Zealand's agricultural industries have a tradition of collaboration among participants, a long and presumably beneficial research and extension experience, and are of a scale that research and extension costs per participant are modest. The dairy, beef and wool industries are examples of these. Industries with these characteristics are likely to be able to respond more effectively to the needs of the 'market-driven' funding for research and extension than industries that are diverse, have only a poor record of collaboration among participants and where differences among participants are such that the benefits of research and extension are likely to be captured by the more powerful

members of the industry. As this latter situation prevails in the nursery industry, this industry is likely to confront special challenges in funding, organising and executing research and the associated extension of favourable findings to its participants.

There is an element of risk in all research. There is no certainty that by spending a given sum on research that a particular problem will be resolved. Similarly, even if a *problem* is researched and resolved there is no prior expectation that the benefits arising from the adoption of a solution by industry participants will be the same to all adopters. These uncertainties are compounded when there are numerous (unranked) problems to be researched and the method of apportioning research costs is not agreed upon by the potential beneficiaries.

Both research and its associated extension are investments. As such it can be expected that participants in an industry will only support such investments if they expect the benefits to them to be greater than the costs to them. The uncertainties noted above suggest that they will be better able to collaborate and to agree to fund research on well-defined problems. Such a stance suggests adaptive or applied research is more likely to be supported by industries such as the nursery industry than are basic or strategic research, where the expected benefits are at best only able to be described generally and where the research is not tailored to current or even medium term needs of the industry's participants.

To provide this adaptive research, which fits new technologies often developed overseas to New Zealand conditions, research workers need to keep closely linked to the activities of the farmers and growers. In an industry such as the nursery industry, where the trade organisation represents about half of the growers, how can the researchers develop and keep these links? Do they need to keep in contact with every grower? What are the concerns of the growers? What do these growers believe constrains their businesses? Can research help

overcome the constraints? Such questions must be satisfactorily answered as a necessary but not sufficient condition for beneficial research to be undertaken by the nursery industry. The substance of this thesis is the presentation of an approach to establishing an adequate knowledge of the nursery industry which will allow these and other related questions to be answered.

1.1 Objectives

The general objective of this study is to evaluate the potential for Massey University to continue to participate with plant growers in the nursery industry. This is achieved by applying a research methodology for the derivation of research and extension programmes appropriate to the needs of the growers and of the University. By developing better information about the nursery industry and its participants, industry parameters and the opportunities and constraints for nursery businesses and their operators can be described. The description may be used to make proposals for research and extension activities focused on the industry.

As the whole nursery industry is too diverse and complex to study conveniently, only growers involved with woody plant production were selected as the target for the study. Woody plant growers are all involved with similar types of crops and should have similar production problems and opportunities. This group also includes the members of the tree and shrub growers sector² of the NZNA, the largest grower sector of that organisation. The political leadership of the NZNA is currently from the tree and shrub growers' sector. Retailers in the nursery industry are not included in the study except if they are also plant growers. It is hoped that the methodology followed in this study can be used as a model for derivation of research and extension initiatives for other similarly diverse industry groups.

²

See Chapter 2 for discussion of NZNA sector groups and classification of nurseries by common attributes.

The specific hypotheses for this project are:

1. That by describing the woody plant growing sector of the New Zealand nursery industry and its participants, in terms of factors such as the attributes of the growers and their businesses; the crops they produce and handle; along with social and locational detail, then, constraints to, and opportunities for the development of this part of the nursery industry can be prioritised.
2. That from these prioritised constraints and opportunities, worthwhile programmes of action for producers, researchers and extension agents can be designed to assist the industry and its participants to develop together.
3. Given the needs of the industry can be established and opportunities for co-operation can be identified, that strategies for the industry to realize these opportunities through a working relationship with Massey University can be developed.

1.2 Organisation of this study

The first part of Chapter 2 presents an overview of the development of the nursery industry in New Zealand from the arrival of European settlers in the early nineteenth century to the present time. Section 2.1 describes the development and operation of the New Zealand Nursery Research Centre (NRC). The NRC is the only research and extension institution which has been created to serve the nursery industry. The final Section 2.2 describes the various classification schemes that may be used for grouping nursery industry participants.

In Chapter 3, Section 3.1 the nature of agricultural research from basic research through to on farm testing and demonstration of new technologies is discussed. This section also includes a discussion of the approach to agricultural research that has developed in New Zealand's farming. The next Section 3.2 includes discussion of two research, and extension models used to describe the links between farmers, extension workers and researchers. From this discussion, attention in Section 3.3 shifts to the selection, administration and analysis of survey techniques appropriate to eliciting basic information about a population of farmers.

Chapter 4 describes the methodology used for this study. Results of this study and discussion of these are presented in Chapter 5. Chapter 6 includes the conclusions drawn from the results of the survey, together with other general proposals relating to the potential for future research and extension initiatives which may be developed to meet the needs of woody plant industry participants.

European colonisation of modern New Zealand took place at the peak of the Victorian era when interest in *new* plants in England was strong. The early botanists became our first plant exporters, supplying their sponsors in Europe with *specimens of plants, mosses and ferns, if possible with fructification three parts ripe, and if possible specimens of handsome shrubs or herbaceous plants* (Corbett, 1854). These first exports were uncultivated plants taken directly from the native bush. Some of these botanists also devoted their lives to collecting plants world wide for growing in New Zealand. Much of the diversity of plant material in New Zealand can be attributed to the activities of these *plantsmen* who brought plant material to New Zealand from all parts of the globe (Hammett, 1993).

Like the Californian nursery industry which was established by Spanish missionaries (Davidson and Mecklenburg, 1981), the first growers and suppliers of more mundane plants to New Zealand, such as those providing fruit and vegetables were the pioneer settlers and missionaries who brought with them the plants from Europe (Sykes, 1974). Amongst the colonists, *gardeners* became the source not only of the direct products of these plants, such as, fresh fruit and vegetables, but also of the plants they propagated. Hale (1955), in his book *Pioneer Nurserymen of New Zealand*, reported the development of the first *specialist* nurseries by these gardeners of the mid-nineteenth century. These early businesses are reported to have been set up by individuals who were *true pioneers being resolute and self reliant* (Hale *op cit*). Many of these early businesses had a short life of at most 15 to 20 years (Hale, 1955) and produced mainly fruit and vegetable plants together with a few ornamentals. This self-reliance is still a feature of the industry today. Likewise many modern nursery businesses may not be surviving their founders. These issues are investigated in detail later in this thesis.

The first documented instance of cooperative endeavour among nursery industry participants was reported in 1904 by Hale (1955), when Thomas Horton, a

Hawke's Bay nurseryman, formed an organisation representing the interests of the gardening industry. This association, was called the New Zealand Association of Nurserymen (NZAN). The proceedings of the NZAN listed 125 members in 1916 (NZAN, 1916). In that same year, 257 growers were registered as growers of prescribed plants³ (Department of Agriculture, Industry and Commerce, 1917). There would also have been a number of growers of non-prescribed plants who were not included on the register held by the Department of Agriculture.

The nursery industry grew steadily as development of urban centres brought with it expansion of nursery operations which grew and supplied the local consumers with the plants they required. World War I interrupted this development but after the end of the war, as the local apple growing industry expanded, tree nurseries again increased their production to meet the demand for new plantings.

Hale (*op cit*) reported the first export of nursery-grown plants from New Zealand to Australia occurred in 1873. By the beginning of World War I, Thomas Horton is reported to have exported apple trees to Argentina (Hale, 1955). This development collapsed during the War but recommenced afterwards. The export by Victor Davies of shiploads of daphnes, rhododendrons, and camellias direct from New Plymouth to Australia is reported in the early 1920s (Hale, 1955). A substantial export trade also developed in native plants.

In that period, which was before international trade in plants and plant materials was curtailed by quarantine and other (mainly tariff-based) restrictions, the New Zealand nursery industry boomed.

³ To help control the spread of plant diseases, particularly those which affected crop plants, the Government enacted regulations in 1916 requiring a nursery grower of *fruit tree or plant, tomato plant, timber or shelter tree or plant, hedge plant, ornamental tree or shrub, or rose plant* to register with the Department of Agriculture. At the same time as these regulations were enacted quarantine regulations were enforced which prohibited the importation of these plants into New Zealand. The quarantine status was maintained but the market for local producers was also protected as no imports could be made.

By 1923, partly as a result of these trade barriers, but mainly due to a decline in the domestic market, New Zealand's nursery industry was again in serious financial difficulty. Reports of the time describe owners walking off their properties because of high debts and large stocks of unsaleable material (NZAN, 1924).

In a retrospective view of the industry, given to the 1977 Nursery Management Symposium, Richards (1977) commented that the industry had remained relatively unsophisticated until World War II. Up to that time, most nurseries produced and sold their own material either at their own gate or by mail order. After World War II, the industry grew rapidly to meet the needs of the increasingly urbanised economy. Technological advances such as plant growth regulators and herbicides were becoming available. These were described by Richards (*op cit*) as *looking like magic wands* and should have enabled growers to produce larger numbers of plants more profitably. However, the nursery industry was reputed to be unable to meet demand for its products. Many growers were not able to exploit the new technologies because their facilities were old and inefficient. Import restrictions on plants and capital equipment after World War II also limited the opportunity to develop. Capital was also rationed and the Government of the time gave preference in import entitlements and capital access to those industries producing mainly for export markets, which the nursery industry was not at that time. Richards proposed another reason for the apparent failure of the nursery industry to modernise. This was that the industry suffered from *deeply entrenched conservatism among the people involved which mitigated against the development of new technology*. As no measurement of technological adoption rates by New Zealand has been reported, it is difficult to substantiate or refute this claim. It is also difficult to imagine on what basis it was made.

Davidson and Mecklenburg (1981) report that the single most important technical change in the USA nursery industry took place in the late 1950's and early 1960's when containerised production was being adopted by many

growers. Prior to containerisation, plants were produced in open ground, and were sold as either bare-rooted or as balled plants. The main consequence of this change was that containerised plants could be produced, sold and planted year round. Trees from open ground nurseries are generally sold in autumn and winter for dormant planting. Although Richards (1977) makes no reference to or comment on the development of containerisation technologies in New Zealand, the effects are presumed to be no less far-reaching than in the USA.

However, the progressive expansion of the New Zealand market since the 1950's has enabled some specialisation to emerge. Firstly, the functions of production and retail trading of plants have become distinct. In recent years, and following overseas trends (Davidson and Mecklenburg, 1981), some nursery industry participants have developed businesses which are highly specialised in terms of the crops they grow. For example, forest tree nurseries have been developed specifically to supply the forest companies with the millions of *Pinus radiata* trees needed for their planting programmes. Other nurseries have become specialised in terms of some activity. Examples of specialisation include; specialist propagators, nurseries which only undertake tissue culture propagation of nursery stock, or other nurseries which handle growing-on-lines, that is they take the propagules and grow them on until they are suitable for sale on a retail basis. Finally, specialist retailers, or *garden centres*, have also emerged in the market. These centres buy in plants ready to sell and carry out few traditional nursery operations with the plants because of the short time the plants are held. Specialist export companies have been formed, with some firms combining propagation, growing on, and exporting functions. Expansion of this sector has resulted in some further specialisation, with nursery brokerage firms entering the market.

Davidson and Mecklenburg (1981) report that nurseries in the USA have, in addition to the sorts of specialisation reported above, also shifted their production focus from fruit trees and vegetables to ornamental plants. The lack of New Zealand industry data means such shifts in production focus have not

been reported but as this country has become more urbanised similar changes are likely to have taken place.

The New Zealand forestry industry was being established in the early twentieth century, at the same time as the developments were taking place in fruit and ornamental plant nurseries. *Pinus radiata* had been introduced to New Zealand by several nurserymen in the period 1855 to 1880. Some initial forest plantings were made in the early 1900's, but most of the development did not take place until the Government became involved with forest establishment. The New Zealand Forest Service was established in 1920. By 1930, the Service had grown the trees for and planted 134,000 hectares of publicly-owned land in *Pinus radiata* (Shepherd, 1990). Private investors developed a further 10,000ha of forests by 1935.

In contrast to modern practice, by which forests are managed using industrial management principles with nurseries producing several million trees each year, the early forest managers were the nurserymen themselves who used a large labour force to wrench, transplant and weed the newly-planted trees (Hinds, 1971). The use of a large labour force reflected the lower cost of labour relative to capital and technological costs of the day. The development of industrial management strategies in forestry production has weakened the links between the forest nursery sector and the other nursery groups. While some forest nurseries have retained their affiliation to the nursery industry, most of the bigger nurseries are operated as part of the forest company. The extent to which these forest industry nurseries have similar problems and opportunities to the rest of the nursery industry is investigated later in this thesis.

Following a proposal made by the New Zealand Horticultural Trades Association (NZHTA)⁴, a Nursery Stock Research and Extension Committee was established in 1956 by the Department of Agriculture (NZHTA, 1957). The

⁴ The New Zealand Horticultural Trades Association came into being when the New Zealand Nursery Trades Association changed its name in 1928 (NZHTA, 1929)

Committee brought together the Government Departments involved with the nursery industry and representatives of the NZHTA for discussions on the research and extension initiatives appropriate for the nursery industry (NZHTA, 1956). The arrangements by which this organisation was funded and functioned and in particular the way it established research and extension priorities, is not documented. No details are available on the issues of research and extension concern at that time to either researchers or extension workers or growers.

Arising from a proposal made through the Nursery Stock Research and Extension Committee, the first known survey of the New Zealand nursery industry was performed by Salinger (1964), in the 1962/1963 growing season. The survey was conducted under the direction of the Department of Agriculture and the NZHTA. In this survey, to which 88% of all 526 registered nurseries responded, Salinger (1964) reported on the numbers of plants the New Zealand nursery industry produced over the 1962-1963 production year. Table 1.1 summarises the results of the survey. Production was described as being greatest in the Auckland area, although the Manawatu, including Horowhenua and Wanganui, also had a large area of nurseries producing woody plants. Canterbury was described as being the main producing area in the South Island. Taranaki was the main district for production of ornamental plants. The report on the survey noted that the production of such quantitative data will *assist in planning future lines of production and development of the industry as a whole* (Salinger, 1964). No information is available to show that the data were used for planning.

Surveys made in 1967 of non-registered growers, and in 1968 of the growers registered with MAF to grow prescribed plants, are noted in the report of the Annual Meeting and Conference of the Horticultural Trades Association of those two years (NZHTA, 1967; NZHTA, 1968). However, copies of the reports can not be located, so detail on the distribution of nurseries can not be reported here. Table 1.1 compares the production of prescribed plants by registered nurseries in 1963 and 1968 (NZNA, 1969). Of note is the massive increase in the number

of forest and shelter trees produced over the period of the two surveys. The increased production of forest and shelter trees reflects the increased need for shelter for kiwifruit growers, and production of *Pinus radiata* for the forest industry which were both rapidly expanding at the time. Although the production of ornamental trees and shrubs more than doubled in the five year interval, there was a concomitant increase in production of most crops.

Table 2.1 Production of nursery stock offered for sale by registered growers in New Zealand; a summary of the results of the 1963 and 1968 surveys.

TYPE OF NURSERY STOCK	NUMBER OF PLANTS (In thousands)	
	1963	1968
Fruit trees and plants		
Pip fruit	162	243
Stone fruit	140	164
Citrus	112	215
Subtropicals	45	210
Berry fruit	138	130
Strawberry plants	6,897	7,608
Trees and shrubs		
Forest and shelter trees	6,518	20,309
Hedging	2,424	1,749
Ornamentals	2,144	4,358
Roses		
Bush and climbing	634	833
Standards	131	98
Miniature	28	37
Glasshouse plants		
House plants	649	1,175

Source: NZNA Annual Conference and Meeting Report, 1969

In 1981, amendments to the Plants Act 1970, revoked the regulations requiring growers of prescribed plants to register. Since 1981, no record has been kept of

the number of growers of the plants which had been prescribed previously. Furthermore, for various reasons the low volume growers who have always been a part of the industry, are not usually counted as industry participants. Businesses which are not goods and services tax (GST) registered⁵ or are not part of a GST-registered business are not sent agricultural census forms to complete. Furthermore, businesses for which census information is provided, are not counted as industry participants if they earn less than half of their income from the nursery industry. Census information shows that the number of nurseries that earn over half their income from production and sale of plants has apparently declined over the 1987-1990 period⁶ (NRC, 1991). The belief amongst 20 industry participants who attended an industry planning meeting in 1991, was that there are now more operations earning a small proportion of their income from horticulture than was the situation prior to deregulation of the New Zealand economy by the Labour Government of 1984 (NRC, 1991). No details of the number, location, activities or performance are available for these uncounted businesses.

The NZHTA was renamed the New Zealand Nurserymen's Association (NZNA) in 1968, to reflect better the activities of the membership at that time. The NZNA, which had 435 members in 1992, is the largest nursery industry organisation (NZNA, 1993). However, for the reasons given above, no estimate is available of the numbers of non-NZNA members in the nursery industry although NZNA estimates (NRC, 1991) claim 40 to 60% of nurseries which produce 70 to 80% of the volume of plants traded, are NZNA members. As one aim of this research is to develop research priorities for those whole nursery industry not just the NZNA, then the nature of the difference between the number of NZNA members and the total number of growers is of importance. The quality of these estimates is examined later in this thesis.

⁵ A business is GST registered when its gross income exceeds \$24,000. Smaller businesses do not have to be GST registered.

⁶ Businesses which earn less than 50% of their income from a given activity are not counted by the Statistics Department as members of that industry,

In 1991, an industry outlook workshop was held to help the NZNA formulate policies to lead the New Zealand nursery industry into the 21st century. The workshop was attended by key NZNA members together with representatives from various organisations such as Massey University, MAF and the DSIR, Horticultural Export Authority, and other involved groups. In a background paper to that workshop, Atkins (1991) reported that *statistics are virtually unavailable on inputs and production for nurseries*. Moreover, the summary report produced claimed that the industry participants believed that the nursery industry was significantly larger than indicated by the Department of Statistics information.

The workshop participants completed a S.W.O.T.⁷ analysis of their industry and then described four categories of industry needs which participants saw as crucial to industry development. The results of the SWOT analysis are presented in Appendix (i).

The main needs identified were;

Information about markets: The customers of the nursery industry need to be identified so that the characteristics of the market (particularly the size of the market can be discovered).

Information about productivity standards: So that growers have benchmarks against which success, progress and profitability can be measured, productivity standards need to be established.

Information about technology in general: To ensure that growers get adequate information, appropriate technology transfer programmes need to be developed.

Information about alternatives for fundraising: To carry out NZNA activities including those above, alternative funding arrangements need to be found.

⁷ S.W.O.T. analysis is an analysis of the Strengths, Weaknesses, Opportunities and Threats in a particular situation.

The meeting also identified the lack of information about industry participants as a hindrance to industry development⁸. The lack of information has also been a major problem for research and extension workers involved with the nursery industry because of the increasing need to target research and extension activities for known clients.

Since publication of this report the NZNA has not reported any actions taken to address these needs.

2.1 Nursery Research Centre

Apart from a few informal comments made to a meeting of nursery industry participants by Richards in 1977 (Richards, 1977), no report is known to be available on the adoption of technology by the New Zealand nursery industry.

In a review of research in the nursery industry presented to the 67th Annual Meeting and Conference of the NZNA, Rainey (1974), who was at the time a member of the NZNA's executive and later became a grower-member of the NRC Advisory Committee, commented that little research had been performed in New Zealand on nursery crops and that the main focus of research work in New Zealand horticulture up to 1974 had been on *fruit, berryfruit, grapes, hot house tomatoes, hop and forest tree subjects*. Mention is made, however, of the visits made by nurserymen to Australia in 1966, California in 1968 and to Europe in 1972 to *expose and educate nurserymen in this country to the ideas and techniques of their overseas counterparts*. These overseas trips continue to provide industry participants with innovations from other nursery industries.

At the time that Rainey presented this report, the ornamental industry was reputed by the NZNA to show excellent potential for exports. Concurrently, the Levin Horticultural Research Centre (LHRC), which was a wholly Government funded research facility, was expanding its operations because it had received

⁸ No non-NZNA affiliated growers attended the Towards 2000 meeting so the stance adopted only represents the view of the NZNA growers and the other representatives.

additional Government funds (Rainey, *op cit*). The NZNA argued that the industry should assist in the direction of research by being represented on a Board of Directors of LHRC⁹ (Rainey, 1974). An offer was made of a place on a *nebulous committee with advisory capacity but with no powers* (Rainey, 1974) which did not satisfy the NZNA. As a result the NZNA made a proposal to Massey University to establish a jointly-funded research facility on the Palmerston North campus. The New Zealand Nursery Research Centre (NRC) was established in 1975 as a result of this proposal.

Initially, research activities at the NRC were to *be directed mainly towards aspects of nursery crop production and the development of high health ornamentals* (NRC, 1976). *High Health* ornamentals are crops believed free of known viruses, which have been virus indexed, and have then been produced in special conditions to retain their virus free status. High health plants perform better than their virus infested counterparts and are thus sold at a premium. One objective of the NRC was to *initiate and/or supplement research relevant to the nursery industry being conducted at other institutions* (NRC, 1976). The belief, apparently, was that collaboration between institutions was essential to success in research by the NRC.

Initially, the NRC was part-funded by Massey University and by the NZNA, and was run by a staff of two. Executive control of the NRC was held by the Director, who was responsible to an Advisory Committee for the running of the Centre. The Advisory Committee was initially comprised of four Massey University and four NZNA representatives. When some Government funding was provided to the NRC through DSIR in 1978, two additional positions were created on the Advisory Committee, one each for a DSIR and a MAF staff member.

⁹

At the time LHRC was not managed by a board of directors.

Mr M. Richards, the first Director at the NRC, maintained close contact with the industry. Through his actions and with the assistance of the Advisory Committee, the NRC was able to do the research that the Committee perceived was needed by the nursery industry. Following the provision of extra funds from Government, the NRC's activities were expanded and the number of staff increased to five in 1983.

Primarily, the work of the NRC involved:

- 1 Indexing and subsequent release of "High Health" daphne, and nandina¹⁰.
- 2 Testing agricultural chemicals on a wide range of crops.
- 3 Evaluating different production techniques such as, cutting propagation of various crops, and media trials.

Most of the work was highly applied or demonstrative in nature involving the testing under local conditions of work previously carried out overseas. The work done on agricultural chemicals was paid for by the nursery industry and not on a fee-for-service basis by the manufacturers. The reason for this strategy is not documented but is consistent with the pre-1984 national policy that all research is a public good and not apportionable to groups, companies or individuals.

Every NZNA member was sent a free copy of the NRC's annual report which contained summaries of the results of the research carried out each year. Summaries of the work were also presented in *Commercial Horticulture*, the magazine published under the auspices of the NZNA. Verbal reports of the activities of the Centre were made at each Annual Conference of the NZNA, and at "mid-year" NRC meetings, held from time to time at the University. The results of the work were not published in internationally recognized journals.

¹⁰

The NRC received a commission of \$0.35 for each *High Health* plant sold on the local market, \$0.06 per plant exported in 1985, and \$0.04 per plant exported from 1986. The levies were collected by the NZNA who transferred the money to the NRC annually. In 1989 this process was changed to enable the NRC to be directly credited for these levies.

NZNA members could contact the NRC by telephone to gain "free" assistance from the NRC's staff for problems of an immediate nature.

The only access non-NZNA members had to the work of the NRC was through the annual reports of the NRC which were not widely distributed to non-NZNA members.

At least until the retirement of the first Director, the NRC appears to have had a modicum of success in its research. No record is available of the adoption of NRC results by the industry, although Jamieson (1987) reported that key participants felt they needed the NRC.

The NRC has addressed other issues in addition to the investigations into husbandry operations on which the Centre's operations have concentrated. For instance, Massey University's Market Research Centre carried out a series of investigations into market-related aspects of the nursery industry on behalf of the NRC (West and Bourke, 1976)(West, 1982).

Nineteen eighty six was an eventful year for the NRC. In that year the Centre moved into facilities built for it by Massey University. Also the first Director of the Centre, Mr Richards, retired. Around the same time as the Centre moved to the new facilities, the Government was introducing the *user pays* philosophy. The University established a charging scheme to recoup the hidden costs of the Centre which had up until that time been borne by the University. The Chairman of the Advisory Committee became the Director of the Centre and a junior Massey University staff member was appointed Officer in Charge of the Unit.

In the next three years, the research emphasis shifted from applied and adaptive to a more basic type, reflecting the beliefs of the Officer in Charge that the Unit had engaged in too much applied work in the past. Some criticism was made by NZNA members that the University's charges for the Centre's greenhouse facilities were unreasonably high, and that the NRC would be better using

facilities at commercial nurseries because the commercial growers believed their greenhouses were cheaper to operate than the NRC's own facilities (Olsen, 1992 *pers.comm.*) The implication was that by using facilities at commercial nurseries, the NRC would not be so expensive to run, as fixed costs would be minimised, thus existing funds could be used more efficiently. As Government funding to the DSIR decreased, so too did the DSIR contribution to NRC operations.

In the 1984 annual report to the NZNA Richards (NZNA, 1984) made a plea for more growers to contact the NRC with their problems, so that NRC staff could know the problems to address and work on them. By 1987, partly as a consequence of lack of research focus, the NRC's activities were reviewed. In the report on this review, Jamieson (1987), commented that nurserymen believed that if the NRC did not exist, its absence would make no difference to their businesses.

Jamieson recommended important changes to NRC operation and organisation. The main recommendations were:

- 1 That the NRC must restructure to meet demands for technical information, and for commercial research and backup.
- 2 The NRC should develop into a one-stop shop for extension and research information.
- 3 The NRC must lift its profile with the nursery industry by directing significant resources at extension, liaison, promotion, and marketing.
- 4 The NRC must establish a clear direction for the next five years with a strategic management plan.

Commercial projects proposed by Jamieson included the production of certain specialist lines such as high health daphne, nandina, bulbs, and the production of kowhai plants. Strategies to enable the Centre to establish these projects were presented in the report. However, all the proposals made by Jamieson were not adopted by the Advisory Committee. Proposals on the Centre's direction and activities continue to be made. In 1986, the NRC's Advisory Committee

formalised an unofficial arrangement that had developed with the cutflower industry, by including research into production aspects of cut flower production as one of the NRC objectives.

Administrative problems in the NZNA in the late 1980's meant it was not able to sustain its financial support for the NRC. The University was left to bear an increasing share of the costs of the NRC, some \$110,000 per annum. The University has since reduced its financial support and the NRC has cut its staff to two. As a result the NRC has had to cut its research activities as staff are no longer available to maintain the numbers of projects a larger staff was able to manage.

As the user-pays philosophy has been more widely adopted, the funding for basic research by NRC from the NZNA and DSIR has diminished. The approach taken by both the NZNA and DSIR (now HortResearch¹¹) leadership is that they may fund specific projects through the NRC, if the NRC can do the job at a competitive price. To remain viable the NRC has had to broaden its client base. Although the NZNA provided about one third of the total cost of the NRC in 1986 its contributions in recent years have declined. The total contribution for running the NRC facilities and staff, in 1992, was \$10,000. This amount is a small proportion of the running costs of NRC and is also a small proportion of the total industry turnover¹². The token amount contributed in 1992 by the NZNA toward NRC operating expenses, means that the NRC must now serve any industry member or group of industry members prepared to pay for its services. The NRC is still involved with some general NZNA-funded

¹¹ HortResearch is a Crown Research Institute (CRI) whose head office is located 500m from the NRC's buildings. Although HortResearch's activities are not focused specifically on the Nursery Industry, they are a potential competitor with NRC for NZNA funding, although they are also a potential collaborator. Another CRI, Crop Research - based in Christchurch, is supposedly focused on the Nursery Industry and may also be regarded as another competitor, or opportunity for collaboration.

¹² In 1991 at the Industry Strategy meeting turnover was estimated at 170 million for local market activities.

work, but is also involved in contract work for various nursery and cut flower industry businesses and organisations. As part of those changes the purpose of the NRC has been re-examined and the nature of its client interaction investigated. Discussions with Dr J.Clemens, Director of the NRC since 1988, of the issues discussed above have provided the impetus for this project.

The research component of the industry is important when developing an overall view of the industry. The focus of activities is, however, the growers. Little information describing the attributes of the individual nursery industry participants was located. However, of particular importance at this stage is the way that the individual growers cooperate together to provide the industry organisation, and infrastructure to further their own industry's development.

2.2 Industry organisation

The NZNA organises its membership into "sector" groups. The sector groups are established on the basis of crop type. As management of industry issues, such as its support for research, is organised at the sector level (for example, funding for work on ornamentals is provided by the ornamental sector), the basis for establishment of the sectors is important to understand. A significant part of the Farming Systems Research and Extension methodology¹³ is to develop strategies for growers to use in their businesses. If these strategies can be developed for groups of growers, who have similar attributes and constraints, the FSR/E process can operate more efficiently.

So that potential grouping schemes can be developed some consideration of nursery classification schemes is warranted.

¹³ Farming Systems Research and Extension (FSR/E) methodology is elaborated upon in Chapter 3.

2.2.1 Classification

The aim of a classification system is to ensure that the members of the class identified will have at least one important common attribute. Is the NZNA sector grouping sensible for the purpose of diagnosing, describing, testing and extension of research for the nursery industry or could more useful groupings be used?

In the nursery industry there are many possible ways in which nursery businesses can be classified. Although the NZNA bases its classification of sector groups on the type of plant material produced, other classification systems have been used elsewhere. In the USA, Davidson and Mecklenburg (1981), report on four approaches to the classification of USA nursery businesses. Nurseries can be classified by;

- 1 The way the business is owned (its ownership-i.e private, government, or educational institution);
- 2 The function of the business (its purpose-i.e. production, landscape, quarantine, research);
- 3 The production system employed (its process- i.e open ground or container nurseries); and
- 4 The type of plant material produced (its product-general nurseries growing a range of plants or specialists, specialists growing fruit, ornamental, forest and conservation and propagation and liner material growers etc).

In terms of the aims of this study, classification of businesses by the way they are owned or by the function of the business is unlikely to be of much value. Classification by the type of production system employed may enable groups of growers to be defined whose research and extension needs are more closely linked than the NZNA sector groupings suggest. For instance open ground growers of apple trees, and roses may have more in common with each other than they do with growers producing the same crops in containers.

2.2.2 Trade organisations

Unlike their New Zealand counterparts, USA nursery trade organisations are primarily classified using a functional (purpose) basis although some are classified by the type of plant material (product) produced. Table 2.1 shows the seven sector groups which comprise the current membership of the NZNA. Although members are presumed to belong to the group with which they have closest affinity (i.e. the crop they grow), some growers or businesses belong to two or more sectors because they have more than one product. In the past, landscapers and flower growers have also been members of the NZNA. Some of the latter group are still closely allied with the NZNA. However, some of these industries have withdrawn from the NZNA.

Table 2.2 The sectors of the NZNA and their membership

Sector group	Membership
Bedding plant and perennial growers	377
Forest tree growers	12
Fruit tree growers	29
Indoor plant growers	24
Ornamental ¹⁴ growers	81
Rose growers	17
Retailers	121

Source: NZNA membership lists (NZNA, 1992)

The ornamental growers group contains the largest number of grower-members and thus is the most politically important group within this association (Clemens, 1991 *pers.comm.*) Groups such as the fruit tree, and rose growers are

¹⁴ The ornamental growers sector used to be called the tree and shrub growers sector.

numerically much smaller. NZNA levies are collected on the basis of the number of staff a business employs. The maximum levy is paid by a business with a staff of 26 individuals. As funding for research and extension is provided at the sector level, large groups within the NZNA are likely to have more funds available for these activities than the smaller sectors. For example the tree and shrub growers will be better funded than the rose growers.

The purpose of this research is to examine part of the industry, to make propositions about the whole industry. As the tree and shrub growers group is the largest and most influential NZNA growers sector group, it was considered desirable to focus the research on this group's activities, so that the NRC's efforts could target a major area of interest¹⁵. To do this a plant material classification system, such as (4) above, which included the ornamental growers from the NZNA but which also included growers of similar woody crops, such as roses, fruit trees and forest trees was chosen. By extending the classification beyond the NZNA sectors the appropriateness of the NZNA's classification system could also be examined in terms of the common attributes of the industry participants targeted. The classification chosen was called *woody plant growers*. In addition, by using a classification scheme different from that of the NZNA, the effects of the personal and private rivalries reputed to be of importance between non-NZNA members toward the NZNA are likely to be minimised. This classification, with the exception of tomato plant producers, is

¹⁵ One of the common recommendations made to NRC by its various reviewers has been for it to focus its area of work as it spreads its activities too widely.

the same as the list of prescribed plants used in 1916 by the Government as part of its regulatory machinery.

Discussion of the appropriateness of the NZNA's sector groupings for research and extension together, with description of commonalities between growers is included in Chapters 5 and 6 of this thesis.

3.0 ALTERNATIVES FOR KNOWLEDGE ACQUISITION IN THE NURSERY INDUSTRY

Knowledge about farming generated by agricultural¹⁴ research in New Zealand and transferred to farmers has aided the development of the country's primary industries (Scobie and Eveleens, 1986). The nature of agricultural research and its place in the development of New Zealand's agriculture is discussed in Section 3.1. The traditional model for research and extension, called the Transfer of Technology (TOT) model and the alternative Farming Systems Research and Extension (FSR/E) model are described and compared in Section 3.2. Section 3.3 describes the processes involved with preparing, administering and analysing surveys for gathering descriptive information for FSR/E projects. The final part of this literature review, Section 3.4, reviews the use of surveys in New Zealand's agricultural industries.

3.1 Agricultural research

3.1.1 Describing research

Bonte-Friedham (1992) describes agricultural research as being composed of several different types of research. These are:

Basic research, which is concerned with scientific knowledge for its own sake, with no specific objective or apparent use;

Strategic research, which attempts to translate these scientific findings into practical applications;

Applied research, which is the development of new products or technologies¹⁵;

¹⁴ Throughout this Chapter no distinction is made between *agriculture* and *horticulture*.

¹⁵ Note that technology can be either hardware or practical methods for performing something without hardware.

Adaptive research, which attempts to fit the products of applied research to local conditions, both natural and socio-economic;

Testing, which is carried out to ensure that the results of adaptive research are usable in a field situation before farmers can get acquainted with them; and,

Demonstrations, which are used to show farmers the new product or technology being used.

In most traditional views of research, testing and demonstration are not considered to be part of the researcher's activities (Anderson and Hardaker, 1992). Testing and demonstration have been regarded as part of the extensionist's activities. Anderson and Hardaker (1992) argue that for researchers to be effective in agriculture, they need to be involved with applied and adaptive research which produces outputs that both appeal to, and are taken up by farmers. Without adoption taking place the benefits of research to end users are zero.

3.1.2 Agricultural research in New Zealand

New Zealand's agricultural development since the arrival of Europeans has been closely linked with the success of applied and adaptive research programmes and the adoption, by farmers and growers, of the results produced (McMeekan, 1963). Developments such as the use of phosphatic fertiliser on pastoral farms, and other technological developments such as seed certification and rotational grazing, brought rapid improvement in the circumstance of New Zealand farmers and their families.

During the first 50 years of European settlement, the country's agricultural growth rate was at its peak (McMeekan, 1963). Between 1920 and 1960 production from pastoral farms still increased but at a much slower rate than was achieved prior to 1920. Maughan and Ward (1978) attribute this continued growth to the adoption by farmers of relatively low cost, yield-increasing technologies. Government subsidised many farm inputs in addition to paying

for research and extension, as part of its objective to boost primary production. By the end of the 1970's, pastoral farms had largely taken up the technologies which enabled them to make significant increases in output-input ratios. Maughan and Ward (1978) commented that the problem for agricultural researchers (in New Zealand) was that extra production in farming was more likely to be obtained by better management rather than by simply applying a new technology. The rate of development in New Zealand agriculture derived by simply applying new technology would be less than that obtained by considering improvements to management of the agricultural businesses.

In recent years Government policy has shifted from state funding of research and extension to requiring more direct industry involvement. At the same time, McRae (1991) reported that farmers have been exposed to more risks associated with operating in a less protected (i.e.deregulated) environment. Although there are no published accounts of dissatisfaction with the research priority setting process in New Zealand today, farmers have reported such feelings on an informal basis (McRae 1991, *pers. comm.*). Similar views have been expressed by nursery industry members (Liddle 1992, *pers. comm.*).

With the advent of *user pays* philosophies, the industry service groups which were previously Government funded, have been obliged to try to tailor their research and extension programmes to meet better the industry's needs in order to attract funding. Industry groups involved with developing research, extension and production initiatives have found the process of knowledge acquisition, and transfer central to their activities. New models for the development of research programmes have been proposed (Dillon, 1976; Chambers and Jiggins, 1987a).

3.2 Two research and extension models

Two models for the organisation of research for producers are presented in this section. The first of these has evolved as the research and extension

organisations have become more sophisticated, the so called *Transfer of Technology (TOT)* model is discussed in Section 3.2.1. The second, a new alternative to the TOT model, is in Section 3.2.2.

3.2.1 The reductionist approach and the TOT model

According to Dillon (1976) and Bawden and Macadam (1987), the traditional approach of scientists when conducting research is to derive their understanding of the whole system from the mechanical structure of the parts of that system. The manner in which something works is explained by reducing the system to a series of mechanistic steps. This traditional approach, the so called reductionist approach, reduces phenomena to their more basic parts (Dillon, 1976). The functioning of these components is usually analysed experimentally using appropriate statistical methods under conditions where maximum control over the environment is achieved by the experimenter. The results from such trials are then promulgated in the relevant disciplinary societies. At a later time the results may be distributed to producers (usually after some change in form).

Researchers are mainly rewarded for acceptable scientific output, a common measure of which is the number of published scientific papers. For this reason, little if any attention is given in traditional research to examining the impact (if any) of adoption of their primary results by end users (clients).

The reason researchers continue to use this approach is, in Dillon's opinion, because it is simpler to keep on reporting work performed in controlled conditions, than it is to report on work using more variables and less control where results are less able to be statistically analysed.

The traditional model of agricultural research assumes that researchers (scientists) are the source of knowledge, and that the information they generate is communicated linearly, or diffused downwards to the receivers (farmers). The agent for this knowledge transfer is the extension worker. Technology is

developed by the scientists and transferred by the extensionists to the farmers or growers. It is strongly implied in this model that the farmers are in some way ignorant, but that through help from scientists, they can be *educated* and their circumstances improved.

According to extension workers such as Farquhar (1962) extension is:

...a service or system which assists farm people through educational procedures in improving farming methods and techniques, increasing production efficiency and income, bettering their levels of living, and lifting the social and economic standards of rural life.

This definition of extension is consistent with the viewpoint that farmers *need* educating, and that they need to better their standards of living. This model for extension has been variously described by Chambers and Jiggins (1987a) as the *transfer of technology (TOT)* model and by Russell *et al* (1989) as the *linear technical innovation* model. According to Chambers and Jiggins (1987b), the reward system for research as described above, and the assumption that the TOT model is appropriate, form a powerful linkage. This linkage has resulted in entrenched bureaucracies that are resistant to change even when evidence of the weaknesses of the approach are made evident. Problems with the TOT model are blamed on inappropriate extension techniques, and not on the fact that the research is simply inappropriate to the farmers needs. The implementation of alternative models for developing research and extension priorities has therefore been slow.

There is growing concern that there is a widening gap between the activities of researchers and the needs of farmers and growers (Maughan and Ward, 1978; Bawden and Macadam, 1987; Chambers and Jiggins, 1987a; Russell *et al.*, 1989; Ison, 1990; Anderson and Hardaker, 1992). The TOT model is said to have broken down. At least in the less developed countries this concern is believed by Norman and Collinson (1985), to be because the technical researchers seldom see the small-resource poor farmers, they even more rarely talk to them and the

extension agents rarely provide effective feedback.

The models for establishing research priorities, and for delivering knowledge throughout industry groups are being re-examined. Even in the early 1960's McMeekan (1963), wrote that agricultural research must remain applied if it is to be successful. To do this the links between farmers and researchers must be effective, otherwise researchers will do research which has little relevance to farmers. The researchers may be able to pursue independent research goals in the short term, but it is unlikely to be sustainable when full contestability for funding occurs.

3.2.2 The Farming Systems Research and Extension (FSR/E) Model

A more recent approach to agricultural research is the Expansionist or Systems Approach, which recognises that events in any given setting occur as part of a larger whole (Dillon, 1976; Spedding & Brockington, 1976). The focus is on the whole system rather than the parts of which it is comprised. Anderson and Hardaker (1992) add that a systems approach to research emphasises an inductive approach rather than the deductive approach taken by conventional science.

The aim of FSR/E as reported by Norman and Collinson (1985) is *to improve the well-being of individual farming families by increasing the productivity of their farming system given the constraints imposed by resources and the environment*. Shaner et al. (1981), as reported by Norman and Collinson (1985), describe the common elements of FSR/E projects as:

- 1 The farm as a whole is viewed in a comprehensive manner.
- 2 The choice of priorities for research reflects initial study of the whole farm.
- 3 Research on a farm sub-system is legitimate FSR/E provided the connections with other sub-systems are recognised and taken into account.

- 4 Evaluation of research results explicitly takes into account linkages between sub-systems.
- 5 As long as the concept of the whole farm and its environment is preserved, not all the factors determining the farming system need to be considered as variables - some may be treated as parameters.

Norman and Collinson (1985), Chambers and Jiggins (1987b) and Blum (1991) among others have discussed the development of FSR/E as a tool for agricultural research priority setting in many situations. The development of research priorities in less well-developed countries using FSR/E is reported extensively (Charry and Dillon, 1989; Gryseels *et al*, 1989; Basuki and Koster, 1991; Delobel *et al.*, 1991;). Fewer projects involving farmers in resource-rich agricultural industries have been reported. However, the methodology used for these projects is the same as that used in the less developed areas. Systems thinking has enabled a more comprehensive definition of extension than the one provided in Section 3.2.1 to be developed. Van den Ban and Hawkins (1988) describe extension as

....the conscious use of communication of information to help people form sound opinions and make good decisions.

Extension is no longer directed at the farmer, extension is targeted at all decision makers in the agricultural system. The aim of an extension programme is to get the players in the system to make their own, informed decisions. The model assumes that these people are not ignorant and can make their own decisions. The changes in these definitions mirror a change in attitude amongst at least some research and extension personnel.

Anderson and Hardaker (1992) discuss the measurement of success of agricultural research in terms of the results of the research being taken up *by an appreciable number of farmers*. The first step is to identify the participants, and their characteristics, and the problems they have (Blum, 1991). From that step

and from hypotheses developed from the data derived, initial steps can be taken toward developing an industry-driven research and extension programme. To do this Norman and Collinson (1985) describe a four stage process, known more commonly as the Farming Systems Research and Extension (FSR/E) approach to agricultural research.

The first stage is called the descriptive, or diagnostic stage. In this stage the objective is to develop target groups or *recommendation domains* and to ascertain major constraints on farmers in an area selected for the project. The method by which these areas are chosen is not well described. The second part of this stage involves ascertaining the opportunities for change to the farming systems. Norman and Collinson (1985) consider that information for this stage can be gathered from informal discussion with farmers, without the use of formal questionnaires or carrying out structured surveys to randomly selected producers. However, using such an approach to diagnose problems in the target area requires considerable skill and experience on behalf of the investigator to ensure that useful, balanced information is obtained. This is necessary because this information is collected to be used by research and extension decision makers and their professional staffs.

These authors expect that at least one formally administered survey is needed in sparse knowledge situations to quantify basic feelings of the systems under study and to satisfy the need for credibility, and validity of the findings. The general philosophy adopted, however, is that the methods used should be based on the criterion of the lowest possible cost commensurate with the degree of understanding that is necessary.

Harrington (1981), as reported in Norman and Collinson (1985) concluded that:

- 1 An informal survey is the minimum data collection effort necessary for planning research,
- 2 Where time and resources allow a formal survey should follow the informal survey,

- 3 Should further time and resources allow, or if the effects of time on the system are important, a multiple visit survey can be used to give improved understanding.

The second stage, according to Norman and Collinson (1985), is to design solutions. In situations where little relevant experiment station information exists, the solutions should be designed from the information derived in the first stage. The FSR/E workers' understanding of the system is used to identify and evaluate apparently appropriate solutions to the problems raised. As FSR/E is usually employed as part of a team approach, the teams work together at this stage to develop solutions. In this project rather than use a team approach to develop solutions to technical issues, the FSR/E methodology is used to develop organisational strategies for the University and the Industry. The project is completed on an individual basis using multiple skills to substitute in part for the team approach.

The third stage of the FSR/E process is to evaluate on the farm the improved practices flowing from the design stage. The solutions are evaluated in terms of the criteria found to be important to the decision makers on the farms in the first stage. The testing can be carried out by researchers on farms or by farmers under the direction of researchers, or some combination of these if several new practices are being evaluated. Whatever testing is used the issue of interaction between farmers and their families, researchers and extension workers becomes important. Further FSR/E programmes need to be used to ensure the improved technology is relevant to the "average" farmer.

The final stage of the FSR/E process is to derive recommendations for dissemination. Most FSR/E programmes are developed for large populations of farmers' so the method chosen to disseminate and evaluate farmer adoption of the recommendations is important if change is to be created. In Africa, FSR/E approaches have been used in both extension organisations and research institutions to assist with the development of programmes (Norman and

Collinson, 1985). Many of the problems associated with implementation are reputed by Norman and Collinson (1985) to be attributable to the bureaucratic problems associated with this approach to research strategy development.

Dixon and Leach (1984), describe survey research as being one of the basic tools of social science research for deriving a thorough understanding of the environment, people, culture and society. Other authors have described the central role of descriptive surveys to FSR/E methodologies (Norman and Collinson, 1985). The literature contains numerous texts and articles on the preparation of surveys (Babbie, 1990; Erdos and Morgan, 1970).

3.3 Identifying needs and client groups

The texts by Erdos (1970) on mail surveys and by Babbie (1990) on survey research methods serve as good guides for the development of survey tools.

Babbie (1990), describes survey research as one of several methods of social research which involve the collection and quantification of information which can be used to describe, explain, or explore the nature of specified aspects of a population.

Erdos (1970, p 22-23) outlines twelve steps as part of the survey design, administration, and analysis process. The first nine of these steps are relevant to the survey to be conducted on woody plant growers:

- 1 Outline the problem
- 2 Definition of research objectives
- 3 Investigating existing research on the same problem or with the same objectives
- 4 Definition of the universe
- 5 Deciding on the degree of reliability aimed at within a realistic budget
- 6 Definition of the sample and scope
- 7 Deciding on the survey method

- 8 Deciding who will conduct the survey
- 9 Establishing the techniques that will be needed to achieve the research objectives

The remainder of this part of the literature review follows this sequence of steps. The steps are grouped for convenience.

3.3.1 Survey objectives

The first four steps of survey research as defined by Erdos and Morgan (*op cit*) are to outline the problem; define the research objectives; investigate existing research on the same problem or with the same objectives; and to define the population of interest. These steps correspond to the area selection components of the first stage of the FSR/E process. In terms of the woody plant group of interest in this study, the objectives and their development are described in Chapter One and the investigation of relevant references is carried out in this and the preceding chapter.

The general aims of conducting surveys in FSR/E projects are to collect descriptive information about the population under consideration (Norman and Collinson, 1985), as well as to explain the basic relationships among the system participants. This stage of survey design is a key determinant of the later usefulness of the survey data. By not defining what precisely is expected, the data collected may not meet the requirements of the project.

Traditional survey researchers are careful to avoid including groups beyond the scope of the survey in the survey sample, or conversely excluding groups who should be in the survey as a biased data set can result (Department of Statistics, 1992b). In FSR/E surveys, as the objective is to describe the whole, and to gather opinions widely, it is especially important not to exclude inadvertently

any industry participants. By attempting to include as many as possible some extra responses may be received, but these responses can be deleted from any subsequent analyses (Parker and Hughes, 1989).

3.3.2 Precision of data obtained

Lavrakas (1987) describes surveys as a way of making precise representations about whatever is being measured from a population. The *Guide to good survey design* by the Department of Statistics (1992b), describes two sources of error which lead to imprecision in surveys. These are non-sampling error, and sampling error.

Non-sampling errors arise for reasons other than that of sample selection (Babbie, 1990). Some of the main causes of non-sampling error are poorly defined objectives, poor definition of the population, and non-response due to poor survey design and administration (Department of Statistics, 1992b). Because non-sampling errors can arise by mismanagement at all stages of survey design, implementation and analysis, the methods for dealing with these errors will be dealt with as each stage is described, rather than in a separate section.

Traditionally, surveys are administered to only a sample of the population of interest as the costs and time involved in taking a census are prohibitive (Babbie, 1990). This recommendation applies when a census survey is administered to large target populations, such as pastoral farmers in New Zealand. However, if the target population is small, such as the woody plant industry, then the costs of administering a census survey are much reduced. Whatever the approach taken to selection of the group to be surveyed, the "survey population", the objective of conducting a survey is to collect the information in the cheapest, most efficient manner (Babbie, 1990).

Sampling error arises as a consequence of the sample survey collecting information from a fraction of the population of interest. The issue of error

control, and hence sample selection, is considered in two stages by Erdos and Morgan (1970). Firstly, consideration of the degree of reliability within the budgetary constraints is made. Then the sampling issues are considered.

Harrington (1981) (cited in Norman and Collinson, 1985), considers that although data collection using a formal survey is worth doing, informal conversations with farmers, together with consideration of relevant secondary sources of information are the minimum requirement for providing information to provide the system description for planning research. By implication formal surveys performed to describe research requirements do not need to provide highly precise estimates of any one variable. It is the overall picture that is important. Norman and Collinson (1985) report that relatively low confidence intervals of between 10 and 20% have been acceptable for FSR/E work.

Decisions are needed about the size of the sample to be surveyed, and the procedure to use to select the individuals to form the sample. The approach to setting sample size in experimental research is to use previous knowledge about the population to make an estimate of the variance expected, together with the estimate of the precision required from the research. From this information, and from the basic statistical principle that in order to get a desired level of precision the sample size must increase as the variance in the population increases, a sample size can be chosen (Sokal and Rohlf, 1981). However, in many cases the size of the sample is limited to less than the statistical ideal by the resources available for administering the survey (Ryde and Nuthall, 1984; Babbie, 1990).

Babbie (1990) describes alternative sampling procedures. The basic choice is between probability sampling and non-probability sampling. All members of a population sampled using a probability sampling regime have an equal chance of being selected in the sample. Bias, which is misrepresentation of what is occurring (Babbie, 1990), can result if the sample is not representative of the whole population (Parker and Hughes, 1989). If prior knowledge about the

target population is available, it can be used to develop a stratified sample design which can be used to reduce the sampling error of estimates. Standard statistical methods are available to calculate population parameters from sample data gathered by probability sampling. Standard statistical, or parametric, procedures assume that the data comes from populations that are normally distributed and have equal variances. If these assumptions are not met, non-parametric procedures are available. These non-parametric procedures require no assumptions to be made about the way data are distributed to enable tests to be made. These methods have less discriminatory power than their parametric counterparts (Conover, 1980).

Non-probability samples are taken when probability sampling is too expensive or when it is not necessary to have a representative sample. One of the most common of the non-probability sampling regimes is purposive sampling. Purposive sampling may be used to complement FSR/E projects by surveying selected members of the target population because they have a common characteristic; for instance follow-up surveys of industry leaders.

3.3.3 Survey method, administration and analysis

Although Erdos and Morgan (1970) describe the steps of preparing, administering, and analysing a survey as a sequence, they are interrelated. The type of survey chosen affects its cost, and hence affects the sample size to be used. Similarly, the objectives of the project may suit one survey method better than another. The way that a survey is administered, that is the way it is written, presented, delivered and analysed are also affected by the objectives of the research and the nature of the population under review. As the objective of this work is to collect descriptive information about an industry about which there is little knowledge, it is more important to develop a gross measure of association than it is to be highly precise in the measurement of a few variables.

To avoid bias, similar amounts of information should be collected widely over all issues of relevance to the system. Once the industry situation is described, later work may refocus on issue found to be important.

Babbie (1990) identifies two basic styles of survey. The first, and most common survey, is the cross-sectional survey. The data are collected at one point in time from a sample selected to describe a larger population at that time. The second is the longitudinal survey. In a longitudinal survey, the dynamic state of something, over time is examined by repeated sampling to see the effects of time on the system. Both these survey styles have been used in FSR/E projects (Norman and Collinson, 1985). The cross-sectional survey provides quickly the initial information to derive descriptive information, while the longitudinal survey enables the dynamic view of the system, defined perhaps from the data provided by the cross-sectional survey, to be built up over time. Longitudinal surveys may be used to carry out the re-evaluation, necessary as part of the FSR/E method.

Babbie (1990) also differentiates between self-administered surveys and surveys done by interview. Self-administered surveys are usually conducted by mail. Whereas interview surveys may be conducted either over the telephone or in a face-to-face situation. Ambler (1977) and O'Donnell (1969) report that mail surveys are a powerful tool for collecting rapidly and at low cost a large quantity of information from a large number of farmers, who may be located in geographically isolated places. The mail survey method was selected for this study for these reasons. The advantages of the different methods of surveys summarised from O'Donnell (1969), Erdos and Morgan (1970), Linsky (1975) and Parker and Hughes (1989) are included in Appendix (ii)

Ambler (*op cit*) reports that much of the suspicion about the usefulness of mail surveys has stemmed from the low response rates that may be achieved. Non-response has been noted above as a major source of non-sampling error. A major part of survey design, whatever method of surveying is used, is to ensure that the effects of non-response are minimised.

As non-respondents can have different characteristics and opinions to respondents, non-response rates greater than 30% may have significant levels of non-response error (Department of Statistics, 1992b). Non-response is reputed to be most frequently caused by potential respondents; losing the survey, by them being too busy to complete the questionnaire, or by them forgetting to complete it (Erdos and Morgan, 1970). The usual approach to increase the number of responses is to use reminder notices and to re-mail the survey. However, these efforts are likely to be wasted on respondents who are not interested in the study for which the survey is being administered (Babbie, 1990). Surveys involving topical industry issues are more likely to achieve a high response rate easily (Esslemont *pers. comm.*) Babbie (1990) and Erdos and Morgan (1970) make additional suggestions, particularly for mail surveys, to improve response rates in such situations. These include the use of a personalised letter, which seeks the respondents help with the research by completing the survey; including a reply paid envelope for the return of completed questionnaire; together with many other similar proposals.

The Department of Statistics (1992b) suggests various ways of dealing with non-response during data processing. Firstly, the characteristics of the non-respondents can be assumed to be the same as those of the respondents, requiring no further action. Secondly, a sample of the non-respondents can be surveyed to establish whether or not they do have different characteristics from the respondents. This option minimises some costs, especially if it is deemed necessary to carry out telephone interviews of the non-respondents. This method requires that the procedure used enables non-respondents to be identified while maintaining confidentiality. A third way of dealing with non-response is to reanalyse previous surveys of the same population to estimate possible bias (Armstrong and Overton, 1977). These authors report that as the marginal costs of getting fewer non-responses rise, the methods for assessing differences between respondents and non-respondents should be considered rather than trying to get better response rates.

The preparation of the survey questionnaire is as important to success in a survey as sample selection and choice of survey method. Three main issues must be addressed in the preparation of a survey instrument. These are:

- 1 The type of question that is asked and hence what (sort of) information can be derived.
- 2 What sort of analysis is expected to be used, taking into account the objectives of the survey. For instance, what measurement scales are best to use.
- 3 What wording of the questions and layout of the questionnaire is expected to produce the highest response rate.

Sudman and Bradburn (1983) report upon two basic types of question that can be asked in surveys; open and closed questions. Open questions allow and encourage respondents to give their opinions, and to express themselves using terminology with which they are comfortable. Open questions are described by Sudman and Bradburn (1982) as *.....an absolutely essential tool when you are beginning work in an area and need to explore all aspects of an opinion area*. The disadvantage of open questions is that the respondents can give unexpected answers which make coding¹⁸ for computer based analysis of them difficult. The responses to closed questions are entered into pre-coded categories. The disadvantage of the closed question, especially in a mail survey, is that the author of the survey must make allowance for all possible responses before the survey is administered. However, Sudman and Bradburn (1982) believes respondents find closed questions easier to respond to than open questions as some of the organisation of the answer is done for them.

The type of analyses which are expected to be carried out on the survey data importantly determine questionnaire design. Most parametric procedures for data analysis are designed for use with ratio, interval, and in some cases ordinal data (Gordon 1992, *pers. comm.*). To make inferential statements from ordinal or

¹⁸ Coding is the process by which the answers from surveys are converted to numerical codes prior to entering into a computer data file.

simple descriptive, nominal, data special statistical procedures are required. The main purpose of surveys administered for FSR/E needs is the collection of descriptive information about the target population (Norman and Collinson, 1985), hence data from any kind of scale is likely to be useful. However, should detailed explanation and exploration be required, questions should be posed so as to derive at least ordinal, and preferably interval or ratio scale data to enable parametric procedures to be used.

To get the best possible completion rates and thus response rates, the wording of the questions should be unambiguous. Whatever approach is taken to developing survey layout there is general agreement that the questionnaire should have a professional appearance and not appear too lengthy or take more than 45 to 60 minutes to complete (Erdos and Morgan, 1970; Babbie, 1990). The desire to collect as much data as possible must be balanced against the possibility that the survey will be discarded. Pretesting the questionnaire by administering it to a sample of potential respondents to ensure they interpret and understand the questions appropriately is essential.

The data from the respondents surveys are usually transferred to a computer file for subsequent analysis. The process of coding is particularly important when a wide range of descriptive responses such as are derived from open questions, are converted into a smaller number of numerical codes suitable for analysis.

Coded data are then entered into a data set for checking prior to further analysis. These errors may arise through clerical mistakes or respondent error. Editing may take the form of simple examination or complicated automated data verification performed automatically (Naus, 1975). Once the data has been verified, and error corrected or deleted, data analysis can begin.

Data can be analysed in three different ways.

1. Each variable can be examined separately. The common approach to univariate data analysis is to consider frequencies, some measure of the central

tendency of the distribution and an estimate of the variability in the population. The mode is reported when discrete distributions (such as rankings) are being analysed. Data which are not normally distributed should be either evaluated non-parametrically, or transformed so that they are normally distributed to enable further analyses to be performed. The assumption that data are distributed normally is the basis of parametric procedures, the data should be tested for normality (Sokal and Rohlf, 1981). Norusis (1990b) reports upon the use of graphical techniques such as normal probability plots for checking normality, and Savage score plots for checking exponential distributions. Data in this study which were found to be not normally distributed were analysed using non-parametric methods rather than transforming them, as the non-parametric methods provided sufficient detail for the purposes of this project. The distributions of all ordinal, ratio, and interval data from this survey were tested using these procedures.

2. Bivariate analysis is analysis of data two variables at a time. The variables are commonly considered in a 2x2 contingency table, also known as a cross-tabulation table (Sokal and Rohlf, 1981). The central issue of importance in these analyses is the measure of association between the two variables. Statistical tests are available to measure the degree of dependence between the variables. The parametric procedure test used to measure independence is the two-sample *t*-test. As the data collected in this study was not normally distributed only the non-parametric tests of independence were used in the bivariate analyses. The most popular non-parametric test for survey work is the Pearson X^2 test of independence. Norusis (1990a) and Fienberg (1980) suggest that the X^2 statistic is unreliable when the expected frequencies are less than one. As the data for this study were found to have expected frequencies less than one this statistic was not used.

Another way to test the association between two variables is the Mann-Whitney Test. The Mann-Whitney Test is a non-parametric test and only requires that data can be ordered (Norusis, 1990b). The test can be used when the expected frequencies are one or less (Conover, 1980).

3. Multivariate analysis is used to examine several variables simultaneously. Multivariate analysis methods are numerous and varied. They include a wide range of parametric and non-parametric methods for analysis of all classes of variables. Multivariate techniques can be used to explore relationships between many variables at once, to simplify the relationship; to make more these more readily understood by the researcher (Chatfield and Collins, 1980). Cluster analysis is one of the simpler multivariate techniques commonly used by survey researchers for establishing groups (Anderberg, 1973). Cluster analysis can be performed on nominal data, and is a simple way to establish group membership. However, most multivariate techniques need at least ordinal data, and many require that data be distributed in a multivariate normal distribution. Furthermore, many of these procedures are sensitive to missing data, and to low frequencies. As the data set derived for this study contained missing data, low frequencies and was not normally distributed these techniques were not used.

An important part of this type of data collection and analysis is the subsequent reporting of the material received.

3.4 Surveys in the Agricultural Sector in New Zealand

New Zealand's primary producers are surveyed by many individuals and organisations for many purposes. Each year, agricultural businesses are surveyed as part of the Ministry of Agriculture and Fisheries (MAF) Annual Agriculture Census, and as part of the Department of Statistics (DoS) Agriculture Survey. Both these surveys produce quantitative data for the policy making and monitoring needs of Government. Although some summaries of these data are published, most of the primary data are only available on a *for a fee* basis from Government agencies. The information in these surveys is often general in nature and is thus especially not useful for detailed within industry studies. The official statistics on the Nursery Industry use the New Zealand Standard Classification system to establish their groups (Department of Statistics, 1992b). These classifications are not detailed enough to be useful in a study such as this

Classification system to establish their groups (Department of Statistics, 1992b). These classifications are not detailed enough to be useful in a study such as this as the data from the group of interest i.e. woody plant growers is not identifiable.

Both the MAF and DoS surveys are designed to provide general information on the operation of the pastoral farming sector and those who service it. Neither of the surveys gathers much information on small scale horticultural business such as plant nurseries. As businesses which earn less than 50% of their income from a given activity are not included in the statistics generated from these surveys it is likely that the supposedly substantial number of plant nurseries operated on a part-time basis would not be included (NRC, 1991).

Occasionally, special surveys administered by these Government Departments, are directed at some target group of interest. These surveys such as the 1987/88 survey of plant growers (Department of Statistics, 1989) are performed to meet specific industry or Government needs. The 1987/88 survey of plant nurseries was an economic survey reporting only upon the average costs and earnings of the nursery industry.

Surveys are one of the main methods of collecting data for agricultural economics research (O'Donnell, 1969), so their use for this purpose by many organisations is reasonably common in New Zealand. However, a significant (but unknown proportion) of the surveys are commissioned by industry groups and the results of the surveys are often deemed to be commercially sensitive. In those cases all of the results are usually withheld, even though they would be expected to contain only minor elements which would be of commercial value. When the reports are suppressed the quality of the surveys can not be established raising questions of adequacy of the survey and of the results.

Many agricultural surveys, however, are less specific and aim to derive some knowledge about agriculturalists in general. The results of these surveys are

available to other researchers as publications. Recently surveys in this genre have focused on the way agriculturalists have reacted to the changed circumstances brought about by the removal of farm subsidies, and other similar issues central to successful agricultural business operation. The target population for these surveys is more difficult to define than for a survey conducted on a specific group. In New Zealand, most survey administrators have focused on pastoral farmers, or on members of the rural New Zealand community. For instance, Pryde and McCartin (1986) completed a survey of "New Zealand farmer intentions and opinions". In this survey, all farms smaller than 20ha were excluded from the target population. Lively and Nuthall (1983) surveyed 1000 farmers throughout New Zealand to ascertain their attitudes to information. In this survey all horticultural farmers with businesses covering less than 5 ha were excluded, as were pastoral farmers whose operations were less than 50ha. These two surveys would have excluded many of the more intense horticultural activities, such as plant nurseries, from their target populations.

Of the relatively small number of surveys administered to horticulturists most have focused on the production system, (for example Rae *et al*, 1976; Salinger, 1963; and NRC, 1978); or the marketing system (for example, West, 1982; Bourke and West, 1976; and Lamb *et al*, 1992). No surveys have been carried out with the objective of developing a picture of growers and their attributes. Again, the larger industries such as the pipfruit growers appear to have been better served in terms of description, than the small participants of the small industries such as plant nurseries.

By conducting a survey of all woody plant growers to describe them and their businesses and the links between them, the participants' constraints and needs can be identified. By identifying the constraints, the topics which can be researched may be identified, priorities established and suitable research proposals developed. The initial problem is the collection of the necessary information from this diverse, information poor industry.

4.0 SURVEY METHODOLOGY

Few descriptive data are available on woody plant growers and their business operations and such data are needed to meet the objectives of this study. The industry is reputed to be diverse and any sample taken to capture this diversity would have needed to be large. For these reasons all businesses involved to any extent with the propagation, production or growing-on of woody plants in New Zealand were surveyed. The survey was designed to provide descriptive information to allow an initial identification of key constraints on, and opportunities for these businesses as seen from the perspective of the respondents to the survey.

4.1 The main survey

By using a census approach, it was hoped that a satisfactory industry-wide perspective could be developed (Department of Statistics, 1992a). To cope with the large number of individuals to be surveyed, and to minimise the costs of acquiring data from individuals located throughout the country, it was decided to administer a mail survey (O'Donnell, 1969). The high unit costs of personal interviews would have limited the survey to a restricted part of the country and a small survey sample thereby introducing possible bias into any information so obtained. The detail that could be obtained through a telephone survey is limited and was not expected to be able to satisfy the objectives of this study. These two methods were therefore not used in this study.

The details of the preparation of the survey instrument, the mailing list and the subsequent administration of the survey are described in the remainder of this Section. Section 4.2 describes the response. Section 4.3 describes the methods of data analysis employed. The next section, Section 4.4, describes the implementation and analysis of a follow-up survey administered to non-respondents to investigate possible non-sampling error (Reid as reported in Armstrong and Overton, 1977). The final section includes estimates of industry size derived using estimates from both the mail and telephone surveys.

4.1.1 Methodology

In an industry such as the nursery industry, where little is known about the participants and their businesses, and what is known suggests the growers operate a diverse range of operations located widely throughout the country, the development of a complete list of all industry participants was needed to ensure that respondent bias was minimised. As no adequate directory of all industry participants was available for this study, a mailing list of as many woody plant industry members as possible was compiled.

The name and address list of "all" woody plant growers in New Zealand was developed from many sources including:

- a) The New Zealand Nursery Register (Edwards, 1991).
- b) The 1992 membership lists of the NZNA. (Rose, Forestry, Fruit Tree and Ornamental Sector lists).
- c) Advertisements from nursery trade magazines (*Commercial Horticulture*, *Horticulture News*, and *Growing Today*). Names were taken from other related industry journals such as *The Orchardist*, and *The New Zealand Gardener*, to ensure as many small producers as possible were included.
- d) Advertisements from selected daily newspapers, including the *New Zealand Herald*, the *Hawke's Bay Herald Tribune*, the *Dominion*, the *Press* and the *Otago Daily Times*. Together these newspapers have a circulation area which covers all but minor horticultural regions in New Zealand.

- e) Likely businesses listed in the advertising section of the telephone directories (known locally as the Yellow Pages) for all North and South Island districts of New Zealand.
- f) The 1992 membership list of the International Plant Propagators Society.
- g) Individual contacts with buyers, suppliers and others in the industry, particularly to identify the smaller scale producers and those not involved with industry organisations.

All businesses advertising themselves as being involved with growing, growing-on or wholesaling of any tree, shrub, rose, forest tree or fruit tree crop were included on the list. Non-sampling errors made through receipt of responses from non-woody plant industry participants were minimised by deleting these cases once the nature of their involvement was ascertained. The list so compiled was entered on a database. PCFile 6.0, a simple relational database programme was used for this purpose (Buttonware Inc, 1991). Duplicate records identified when a listing containing a business name, address and owners' name matched another listing in the database, were deleted. In cases where one operator had several businesses under his or her control, all the businesses were left on the database.

By this process, a list of 834 businesses or operations, reputedly involved with the production or growing of woody plants was obtained.

To avoid problems associated with participants having preconceptions about the aims of this study, and to separate this study from the activities of the New Zealand Nurserymen's Association (NZNA), the term "woody plant grower" or "woody plant producer" was used to refer to the businesses of interest. By taking this approach, rather than focusing on the sector groups defined by the NZNA, such as Rose, Ornamental, Fruit Tree, and Forest Tree Growers' Sectors, it was anticipated that all those involved in growing woody plants would be prepared to answer the survey, and also that non-NZNA members would not view the survey as part of a NZNA membership drive. If this goal could be

achieved then possible bias arising from non-response would be expected to be reduced¹⁹.

A questionnaire was prepared for completion by the owner or manager of the business concerned (see Appendix iv for a copy of the questionnaire). The questionnaire had four sections, one each to record: production, business detail and personal information about the business operators, and one section for commentary by the respondent on a range of issues related to the industry and his/her participation in it. The first questions in the production, business and personal sections sought either simple "yes/no" or quantitative responses. Open ended questions were included in the commentary section to enable additional information to be gathered because of the paucity of knowledge about these growers and their businesses (Erdos and Morgan, 1970). The survey was pre-tested in January 1992 with five industry members considered to be representative of the industry. The time spent completing the questionnaire ranged from 45 to 95 minutes, suggesting that the survey needed to be shortened and some questions clarified. Some alterations were then made to the questionnaire. The survey materials were posted in early February 1992, a relatively slack work time in the growers' year to minimise non-response due to time conflicts.

The questionnaire was mailed to the 834 addresses listed on the database on the February 10. An introductory letter (see Appendix iii) outlining the aim of the research and the advantages to those surveyed of assisting in the study was included with the questionnaire. Respondents were invited to request a resume of the report on the study, if they so wished.

By March 30, 35 questionnaires had been returned "address not known" or "not at this address" or "out of business". Where feasible, an attempt was made to

¹⁹ The NZNA was undertaking such a membership drive at the time the survey was administered. Three respondents commented on the relationship between Massey University and that organisation and suggested this survey was part of that activity.

locate the missing businesses by telephoning the manager, or by contacting the owner or operator using a phone number obtained through the telephone directory service, or through other nursery businesses in the area. Whenever possible the questionnaire was remailed. Individuals or businesses that were not able to be contacted were removed from the database. By May 1, 28 businesses had not been located. It was assumed that these businesses had ceased to operate and the listings were removed from the database. The edited database then contained 806 entries for businesses known at that time to be active and expected to be concerned in some way with the woody plant industry.

As the initial response rate was high, some 25% were returned within seven days of posting it was decided not to mail reminder notices and replacement surveys to non-respondents.

4.2 The responses

Overall, a 37% response rate to the survey, i.e. a total of 303 returns, was achieved by May 1st. Fifteen completed survey forms received after this date were not included in the analysis because the industry's circumstances could have changed between when the late forms were completed and the time that most respondents completed their questionnaires. Differences between the seasons may also cause the respondents answers to differ from what they would have reported at the earlier time.

Of the 303 returns, 81 growers declared themselves not to be involved with the production of trees & shrubs, fruit trees, bedding plants, indoor plants, tissue culture plants, forest trees or herbaceous plants. Most of these 81 respondents stated that they were retailers only and not producers. The nature of the operation was recorded on the database and their data were not analysed further. Two of the respondents who considered themselves not to be part of the industry, and who as a result did not complete all of the questionnaire, were

the industry, and who as a result did not complete all of the questionnaire, were treated as non-respondents. These growers' businesses were within the scope of the industry as defined above²⁰. By including these businesses as non-respondents it was possible to contact them about their operations at a later date. Non-respondents were resurveyed later in May 1992 to determine how their businesses differed from the respondents.

Of the 222 completed questionnaires, a further 35 were not included for analysis as their businesses were found to be involved with crops other than woody plants. A summary of the numbers of questionnaires sent out and received is given in Table 4.1. The net total of respondents from woody plant growers was 187.

Table 4.1. Summary of the numbers of respondents and non-respondents to the survey.

Description	Number
Total names on database before mailing commenced	834
Businesses assumed to have received the survey	806
Non- Respondents (a)	503
Total responses	303
Responses from non-growers (discarded)	79
Responses from non-woody plant growers (discarded)	35
Responses from woody plant growers	187

a) Including two growers who declared themselves invalid and 15 whose responses were received too late to be analysed.

²⁰ One operator claimed to grow *only 5000 tamarillos*, while another grew *alpines*: both these individuals erroneously considered that they did not belong to the woody plant growing industry.

4.3 Data analysis

The survey forms received from the 187 woody plant growers, were encoded and prepared for data analysis by entering data with a text editor as ASCII text files. Subsequent analysis was performed using the SPSS-PC+ 4.0, statistical package (SPSS Inc, 1990). Data screening was performed using frequency tables and by specially designed automated searches to locate inconsistencies and values and combinations of values beyond likely possible ranges. All inconsistencies and range violations identified in these searches were then individually checked on the questionnaires and the most appropriate action taken to correct the data file. Initial analysis using further frequency tables and histograms was performed to prepare the descriptive information required to meet the first objective. Bivariate procedures employed to further analyze the data are described in Chapter 5.

4.4 The survey of non-respondents

As one objective of the research was to describe the industry structure, it was necessary to establish whether the respondents to the survey were not importantly different from the non-respondents. The initial response rate was considered acceptable but the final response rate, after eliminating responses as detailed in Section 4.2 above was poor. A telephone follow-up survey was administered to a random sample of the non-respondents in May 1992 using the method of Reid as reported in Armstrong and Overton (1977) to establish the probable extent of bias. In this survey, information on seven issues addressed by the initial mail survey which were expected to be key descriptors of the firms was obtained. Appendix v comprises a copy of the questions from the survey. By comparing the responses of the two respondent groups, using appropriate statistical procedures, the extent of bias in the mail survey was then estimated. The necessary brevity of the telephone contacts with non-respondents limited the number and type of questions which could be posed.

Ninety-five businesses, approximately 20% of the total number of non-respondents, were chosen at random from the list of non-respondents which had been maintained. Seventeen out of these 95 businesses had apparently gone out of business as no up-to-date phone number could be found for them. Other information was available in some cases to support this conclusion. The remainder of the business operators were surveyed in a telephone survey. All initial calls were made in the late morning to try to get owners or operators at work. Calls which went unanswered were re-tried in the evening, and again the next afternoon. Table 4.2 summarises the responses obtained with the telephone survey. Data were entered as ASCII text and handled in the same way as the data obtained with the mail survey.

Table 4.2 Description and summary of the results of the follow up telephone survey.

Description	Number
Total names in follow up sample	95
Businesses unable to be contacted and assumed to have gone out of business	17
Businesses for which the owner or manager could not be contacted, (three calls made)	14
Businesses where the contacted person declined to participate in the survey	16
Non-growers	5
Non-woody plant growers	8
Woody plant growers	35

4.5 Estimate of the number of industry participants

Based on the various portions of growers in the two surveys the size of the woody plant industry is estimated to be 499 as shown in Table 4.3. The original lists for the mail survey were compiled so as to include all expected industry participants. It appears from this result that approximately 250 surveys were

sent to non-woody plant growers. An improved estimate of the number of woody plant growers is made using the extra information, about the mail survey non-respondents, from the interviews. The revised estimate of industry size is presented in Table 4.4.

Table 4.3 Estimate of the number of growers in the woody plant industry based on the responses to the mail survey.

Description	Number	Total
Mail survey respondents	303	499
Woody plant growers	187	
Business who were assumed to have received the survey	806	
Estimate of industry size	$(187/303)*806$	

Table 4.4 Estimate of the number of growers in the woody plant industry using all available information.

Description	Number	Sub-Total	Total
Mail survey woody plant grower respondents		187	541
Mail survey non-respondents	503		
No phone number exists- assumed out of business	17		
		486	
Interviewed woody plant growers	35		
Interviewees	48		
Total number of woody plant growers	$((35/48)*486)+187$		

There are no other up to date lists that provide an estimate of the numbers of growers in the woody plant industry. However, a Department of Statistics surveys administered in as part of an economic review of the nursery industry in 1987 was sent to 191 individuals. The list used by the Statistics Department was presumably sent to only those nurseries which declared that they earn more than half their income from the nursery industry. Although not directly comparable, the larger number of extra businesses are believed in the main to be those that are involved in the woody plant industry in a small way. The NZNA ornamentals group, comprising 81 members (NZNA, 1992) represents a small portion of the woody plant growers in terms of the number of growers.

The characteristics of the businesses found to be part of the woody plant industry are discussed in the next part of this thesis, Chapter Five. The implications of these findings are included in Chapter Six.

5.0 RESULTS AND DISCUSSION

A diverse group of individuals responsible for 222 businesses completed and returned the mail survey, of which 187 were engaged in the production of woody plants. A further 29 were received from non-growers.

Relationships between ordinal and nominal data obtained in the mail survey were investigated using frequency counts and contingency tables in combination with various parametric and non-parametric statistical tests. These procedures were also used to investigate the relationships between the variables containing nominally and ordinally classified data and the groups established within variables containing continuous data.

The data for the seven variables collected from the non-respondent survey were analysed by comparing them with the data for the same variables obtained in the mail survey. As no significant differences were found between the variables from the two samples, it was assumed that the results from the mail survey could be used to represent the whole woody plant industry.

In order to meet the first two objectives of this research, and to provide industry with basic information for use by future researchers, this section comprises discussion of an extensive range of variables. The description and initial analysis of the industry and its characteristics are provided below, together with the initial development of proposals for industry development.

Many woody plant producers are involved with other nursery enterprises²⁰ together with their woody plant enterprise(s). Half of the respondents were involved with one or more other plant growing enterprises such as operating a tissue culture facility, growing herbaceous, bedding or indoor plant crops, or some combination of these. Table 5.1 shows that although most of these

²⁰ An enterprise is a portion of the nursery business which employs a different production system and which may be separated from other parts of the business.

respondents were involved with the production of trees and shrubs (T&S), only 39 (21%) were solely concerned with this enterprise. The T&S growers sector of the NZNA is the largest grower group within that organisation, but most of its members were likely to be involved with other enterprises.

To simplify analysis of results later in this Chapter, growers were grouped according to the degree of diversification in their business endeavours. Group 1, 2 and 3 growers were *specialists*, being involved only with woody plant production. The group number corresponds to the number of plant enterprises with which the business was involved. Group 1 growers were involved with only one woody plant enterprise and were thus the most specialised. Group 2 growers were involved with two woody plant enterprises, while Group 3 growers were involved with three woody plant enterprises. The woody plant enterprises identified were T&S, forest tree and fruit tree production.

Growers classified in Groups 4 to 6 were involved with woody plants and one, two or three or more other crops. For instance, Group 4 growers were involved with woody plants and one other nursery enterprise. Growers in Group 6 have the most diverse range of nursery enterprises as they are involved with one or more woody plant enterprises, together with three or more other nursery enterprises such as indoor plant production, bedding plant production and herbaceous plant production.

This arbitrary classification allows growers who are similarly diversified to be grouped together. Growers in each of the Groups 4 to 6 were assumed to have increasingly complex production systems to handle the various enterprises undertaken. Although woody plant growers in Groups 1 to 3 may produce many lines within an enterprise they were assumed to use similar production systems for these lines. This grower group identification system is used throughout the remainder of the study.

The numbers of growers in each of the six Groups and a summary of the numbers in each enterprise are given in Table 5.1. Most of the non-specialist growers belonged to Group 4, within which the most frequent combination of enterprises was the production of both trees and shrubs and herbaceous plants. Twenty percent of the total number of respondents were involved with this combination of enterprises. This high proportion may be due to the high demand for perennial plants in most parts of the country (Edwards, 1992). More growers tended to be involved with herbaceous plants than any of the other alternative crops, regardless of the diversity of their businesses. Only 5% (10) of respondents were involved with tissue culture. No growers declared involvement with all the activities tabulated, but 14 declared themselves to be involved with all enterprises except tissue culture.

Table 5.1 Enterprise combinations reported by surveyed woody plant growers. Showing numbers and percentages in groups and percentage of total.

Class, Group number and Enterprise	No. and % of Growers in Group		Percentage of Total Growers
	Number	Percent	
Woody Plants Only (Specialists)			
Group 1: One Woody Plant Enterprise			
Only Trees and Shrubs	39	76	21
Only Fruit Trees	7	14	4
Only Forest Trees	5	10	3
Sub Total	51	100	27
Group 2: Two Woody Plant Enterprises			
T&S and Fruit trees	9	28	5
T&S and Forest Trees	23	72	12
Fruit and Forest Trees	0	0	0
Sub Total	32	100	17
Group 3: Three Woody Plant Enterprises			
T&S, Fruit Trees and Forest Trees	7	100	4
Sub Total	7	100	4
Total Woody Plant Specialists	90		48
Woody Plants and Other Enterprises (Diversified)			
Group 4: One or More Woody Plant and One Other Enterprise, which is;			
Tissue Culture	3	6	2
Herbaceous Plants	38	73	20
Indoor Plants	6	12	3
Bedding Plants	5	10	3
Sub Total	52	100	28
Group 5: One or More Woody Plants and Two Other Enterprises, which are;			
Tissue Culture and Herbaceous	4	14	2
Herbaceous and Indoor	8	29	4
Herbaceous and Bedding	10	36	5
Indoor and Bedding	6	21	3
Sub Total	28	100	15
Group 6: One or More Woody Plant and Three or More Other Enterprises, which are;			
Tiss. Cult., Herbaceous and Indoor	3	18	2
Herbaceous, Indoor and Bedding	14	82	7
Sub Total	17	100	9
Total Diversified Growers	97		52
Total Respondents	187		

In Section 5.1 the general characteristics of the respondents and their woody plant businesses are described. The enterprises are classified by location, and business size related detail. Demographic details for the business operators and their operations, including information on the participants' age, education, and membership of industry organisation are provided. The use made by respondents of industry publications and use of other information sources is then described and discussed. The status of particular businesses with respect to export activities is reported upon.

Section 5.2 provides more detailed information on technical and crop specific aspects of the respondents' businesses, such as production system, crop specialisation and growing media use.

Section 5.3 provides an interpretation of the industry from the perspective of respondents together with initial comments on constraints and opportunities for the woody plant growing industry.

The final section, Section 5.4, describes the results of the telephone survey of the sample of non-respondents with special reference to the problem of survey bias.

5.1 General industry features

This section contains basic descriptive information about the respondents businesses. The section begins by providing basic detail on the businesses. Information such as the location, size, and age of the businesses is provided to give a general picture of the respondents' businesses and their location. As the section progresses the emphasis shifts to describing the attributes of the people in it rather than their businesses. The age, nature of ownership, financial situation, and education of respondents are discussed to provide the description of the "human resource". The final part of the section contains description of the participants' employment history, membership of industry organisations, information sources and an introduction to exporting activities of the growers.

The aim of the section is to provide an overview of the industry and its participants.

5.1.1 Location of the businesses

Of the 187 responses received, most (66%) were from the North Island. There were, however, large differences between region in the number of responses received. These data are presented in Table 5.2. A map showing regional boundaries and the numbers in each region is included in Appendix vi.

Table 5.2. Number and percentage of respondents by region for woody plant growers.

Region	Number of responses	Percentage of total responses
North Island		
Northern North Island (NNI)	39	21
Central North Island (CNI)	17	9
Western North Island (WNI)	15	8
Eastern North Island (ENI)	35	19
Southern North Island (SNI)	18	10
Total North Island	124	66
South Island		
Northern South Island (NSI)	12	6
Eastern South Island (ESI)	22	12
Western South Island (WSI)	3	2
Southern South Island (SSI)	18	10
Total South Island	55	34
Not Locatable	8	4
Total	187	100

(a) Eight growers did not return their surveys in the coded envelopes they were provided. Their addresses could not be confirmed so this information was lost.

The differences between the number of nurseries and the district in which they were located reflects the distribution of population around New Zealand, as districts with high numbers of nurseries tended to be those associated with high populations (Department of Statistics, 1992c). The NNI was the most important district in terms of the number of businesses. Some 21% of all respondents' businesses were located in that region. Nineteen percent of woody plant growing was being undertaken in the ENI. Twelve percent of woody plant growers are from the ESI.

Most of the Group 1 growers (those who were involved only with one woody plant enterprise) were in the North Island. Eighteen percent of specialist tree and shrub (T&S) growers were found in the NNI, 22% were found in the ENI while 8%, and 12% were located in the CNI and WNI districts, while the whole South Island accounts for only 29% of specialist T&S production. Much of this specialised nursery industry activity was associated with the favoured forest and fruit growing districts such as the NNI and ENI. Twenty-nine percent of all Group 1 fruit tree nurseries were located in the NNI region, while the ENI region contained 57% of all specialist fruit tree nurseries. Forty percent of all specialist forest tree nurseries were in the ENI region. The trend established by the Group 1 growers was also found amongst Group 2 growers. The ENI and NNI each contained 25% of the Group 2 growers. Forty percent of the nations Group 2 growers of both T&S and fruit trees were in the ENI, while 26% of the T&S plus forest tree nurseries were located in the NNI.

All Group 3 growers were in the North Island. Twenty percent of the Group 4 growers were based in both the NNI and ESI regions. The ESI comprised the largest proportion of growers involved with the production of woody plants and herbaceous plants as 27% of all these growers were found here.

Group 5 and 6 growers were located throughout the country. The data for this discussion are based on a cross tabulation of Group number with district. This table may be found in Appendix vii (Table 1).

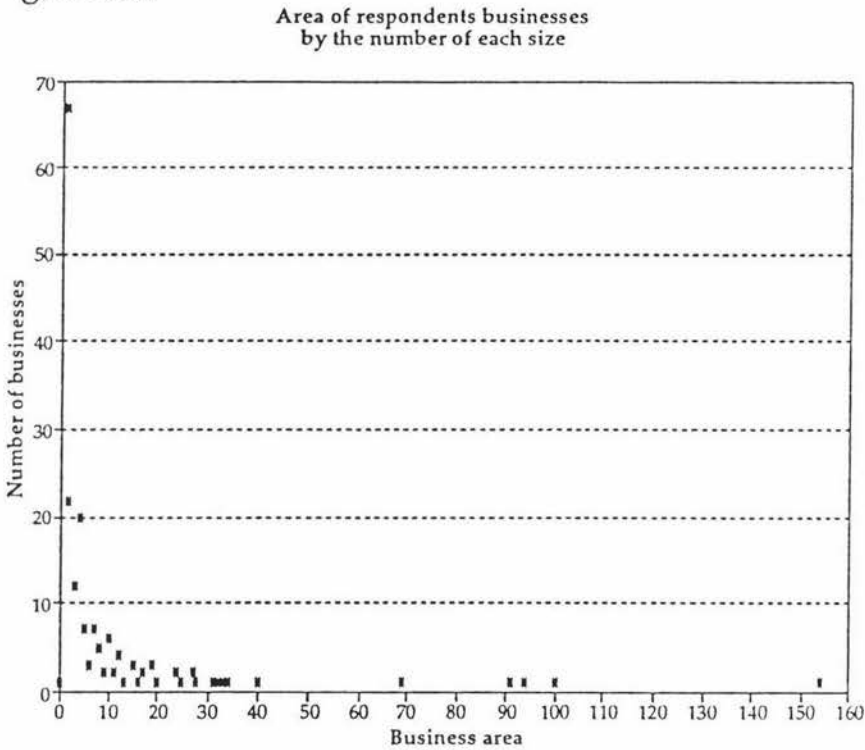
5.1.2 Size of nursery businesses

Because the woody plant growers surveyed were presumed to be involved with a wide range of different types of nursery, standard measures of business size and activity were difficult to apply. No single index could be created which was appropriate for all businesses. Specific questions about the financial performance of the respondents' businesses were not included in the questionnaire because it was felt that the inclusion of such questions would lower the overall response rate. Instead simple measures of the size of the various woody plant businesses were made. These measures include; the area the nursery business covers, the number of staff employed, and the numbers of plants produced each year which are used as proxy variable for business size.

5.1.2.1 Area of businesses

The areas of respondents' businesses ranged from 0.1 hectares to 154 hectares. The mean area covered by woody plant businesses was 8.3ha, the median was 3ha, and the mode was 1 ha. As Figure 5.1 shows, the distribution of respondents' business area was strongly positively skewed (skewness coefficient $g_1=5.14$) and highly peaked (coefficient of kurtosis $g_2=31.87$). Tests based on the normal distribution cannot be used on the raw data for this variable.

Figure 5.1 Distribution of business areas for responding woody plant growers.



For ease of comparison businesses were classified as to belonging to one of four size classes ("small", "medium", "large", and "very large"). Table 5.3 shows the size range for each class and the number of respondents in each class. Most of the respondents' businesses were small as they only covered less than 2ha. Most of these businesses would have been excluded from many of the surveys of agriculturalists in New Zealand (e.g. Ryde and Nuthall, 1984; Moore, 1990).

Table 5.3 Means, and class membership of the four size classes used for convenience.

Size Class	Class Size Range (ha)	Number in Size Class
Small	less than 1.9ha	68
Medium	2 to 4.9ha	55
Large	5 to 19.9ha	45
Very large	more than 20ha	17
Unknown	-	2

The distribution of business sizes was discontinuous. Some of the very large businesses covered as much as 150 ha, the next biggest businesses occupied 40ha. Although some (Sokal and Rohlf, 1981) suggest modifying or deleting outliers the approach taken was to include all cases to enable the overall view of the whole industry to be developed, and to use non-parametric procedures to investigate the data where necessary (Sokal & Rohlf, 1981). However, in some situations where more detailed investigation of the distribution of the businesses was required the outliers were deleted for that analysis.

Table 5.4 shows that most of the respondents have small nurseries, with little area under glass or plastic or under shade, and most producers had little area for open ground production. The range of areas which respondents claimed to have under glass, plastic, shade, and as open ground production were also positively skewed.

Table 5.4 Size of businesses in terms of the area under the nursery, under cover, under shade, and under open ground cultivation for the 187 respondents.

Parameter (units)	Statistics			
	Range	Mean	Mode	Median
Area of nursery (ha)	0.1 - 154	4	0.2	1
Area of open ground (ha)	0 - 121	3	0	1
Area under shade (m ²)	0 - 4300	449	0	200
Area under cover (m ²)	0 - 6000	481	0	150

Growers in Group 1 tended to be small and only 4% of this group had nursery businesses that occupied more than 20 ha. The businesses classed as *very large* were involved with open ground production. Two of these were forestry nurseries while two others produced Trees & Shrubs. Seventy-one percent of the fruit tree growers occupied 5 to 20ha of land. These businesses also practised open ground production.

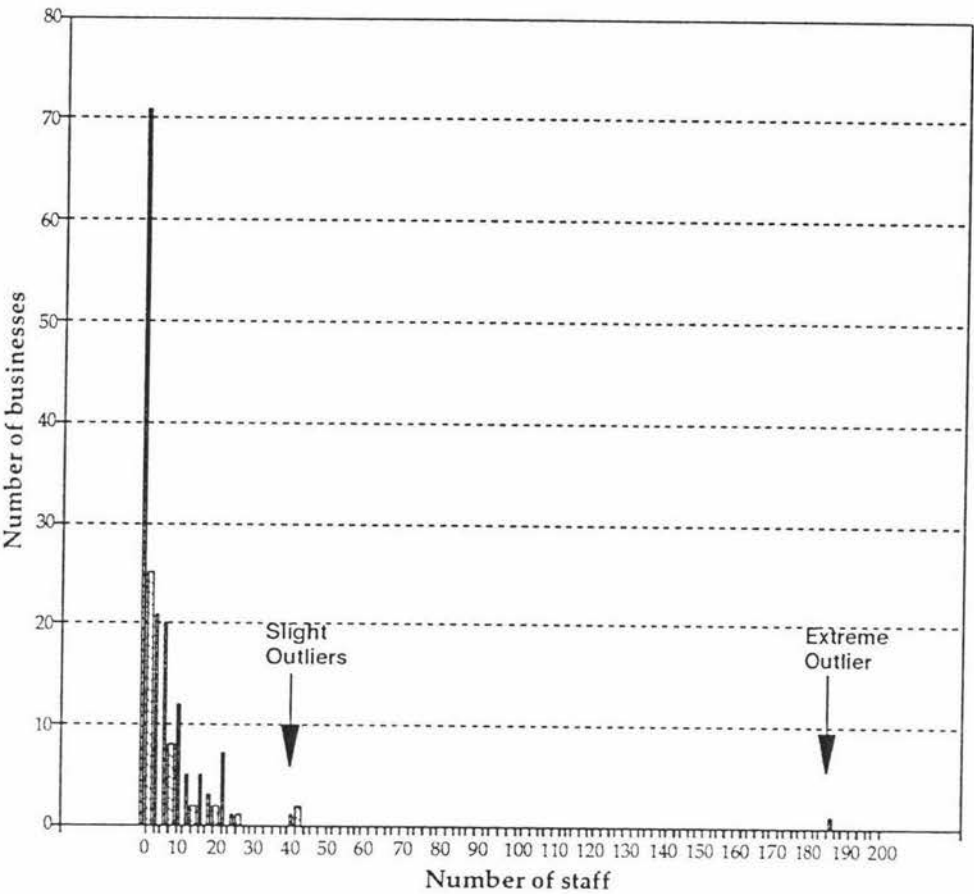
5.1.2.2 Number of employees

The number of staff employed to operate the business, that is in addition to the owner(s), is a measure of the size of a business. Nursery businesses such as specialist propagators may use small land area to run a business with high turnover. The total number of employees (including permanent, casual, contract and other staff employed) varied from zero to 185. On average, almost 10 staff were employed in each business. The median number employed was five persons, while the mode was two staff employed for each business. The distribution of the number of employees per business was strongly positively skewed.

The estimate of industry size derived from the number of respondents to both the mail and follow-up telephone surveys is 541 members (Section 4.5). Combining this value and the numbers of people per firm, gives an estimate of 5410 persons employed in the woody plant industry. Of these approximately 2944 were permanent employees and 2250 were casuals, with the remainder being employed on contract or other arrangements. Figure 5.2, is a frequency distribution of permanent staff number. The distribution is positively skewed.

When the degree of correlation between business area and the number of permanent staff was investigated, the effect of the one very large nursery business on the correlation was evident. When all cases were analysed the total staff correlates highly with the area of the business ($r^2 = 0.68$). However, when the single very large business was removed from the data set, the correlation between these two variables decreased considerably ($r^2 = 0.32$). The largest operation, in terms of business area, also employed by far the largest staff. The effect of including this one very large business in this analysis was to hide the real relationship between the rest of the industry participants total staff numbers and the area of their businesses. The low correlation between these two variables shows that businesses with large area need not necessarily employ large numbers of people.

Figure 5.2. Number of businesses by total staff number.



5.1.2.3 Production of plants

Growers were asked to record the number of plants they propagated for sale as: propagules, growing on lines, retail lines or which they bought in for resale on a wholesale or retail basis, and to record the percentage of their 1991 sales that were attributable to each of these sources. These questions were poorly answered. Most respondents did not supply quantitative information but simply recorded the percentage of their income attributable to each activity.

However, the businesses that did respond reported the production of between a few hundred plants to the largest, which produced millions of plants. The huge difference in scale of production meant that any comparison between nurseries in terms of numbers of plants produced was meaningless.

5.1.3 Age of growers

One factor important to the design and delivery of extension programmes is the age of the clients. Older farmers are more resistant to change and may be slower to adopt new technology than younger farmers (Van den Ban and Hawkins, 1988).

The average age of woody plant respondents in this survey was 44 years. This is similar to the average age of farmers as reported by Moore (1990) who found that the average age of Canterbury farmers was 42; and by Hughes *et al.* (1989) who reported the average age of dairy farmers in the Manawatu to be 45 years. The distribution of ages of woody plant growers was similar to the age distribution of farmers reported by Moore (1990). Both these sets of data are presented in Table 5.5.

About half of the members in each survey group are in the 25 to 44 year age group. These age distributions are similar to those provided for farmers by other workers (Lively and Nuthall, 1983). Of interest, however, is the low percentage of nursery industry respondents aged 34 or less (16%) in comparison to the 32% of Moore's (1990) farming group. It seems that woody plant growing businesses were not operated by these younger people.

Table 5.5. Distribution of age of woody plant growers from this author's survey compared with the age of New Zealand farmers from the survey by Moore (1990).

Age class (years)	Percent of ^(a) farmers (%)	Percent of ^(b) growers (%)
Less than 25	3	0
25 to 34	29	16
35 to 44	24	39
45 to 54	27	26
more than 54	17	19
Total	100	100

^(a) From Moore (1990).

^(b) This survey

5.1.4 Business establishment

Seventy-seven percent of respondents reported that they owned or managed a business which they had established. This is a high proportion of *first generation* growers when compared with the situation reported on farms by Moore (1990). In Moore's survey 35% of farmers were operating properties that had been in the family for three generations and 24% were second generation farmers.

There are two possible reasons for this difference. The nursery industry has expanded a great deal in the last 20 years and few participants have left so there were a large number of first generation growers amongst the survey respondents. Alternatively, Woody Plant Growers set businesses up, operate them for 10 to 15 years and then close them down, so there were few second and third generation operated businesses. Few businesses are sold as going concerns as most respondents reported that they setup their own business. Whatever the reason for this occurrence, businesses in this mode of long term operation can only remain relatively small. The implications for this difference in terms of the extension and research needs of the industry are that the problems most growers have will always be those associated with developing businesses. They will not be the problems faced by mature business operations.

Growers who set up their own businesses were older than those that did not (45.6 compared with 39.2 years) ($P < 0.01$). The businesses set up by respondents were smaller than those not set up by respondents. Younger individuals set up small businesses (in terms of business and nursery area, and greenhouse area). The survey data do not support popular industry claims that it is composed of many retirees or older people establishing nurseries.

The industry contained mainly middle-aged and younger growers. It did not contain large numbers of aged participants (>60 years).

5.1.5 Age of business

Table 5.6 shows that few of the respondents had owned or managed their businesses for more than 15 years. Only 8% of the businesses had been managed by the respondents for more than 30 years. These results suggest that most nurseries were set up by persons 30 to 35 years old and that by the time they reach 50 years old the businesses were closed down.

Table 5.6. Time (years) that respondents have owned or managed this business.

Years business owned or managed	Number of businesses	Percentage of businesses
0 - 5	44	24
6 - 9	44	24
10 - 14	40	21
15 - 19	23	12
20 - 24	13	7
25 - 29	10	5
30 - 34	6	3
35 - 39	5	3
40 - 44	1	0.5
45 - 50	1	0.5
Total	187	100

The situation appears different in pastoral farming. Moore (1990) reports that 52% of farmers had had control of their businesses for less than 10 years but that 11% had managed their farms for each of the 11 - 15, 16 - 20 and 21 - 25 year periods. Thirteen percent of farmers had run their farms for more than 25 years. Thus pastoral farmers appear to keep their businesses longer than their nursery industry counterparts (Moore, *op cit*). The dairy farmers reported by Hughes *et al.* (1989) had their farms for an even longer period. Twenty-two percent of the dairy farmers reported upon in this survey had had their farms for more than 24 years (Hughes *et al.*, *op cit*). The distribution of ages of dairy farm businesses was much flatter than similar distributions of nursery industry businesses. This suggests that the woody plant businesses were not usually run as a way of life and that they were run for some commercial gain.

Although the cell frequencies in the cross tabulation of grower Group by the age of the business were low, industry trends can be seen from this analysis which is included in Appendix vii (Table 2). There were fewer growers (18%) in Group 1 with new businesses (0 to 5 years old), than there were in businesses 5 to 10 years old (24%), or 10 to 15 years old (24%). The same pattern applied to Group 4 businesses. In this Group there were fewer new businesses (17%) than there were businesses in the next two age categories (27%) and (25%). For Groups 2, 3, and 6 the percentages of businesses aged 0 - 5 years, 5 - 10 years or 10 - 15 years were similar. Almost one third of all Group 5 businesses were less than 5 years old.

The number of businesses established as *specialist* woody plant growers was low. The path that the businesses greater than five years old had taken to become specialist woody plant growers was not clear. If woody plant growers started with the specialisation, and other more diversified growers did not become woody plant specialists, the number of woody plant specialists would be expected to decline with time. The implications of this potential decline are discussed in Chapter 6.

Table 5.7 summarises the data on the reported age of the respondents when they set up their businesses. Some of the older industry participants claimed to have set their businesses up when they were 15 to 20 years old (in the 1950's). When these data are compared with the age of the woody plant industry participants at present, the age at which individuals establish their woody plant business has increased steadily over the past decades. At the time the survey was administered the new entrants to woody plant growing were older than ever before.

The number of new entrants to woody plant growing appeared to be declining and the average age of those establishing these new businesses was increasing. The lack of young industry participants may be attributable to two factors. Firstly, the industry may not appeal to younger persons. Secondly, changes in

the economy and the market place may be preventing new growers from becoming established.

Table 5.7. Average age of respondents when they established their businesses.

Age of operator when business set up (years)	Number of respondents	Percentage of respondents
15 - 20	3	2
20 - 25	20	11
25 - 30	48	27
30 - 35	49	27
35 - 40	28	16
40 - 45	11	6
45 - 50	7	4
50 - 55	8	4
55 - 60	4	2
60 - 65	1	1
Total	179	100

5.1.6 Full-time or part-time growers

Most of the businesses (77%) were run by the respondents on a full-time basis (as reported in Table 5.8). A relatively high proportion of the respondents (20%) operated their businesses on a part-time basis when compared to respondents in other primary industries²¹. Lively and Nuthall (1983) reported that in their survey of 1000 farmers²² only 7% were operating their businesses on a part-time basis. Fewer growers in Groups 3 (14%), 4 (17%), 5 (18%), 6 (18%) and 1

²¹ In an OECD report prepared by MAF in 1977 it was reported that no direct statistics were collected on the numbers of part-time farmers in New Zealand.

²² Farmers were individuals who operated businesses larger than 5ha. Small horticultural properties were excluded from this survey.

(20%) described themselves as part-timers. Thirty-one percent of Group 2 described themselves as part-time growers.

Table 5.8. Numbers and percentages of respondents operating their businesses on a full or part-time basis.

Time involvement in management	Number of Respondents	Percentage of respondents
Full-time	143	77
Part-time	38	20
No Data	6	3
Total	187	100

Furthermore, part-time growers had smaller nurseries and earned relatively little from trees and shrubs or from woody plants. Although there were no significant differences between the ages of part-time and full-time growers, part-time growers had operated their businesses for a shorter period of time (mean business age 8.5 years) than had the full-time growers (mean business age 12.8 years M-W, $P=0.002$). Part-time growers were equally likely to be involved with any of the nursery enterprises except tissue culture. There were no part-time operators of tissue culture facilities.

5.1.7 Ownership structure

Table 5.9 presents data on the numbers of respondents and the way they own their businesses. Forty-seven percent of the respondents' operations were run as some kind of partnership. Slightly more than 25% were private companies, while about 20% were run as sole proprietorships. The industry comprised few public companies or trusts. This situation can be compared with farmers (Moore, 1990) where 44% and 26% of the farmers were running their businesses as partnerships and as sole owners respectively. Ten percent of Moore's population were working as managers, while 20% were owned in other ways. The prevalence of partnerships as the main type of ownership of nurseries is in line with the trend reported by Attwood (1984) who showed individual ownership decreasing and partnerships increasing with time, perhaps as family

members gain equal recognition for their inputs. The relatively large number of private companies contrasts with the farming situation where few private companies are reported (Moore, 1990).

Group 5 growers had the highest percentage (32%) of sole proprietorships, while Group 6 growers were most likely (41%) to be private companies.

Table 5.9. The ownership structure of the respondents to the survey.

"Ownership Structure" ^(a)	Number of responses	Percentage of responses
Sole Trader	36	19
Partnership	88	47
Private Company	51	27
Public Company	1	1
Trust	2	1
Other	3	2
Missing/not known	6	3
Total	187	100

^(a) Respondents employed by organisations, such as the nurseries of regional authorities, and state owned enterprises, are classified under the "Other" ownership category.

Although most of the businesses are described as partnerships. The reason for the relatively high proportion of private companies in the woody plant industry is not known. Nursery operators may prefer this approach to shift the risks to investments in capital assets away from the family, or perhaps this arrangement enables the limitation of other liabilities.

5.1.8 Financial position of growers

Overall, most respondents (59%) did not consider short or long term debts limited their business activities. However, fifty-eight percent of sole traders believed debt seriously limited their operation, while 33% of partnerships and 44% of private companies respectively believed debt seriously limited their operations. Businesses ranking debt as a problem did not have significantly bigger business, nursery or open ground areas, but businesses with a large area under greenhouses were more likely to have problems with debt than those with little area under greenhouses²³.

Table 3 located in Appendix vii shows that respondents in the 35 to 40 year old age group were most likely to be troubled by the effects of debt in their operations. Older respondents reported the fewest problems with debt of all age classes, while 44% of the youngest growers believed that debt limited the operation of their business.

Table 5.10 shows that respondents rated the effects of long and short term debt on their businesses in a similar fashion. Overall, similar proportions of respondents considered short-term and long-term debt to be problems. However, the growers who described short-term debt as a problem tended to be those associated with greater diversification i.e the Group 5 and 6 growers who also had large areas under greenhouses. Thirty-five percent of the growers of woody plants and three or more other crops described short-term debt as having had an above average to great effect on the operation of their businesses. The effects of long-term debt were reportedly felt more strongly by the "specialist woody plant" growers.

Twenty-six percent of respondents reported they never used budgets, while another 26% reported using them annually. Growers operating private

²³

The relevant Mann-Whitney test showed this difference to be significant at $P=0.003$.

companies were the most frequent users of budgets. All of the growers who used budgets more than monthly were private companies. Eighteen percent of all growers reported using budgets monthly. Surprisingly of the 11 growers who listed short term debt as a major problem only 2 carried out budgets monthly or more frequently.

Table 5.10. The degree that short term and long term debt affected respondents businesses.

Effect of debt	Rating	Percentage of respondents in each situation	
		Short-term debt	Long-term debt
No effect	1	51	55
	2	13	12
Average effect	3	18	13
	4	10	9
Great effect	5	9	12
Totals	-	100	100

Some 34% of part-time growers never used budgets, even though some of these described short-term debt as being a serious problem. A further 47% of part-time growers used budgets annually. Only 6% of part-time growers used monthly budgets.

5.1.9 Respondent training and education

Many commentators consider that better educated growers are more receptive to new technology and are more receptive to change and are easier to educate than their less educated colleagues (Van den Ban and Hawkins, 1988). Higher education levels favour earlier adoption of new technology, and more adaptability by growers. To enable effective extension plans to be developed the training, skills and education of the growers needed to be investigated.

The respondents to the woody plant industry survey had a varied educational background. As shown in Table 5.11, 45% of the respondents reported having received no formal horticultural training. These respondents made comments such as "learnt from my father", or "learned by doing it" or "not needed". However, the majority (55%) of respondents reported having one or more of a wide range of horticultural qualifications. These ranged from completed apprenticeships, to diplomas, to various university degrees. Eight respondents listed horticultural qualifications variously awarded in Holland, England and Kenya.

Table 5.11. Horticultural qualifications of respondents.

Qualification ^(a)	Number of responses	Percentage of responses
No qualification held	85	45
Horticultural apprenticeship	11	6
Horticultural trade certificate	9	5
Horticultural degrees	5	3
Diploma in Horticulture	17	10
Attended or completed part-time horticulture courses	2	1
Forestry degree	2	1
National Diploma in Horticulture	7	4
Overseas horticultural training	8	5
Non-horticultural qualifications	22	12
Not reported/missing	19	10
Total	187	100

^(a) Only the highest qualification is reported for each respondent

Twenty-two respondents listed a wide assortment of non-horticultural qualifications in response to the question of horticultural training. These included business diplomas and commerce degrees. Others stated that they had

post-graduate qualifications, but did not specify the discipline in which they obtained the qualification. Table 5.12 shows that although 126 of the respondents had no horticultural qualification, 121 of these described themselves as having had some horticultural industry experience before taking on their managerial or ownership role in their present business. Slightly more than one third of all respondents had had no previous horticultural experience prior to their current managerial or ownership responsibilities.

Although a high percentage of industry members had not had specific horticultural training, about half (54%) had attended a tertiary institution. The mean age of respondents who have attended University (42.5 years) was significantly less than the mean age of those who had not attended (46) ($P = 0.059$).

Table 5.12. Respondents experience in horticulture prior to current involvement.

Prior experience	Number of respondents	Percentage of respondents
Engaged in horticulture before this business	121	65
Not engaged in horticulture before this business	64	34
No answer/ not known	2	1
Total	187	100

Table 5.13 shows that 75% of the respondents have been awarded school certificate, and nearly 60% have completed 6th form. Overall only 15% left school at 15 without School Certificate. However, 36% of growers in Group 1 left before this time, reflecting the age difference between members of this Group and the members of other Groups. Only 43% of Group 1 growers completed 6th form, yet 86% of Group 3 growers reached the same standard.

Table 5.13. Basic educational attainment of woody plant growers.

Education level attained	Number of responses	Percentage of responses
Left at age 15	28	15
Left with School Certificate	47	25
Completed 6th form	109	58
Missing	3	2
Total	187	100

The participants in the woody plant industry come from many backgrounds. Industry participants included those whose first career choice has been to be a "plantsman", but also individuals who had had training for other careers, but who then chose to grow woody plants. The industry comprised individuals who had a much wider educational background than farmers with a similar age distribution (Moore, 1990). However, unlike the farmers, more of the woody plant growers had not been involved with the woody plant industry before becoming involved with the business they are reporting on. The respondents entered the nursery business later in life.

5.1.10 Employment history

Although 34% of the respondents had not been employed in horticulture before taking over control of their present business, most had reported some previous employment. Table 5.14 lists the previous horticultural employment classes together with the number of respondents in each class.

Many of those who had not been in horticulture prior to taking on the present position did not report their previous occupation. However, most of the respondents who had worked in horticulture prior to becoming involved with their current business had been in a similar industry. Within these employment

groups there was a wide range of types of employment. Respondents described themselves as "labourers", "skilled plantsmen", or in a few cases as managers. Thus, although the respondents had industry experience it was derived from a wide range of positions within the industry. There was little evidence for the view reputed to be held that the industry is becoming heavily laden with ex-Government employees who had been made redundant.

Table 5.14. Occupation of the respondents before owning this business.

Occupation Group	Number of respondents	Percentage of responses
Horticultural		
Nursery	55	29
Garden Centre	4	2
Orcharding	17	9
Floriculture	4	2
Vegetable growing	1	1
Forestry	5	3
Parks	17	9
Government Agency	3	2
Total Horticultural	106	57
Undefined ^(a)	3	2
Non-horticultural	10	5
no answer/not known	68	36
Total	187	100

(a) Three respondents claimed to have had previous employment in horticulture but did not state the nature of that employment.

5.1.11 Industry organisations

Knowing the way growers have organised themselves in the past can be helpful in appreciating the merit of different industry development strategies. Forty

percent of the respondents claimed that their primary industry organisation was the New Zealand Nurserymen's Association (NZNA). Slightly fewer (36%) of the Groups 1, 2 and 3 growers reported the NZNA was their primary industry organisation. The more diversified growers, those in Groups 4, 5 and 6 were more likely to belong. Some 44% of these growers belonged to the NZNA. However, growers in Groups 4 to 6 also belonged to a range of other small industry organisations.

A further nine growers claimed membership of the NZNA as their secondary organisational affiliation. Thus only 46% of all respondents belong to the NZNA. Most growers do not belong to a second organisation.

Table 5.15 shows that 40% of respondents listed the NZNA as the organisation they claimed as their primary industry organisation. The next most common primary organisation was the International Plant Propagators Society, of which 18 respondents were members. The New Zealand Tree Crops Association, the Farm Foresters Association, and New Zealand Rhododendron Association, were the only other organisations to have more than five respondents claiming membership. One quarter of the industry participants belong to no industry organisation, while a further quarter belong to only one organisation. The lack of affiliation by these individuals with other growers means that industry coordination and development will be hard to achieve as these participants preferred to act alone. A direct personal benefit from the development of industry strategies would have to be perceived by these respondents before they would be prepared change their present approach.

A large number of different organisations were listed by small numbers of individuals as being important to them for their businesses. These organisations were often specialist groups, to which woody plant growers belong in order to obtain crops specific information otherwise unobtainable.

Table 5.15. Primary membership of organisations by woody plant growing respondents.

Organisation	Membership
New Zealand Nurserymen's Association	75
None	47
International Plant Propagators Society	18
New Zealand Tree Crops Association	10
Farm Foresters Association	8
New Zealand Rhododendron Association	5
Royal New Zealand Institute of Horticulture	2
Palm and Cycad Society	2
Royal Horticultural Society	2
Rotary	1
Canterbury Horticultural Society	1
Quality Growers	1
Auckland Botanical Society	1
New Zealand Wine Institute	1
Forest and Bird Society	1
NZ Institute of Parks and Recreation Administration	1
New Zealand Institute of Forestry	1
International Union of Forest Research Organisations	1
Rose Society	1
Taranaki Rhododendron Growers	1
Alpine Garden Society (UK)	1
Alpine Garden Society (NZ)	1
Floriculture Federation	1
NZ Institute of Landscape Architects	1
New Zealand Forest Owners	1
Auckland Botanic Gardens	1
Poverty Bay Horticultural Society	1
Total	187

Most growers (59%) reported that they attended conferences. Some 78% of these respondents were able to identify a conference they attended within the last five years. Growers who did not attend conferences have smaller business areas than colleagues who attended conferences and also tend to be part-time growers. As most full-time industry participants attended conferences, this approach to extension of topical issues could be used to reach large numbers of growers relatively cheaply.

The nursery industry was represented by many small organisations. However, less than half the total number of growers belonged to the NZNA. If Massey University is to strengthen its links with the whole industry a move beyond servicing just the NZNA membership seems appropriate. By servicing the needs of both NZNA members and non-NZNA members the University could double the size of the market for its services.

5.1.12 Information sources

The diversity of information sources used by respondents further reflected the diversity of the members of the woody plant industry. Table 5.16 lists some of the horticultural magazines available in New Zealand, together with the a record of whether the respondents read them or not. The "Other Magazine" titles were provided by the respondents.

All but ten respondents claimed to read *Commercial Horticulture*. The next most "popular" magazine was *The New Zealand Gardener*. These two magazines have quite different journalistic styles. *Commercial Horticulture* is the nursery trade magazine. It is distributed free to members of the NZNA. Non-NZNA members must purchase it. *The New Zealand Gardener* is a glossy magazine aimed at plantspeople in general. Growers with smaller business area read *The Gardener*.

Other magazines aimed at markets less directly related to the nursery industry,

had much lower readership amongst respondents, except where particular interest groups were involved. Examples were the use made by forest tree growers of the *Tree Grower* and *Growing Today*, or the *Orchardist of New Zealand* by the fruit tree growers. Again, the specialist growers listed a wide range of magazines about their crop(s) of choice, but as in the case of industry organisation membership, the readership of these magazines was low amongst this survey group.

Table 5.16. Industry related magazines read by 187 woody plant growers.

Magazine Title	Number of respondents who read magazine	Number of respondents who don't read magazine	No answer/ not known
<i>Commercial Horticulture</i>	152	10	16
<i>Horticulture News</i>	74	51	62
<i>New Zealand Gardener</i>	113	38	36
<i>Australian Horticulture</i>	18	71	98
Other Magazines	(83)	(21)	(83)
<i>Growing Today</i>	21	-	-
<i>American Nurseryman</i>	8	-	-
<i>Tree Grower</i>	7	-	-
<i>The Orchardist of NZ</i>	4	-	-
Other magazines	(40)	(21)	(126)
<i>Growing Today</i>	5	-	-
<i>Tree Grower</i>	6	-	-

As well as getting information from magazines, and by attending conferences organised by the various industry organisations, growers gained information from other sources such as consultants, other growers and by background reading. Table 5.17 summarises the responses of growers who were asked to identify which of the listed sources were their main sources of information for operating their business. The information provided by respondents was incomplete and they did not indicate "Yes" or "No" to the use of each consultancy source as was requested. Thus the most important source of information to these growers was "Other growers" (127 respondents).

Private consultants were reportedly used most frequently by respondents and the Nursery Research Centre was used the least. Only 26 respondents reported the use of NRC as an information source. Despite the NZNA's inputs to the NRC over the past years and the publication of the NRC's annual report, few growers used their own industry research and extension agency.

Table 5.17. Use made of consultancy by woody plant growers as reported in the survey.

Consultancy Service Used	Respondents' replies		
	Yes	No	Missing
Ministry of Agriculture	32	49	106
Nursery Research Centre	26	46	115
Private	66	33	88
Other Consultants	36	30	121
Other growers	127	14	46
Other	53	19	115

Other main sources of information are included in Table 5.18 (below). Of the other sources of information provided by respondents much value was placed on self-derived information rather than using information provided by other people.

Table 5.18. Other sources of information provided by respondents.

Source of Information	Number
Other Businesses	7
Independent personal research	
Private Research	2
Customers	2
Publications (journals)	9
Self	9
Reading (textbooks)	4
Sales Reps	3
Total	40

5.1.13 Export activities of growers

The potential for export of live plants from New Zealand has been reported to offer enormous potential. At the time NRC was established Rainey (1974), commented upon the opportunities for NZNA members to export many crops.

Only 10% of respondents reported the direct export of plants from their businesses. Only 32% of these, were Group 1,2 or 3 growers. The export earnings of respondents from these activities were in many cases modest also. Two Group 1 growers, one Group 4 and one Group 6 grower each earned more than \$100,000 from this trade. Other respondents reported earning lesser amounts from exporting. The reputed export potential has not been fulfilled. The nursery industry is thus still strongly focused on the local market.

5.2 Specific technical detail

In addition to being diverse at an industry level, woody plant growers' nurseries were also diverse at a technical level. Woody plant growers produced a wide variety of plants and used many technologies to produce them. These have ranged from advanced laboratory-based techniques such as tissue culture to simply striking cuttings in the open ground.

This section provides an introduction to some of the technical aspects of importance to the woody plant industry, as well as providing more specific information on the growers whose main focus is the woody plant industry.

5.2.1 Container nurseries

Most of the nurseries reported that they produced containerised plants. As the 11% of growers (21) who were not involved with container production also reported large areas of open ground production, it can be assumed that these businesses were involved only with open ground production. As open ground nurseries were more likely to have problems associated with the seasonal nature of their activities, such as, variations in cash flow, these differences between production systems are important.

Fewer of the nurseries involved with one, two or three woody plant enterprises, that is Group 1 to 3 growers, were involved with container production than the operators of diversified Group 4, 5 and 6 businesses. Most (98%) Group 4 and 5 growers were involved with container plant production, with the only grower not involved from these Groups producing cut flowers and bulbs and some woody plants. Two thirds of Group 6 and Group 1 growers were involved with container production. However, within Group 1, the forestry and fruit tree growers, 24% of the Group, were mostly open ground producers.

Container nursery operators were marginally younger than their open ground production system counterparts (mean ages 43.5 and 47.5 years respectively, which were significantly different at the 8.7% level), but there was no significant difference in the ages of the businesses.

Non-container nurseries had larger business, nursery, and open ground areas than container nurseries. Container nurseries had a larger area under cover (greenhouses) and shade.

5.2.2 Growing media

The use of different types of growing media by growers is an indication of the technological advancement of nursery businesses. Container growers using soil or potting mixes containing material such as lawn clippings are likely to be less able to produce uniform lines of plants than growers using conventional mixes based on peat, sawdust or bark because of variability attributable to the use of these materials and because they are not sterile. Large scale commercial growers avoid the use of such materials for these reasons. Growers who reported the use of soil for containerised production or lawn clippings etc., as the organic component of potting mixes were presumed to suffer problems in terms of poor product quality, resulting from high incidence of disease, lack of uniformity of size, and nutrient problems in their plants. However, most of the container plant growers had larger areas under cover and shade, and reported on the use of potting mix with varying proportions of conventional organic components such as peat, sawdust and bark, for their crops.

5.2.2.1 Container mixes

Most (94%) of the container nurseries reported the use of potting mix as a growing medium. However, 21% of container growers also reported the use of soil as a potting medium and 17% reported using other growing media such as bark for growing orchids. Few relationships were observed between the media being used and the enterprises being undertaken. Respondents commented that they developed a wide range of media for specific purposes.

5.2.2.2 Tissue culture

Although 10 respondents listed themselves as having an involvement with tissue culture production of plants, only six respondents reported having tissue culture facilities, e.g. laminar flow cabinets. Although the costs of purchasing a laminar flow cabinet (approximately \$4,000) and operating it are low, it is assumed that the four growers without them were low volume, small scale producers who find this expenditure prohibitive. Only one grower in Groups 1, 2 and 3 (that is a grower solely involved with woody plant enterprises) was involved with tissue culture. That business was a large forestry nursery with more laminar flow cabinets than any other respondent. Tissue culture was the only activity with which part-time growers were not involved.

5.2.3 Specialisation

Another view of the industry can be developed by classifying woody plant businesses by the crops in which their owners or managers specialised.

One hundred-and-forty-three respondents reported that the businesses they were operating were specialising in particular lines or items. Six percent of these specialists described themselves as propagators. However, most of the specialisations were related to the production of different types of plant material. Table 5.19 lists the prime specialisations provided by growers. Although the

growers may regard themselves as specialists, some described their activities based on one genus e.g. *Azalea*, while others produced one crop, e.g. conifers. Still others described their activity as being a particular production activity such as propagation. Nineteen percent of growers regarded themselves as being specifically non-specialists. These growers reported the growing of a wide range of crops to meet customer demand.

Table 5.19. Specialisations listed by the respondents as being their primary activities.

Type of specialisation	Number	Percentage
Bulb growing	2	1.1
House plant production	2	1.1
Herbaceous plant production	14	7.5
Propagation	9	4.8
Specialty lines ^(a)	7	3.7
Trees for forestry ^(b)	26	13.9
Trees for fruit growers ^(b)	17	9.1
Ornamentals ^(b)	65	34.8
Non-specialists	45	24.0
Total number	187	100

^(a) These growers were involved with various lines identified by some other feature, for instance a grower of South African plants which can not be further identified has been included in this class.

^(b) An implicit difference between these specialisation is the wide range of crops produced by ornamental plant growers and the production of relatively few crops by forest tree growers and fruit tree growers.

In general there were no differences in the range of specialisations between part-time and full-time growers.

Table 5.20, shows that although 10% (19) of the respondents reported a direct involvement with export, 7.5% (14) had woody plant growing specialisations and three were specialist propagators. Two of the woody plant growers involved with export were part-time growers. None of the non-specialist growers were involved in export activities.

Table 5.20. Crop specialisations of the nineteen fulltime and part-time woody plant growers surveyed who are directly involved in export activities.

Reported Specialisation	Fulltime grower	Part-time grower
Bulb growing	1	0
Forest tree growing	1	1
Fruit tree growing	1	0
Herbaceous plant growing	2	0
Propagator	3	0
Shrub growing	9	1
Total Number	17	2

5.2.3.1 Best earning lines

Although growers may specialise in some aspect or activity, industry members may also be classified by the lines they consider earn them the most in terms of total sales volume.

Most respondents declared the production of some "specimen tree" such as *Camellia*, *Metrosideros* or mature trees as their best earning lines. However, as Table 5.21 shows "shrubs" and "other lines" were also highly rated as best earners.

A crosstabulation of the best earning lines with the grower Groups (Table 4, Appendix vii) shows that most growers in Groups 1, 2 and 3, the woody plant specialists, believed their best earning lines were woody plants. The largest proportion of growers in Groups 4 and 6, believed the other enterprises they were involved with produced their best earning line. However, 14% of Group 2 growers (that is the growers producing two woody plant enterprises) reported that "other lines" were their best earning lines. These Group 2 growers were dependent on retail sales for some proportion, but not all, of their income; the

"other lines" included dry goods, and other items for retail sales. Conversely, 54% of Group 5 growers (those with woody plants and two other nursery enterprises) believed specimen trees were their best earning lines. When the second and third best earning lines are considered this pattern changes little although the trends are harder to discern.

Table 5.21. Plant lines or items listed by respondents as being their best, second best and third best in terms of total sales volume for 1991.

Item or plant line title ^(a)	Best earner (percent)	Second best earner (percent)	Third best earner (percent)
Forest trees	13.4	11.8	11.2
Fruit trees	8.0	7.0	4.8
Shrub lines	17.1	13.4	16.0
Specimen trees	25.7	20.9	13.4
Other lines ^(b)	17.1	20.9	17.1
Missing	18.7	26.2	37.4
Total	100.0	100.0	100.0

^(a) The respondents best items were coded to reduce the number of specialisations from 171 items to 10 coded groups. Almost every grower listed a different best earning line of item.

^(b) The other lines includes items and lines which are not woody plant crops such as polyanthus, various perennials, dry goods, palms, etc.

Most growers specialised in the production of the line they believed gave them their best earnings. However, 8% of the growers who specialised in the production of herbaceous plants described woody plant lines as being their best earners. Eighty-six percent of the growers of speciality lines described woody plant crops as being their best earners. Most of those who called themselves specialist propagators (62%) declared their best earning lines to be woody plant crops. Only 20% of respondents to this question believed that non-woody plant lines were their best earning lines.

Woody plant growing was attractive not only to the specialist woody plant growers but also appeared to have been an attractive proposition to the more diversified businesses. Some businesses that specialised in non-woody plants, listed woody plant line as being their best earners. It can not be assumed that because growers were mainly involved with non-woody plants, that they have little financial interest in their woody plant crops.

A number of woody plant growers had some involvement with retailing, the details of which were not provided by respondents. Thus the numbers of plants sold this way are not known.

5.2.3.2 Proportion of income from various activities

If growers from Groups 4 to 6 described their best earning lines or items as being woody plants, what proportion of their income was derived from this activity? How dependent were specialist woody plant growers on their crops? These questions were answered by investigating the percentage earned from woody plant, other nursery, other horticulture and other business activities.

The Department of Statistics only consider businesses which earn more than 50% of their income from some activity to be members of that activity's industry. As has already been discussed (Section 5.1) the woody plant industry comprises many small businesses, involved with many enterprises, and a higher proportion of part-time growers than is found in pastoral farming. Businesses which are vertically integrated and which earn a large proportion of their income from other business activities could also be omitted from the Department of Statistics list as they too may earn less than 50% of their income from woody plants. From Table 5.22 and from Table 5.1 the number of respondent nurseries that would not be considered to be woody plant growers using the Department of Statistics' criterion for inclusion in an industry would be 45. That is 24% of the total respondents, or 135 industry members.

Table 5.22 shows the percentage of growers from each of the assigned grower Groups 1 to 6 that earned; 1 - 25%, 26 - 50%, 51 - 75% and 76 - 100% of their income from woody plants. Similar tables are included in Appendix vii (Tables 5,6 and 7) for the proportion of income earned from other nursery business, other horticultural business, and other (outside horticulture) business.

Table 5.22. Percentage of growers' earnings from woody plant activities (n=187).

Grower Group	1 to 25%	26 to 50%	51 to 75%	76 to 100%	Missing
Group 1	4	6	13	67	10
Group 2	13	16	13	53	5
Group 3	14	0	29	43	14
Group 4	15	15	11	44	13
Group 5	18	11	25	33	14
Group 6	35	18	5	24	18

More than half the growers from all Groups, except Group 6, earned more than 51% of their income from woody plants. Sixty-seven percent of Group 1 and 53% of Group 2 growers earned more than 76% of their income from woody plant production. Apart from minor differences the greater the diversification, i.e. the greater the Group number, the lower the proportion of income earned from woody plant business.

The percentage of growers who earned less than 25% of income from woody plants was greatest amongst Group 6 growers and declined as growers reduced their involvement in other enterprises. The only grower from Group 1 who reported earning less than 25% of income from woody plant business was a part-time grower.

Seventy-five percent of growers who described their specialisation as being the production of fruit and nut trees earned from 76 - 100% of their income from woody plants. Sixty-three percent of specialist shrub growers, and 58% of forest tree growers also earned from 76 - 100% of their income from this activity. Half of the specialist propagators depend on the sale of woody plants for 76 to 100% of income. In addition, one grower who listed house plants, and another specialising in herbaceous plants as specialities also earned 76 to 100% of income from woody plants.

Only a small percentage of Group 1 and 2 growers earned more than 26% of their income from the combination of other nursery, other horticultural and other business activities. Only one specialist forestry grower earned 76 to 100% of income from other nursery business, and one other grower earned the same proportion of income from other horticultural business. Group 4, 5 and 6 growers were diversified not only in terms of the crops they grew but also in their sources of income. Many of the members of these two groups reported 25% of their income was derived from each of the four sources listed above.

Sixty-five percent of full-time growers earned more than 76% of their income from woody plants. Only 13% of part-time growers earned more than 76% of their income from this source. More part-timers earned relatively little from trees and shrubs than earned a lot, while the trend was the other way for full-time growers. Twenty five percent of full-timer growers earned more than 76% from other nursery, only 4% earned more than 76% from other horticulture, and 17% earned more than 76% from other business activities. The full-time growers were more likely to be involved with woody plant production and little else. Only 13% of part-timer growers earned more than 76% from other nursery, 15% earned more than 76% from other horticulture and 37% earned more than 76% from other business. Part-time woody plant growers may be involved with other nursery crops, or other horticultural activity, but most were otherwise involved beyond horticulture when they were not being nursery industry members.

The proportion of businesses earning 76 to 100% of their income from woody plants increased as the business aged. (43% at 0 to 5 years; 71% for businesses 15 to 20 years old). The proportion of businesses earning a high proportion of income from other nursery activities and other horticultural activities did not change as businesses grew. However, the proportion of income from other business activities increased as businesses and their operators aged.

Forty-five percent (84) respondents were full-time growers, and earned most or all, (76 to 100%), of their income from their woody plant business. Another 8% (15) of respondents were full-time growers and earned from 51 to 75% of their income from woody plants.

Ten of the 19 exporters depended on the woody plant industry for 76 to 100% of their income, while three more depended on other nursery business for 76 to 100% of their income. None derived 75 to 100% of their income from other horticulture or other business.

5.3 Commentary by respondents on their industry

Respondents provided a wide range of opinions in response to open ended questions provided in the survey. The classification of responses was done after receipt of all responses. As the range was so wide, the frequencies in many of the cells in the cross tabulations were very low. For this reason the commentary they provided can not be usefully cross tabulated with most other data derived from the questionnaire. The goals reported by the respondents for their businesses together with the satisfaction with their progress towards the goals are discussed in the first sub-section below. Next the respondents perception of the factors which limit expansion of the businesses and the two most important challenges to the success of the business in the next five years are discussed. The way that growers decide which crops to grow is also discussed. The section then reports upon the respondents' commentary of the development of export activities by the respondents directly involved in that activity.

Respondents' views on the industry's need for research and extension is then presented. The respondents' views on the specific needs, and funding sources for woody plant industry research and extension services are reported upon. The general issues raised in the "commentary" section of the questionnaire are then discussed²⁴. The results of this section are summarised.

5.3.1 Goals and business satisfaction

The goals respondent have for their businesses are of central importance to the development of industry cooperation and development initiatives. As Table 5.23 shows the largest percentage of respondents reported business development as being their primary goal. A further 19% of respondents described goals which were readily identifiable as being related to making the business profitable, these include goals related to "making money" and others described as being to "reduce debt". In total 43% of respondents described goals which required the business to remain or become profitable for them to be achieved. A further 23% described goals of a production or technological nature. Fifteen growers stated that their primary goal was to achieve some crop related specialisation, while 8% reported that their goal was to "improve production efficiency".

Other respondents provided less readily categorisable goals for their businesses. Twelve percent stated that their major goal was to enjoy the lifestyle and 6% of growers stated that retirement was their main goal. Goals relating to "enjoying the lifestyle" were hard to categorise. In order to enjoy the lifestyle, respondents needed to be able to make enough profit for the business to sustain itself. Unless respondents who describe lifestyle had an independent source of income this objective too, would be related to business profitability. Only those growers reporting retirement or some production specialisation as their immediate goal were not necessarily interested in sustaining their business as a financially

²⁴ Respondents provided a range of comments on other businesses which suggest rivalry between operations will affect collaboration between them. Discussion of these issues are included in Chapter 6.

viable venture. Growers wishing to retire may wish to sell their business as a going concern, in which case they too need to run a profitable venture, or they may wish to scale production down and close the business.

Most (47.1%) growers did not report upon the degree of satisfaction they felt about achieving their goals. However, of the growers who did reply to this question, most (38.5%) were satisfied with their progress. A few growers commented on some dissatisfaction with the rate at which their businesses were developing. However, even these growers reported that they were reasonably satisfied with their businesses in terms of meeting their goals.

Table 5.23. Goals listed by respondents for their businesses, the number of growers and the frequency of them.

Description of goals listed by respondents	Number of respondents	Percentage of respondents
Business development	31	17
Make money	19	10
Repay debt	16	9
Develop a crop specialisation	29	15
Improve production efficiency	14	8
Lifestyle	30	16
Retirement	12	6
Missing /not known	36	19
Total	187	100

A number of factors were listed by growers as being barriers to future expansion of their businesses. The factors together with the number and percentage of respondents that reported them are provided in Table 5.24.

Table 5.24. Factors reported by respondents to hinder expansion of woody plant growers businesses.

Factor hindering expansion	Number of growers	Percentage of growers
Finance	47	25
Production problems	10	5
Site related problems	20	11
Lack of skilled staff	19	10
Market situation	41	22
The state of the economy	7	4
Don't want to expand	23	12
Missing	20	11
Total	187	100

The factors hindering expansion of respondents' businesses included both those which were within the owner/operators control and those that related to the operating environment, which were not directly controllable.

A large proportion believed finance is a problem to the expansion of their businesses, yet as noted earlier few growers described debt as limiting their operations. The reported lack use of formal cash budgeting methods together with the lack of industry standards, combine to make investment in woody plant businesses a risky venture. As borrowing appears, in these cases, to be an unlikely possibility, woody plant growers must raise capital from other sources. Presumably reported market problems combine with this feature to make conventional funding relatively difficult for woody plant growers to obtain.

A number of growers reported either that the market was oversupplied or that demand had dropped and as a result the market was oversupplied. Many of these growers indicated a belief that the lack of quality standards within the industry meant that product of inferior quality was being traded and that this product was contributing to the oversupply situation. However, most growers

reported using informal approaches to decide what to grow, many simply stated that they used an "educated guess" approach to deciding which crops to grow. Other growers believed they grew crops which suited their district, or which suited them. Only two growers reported selecting crops which provided good financial returns. Speculative production choices were common, the use of such approaches probably increased business risk. The retail industry's unwillingness to place firm orders for supply confounds the planning task. Growers who reported growing on contract, or growing to fill orders reported few problems with demand for their products. These growers tended to be fruit tree nurseries and forest tree growers.

A summary of the challenges believed by respondents to exist for their woody plant businesses is tabulated in Table 5.25. In this longer term view the largest number of growers reported the market situation as being their biggest challenge. A number of growers made comments about government policy with respect to investment in forestry, and with respect to stimulating the economy. Presumably these respondents believed that the reported downturn in the economy was affecting sales of their crops. Several respondents who owned tree nurseries supplying farmers and foresters with forest trees reported that demand for their product depended on government taxation policies. These respondents reported that their main challenge was to ensure that the government established favourable conditions (these changes related to taxation policies) for continuing development of forest blocks.

The next most commonly recorded group of challenges related to production and production efficiency issues. Many growers reported that solving a particular production problem was their immediate challenge. Plant quality was specifically mentioned by a number of respondents. Staff, site, and personal-domestic issues were also mentioned as presenting important challenges to respondents in the next five years.

Table 5.25. Issues which respondents believe to be the primary challenge to their businesses in the next five years.

Challenge described by respondents	Number of respondents	Percentage of respondents
Market situation	48	26
Government policy	23	12
Production	19	10
Product quality	15	8
Production efficiency	13	7
Site and location	15	8
Staff issues	12	6
Personal and domestic situation	16	9
No challenge	3	2
Missing	23	12
Total	187	100

Respondents were asked to provide two main challenges to their operations. The challenges listed as secondary were similar to those listed as primary challenges and have approximately the same numbers of respondents reporting them, except that some respondents specifically listed personal drive, business competition and financial issues as being a challenge to cope with.

Most industry participants reported that the market situation now and in the future presents problems for their businesses. Few reported that financial matters limit their businesses at present, and few listed problems or challenges associated with production efficiency. Growers were in the main satisfied with their progress, but many listed long term goals which necessitated profitable running of businesses. Few respondents reported supplying on contract or to fixed orders, and many reported using "gut feeling" or "personal interest" to assist them to decide what to grow.

5.3.2 Location of businesses

The majority of respondents reported that they had no major problems associated with the location of their nursery in relation to the services needed to run it. Seventy-eight percent of respondents were reportedly within 15 minutes travelling time from such services. A few South Island growers expressed concern at the freight costs across Cook Strait. However, most stated that they felt that improvements in the transport industry had resulted in them receiving better service than they had received in the past.

5.3.3 Commentary on development of export activities

Of the nineteen growers involved with export 63% (12) believed they would earn more from export activities in 1992 than in the 1991 year reported upon in the survey, 21% (4) stated that their export earnings would remain about the same, while 16% (3) believed they would earn less from export activities.

As Table 5.26 shows, most (36%) of these respondents reported that their export business had developed as a result of personal contact with overseas buyers. Respondents reported that these contacts had developed both as a result of visits made by overseas nursery industry members to New Zealand, and from buyers they had met while travelling overseas themselves.

These respondents believed that export activities offered them ample opportunity to expand their activities. However, no two respondents listed the same problem with their export activities. One grower who was withdrawing from export activities stated that such trade "wasn't worth the bother", while others listed problems related to lack of market information, slow payment by overseas clients, the distances and shipping losses involved, and the respondents' difficulty in attaining MAF quality standards.

Whatever the difficulties growers had with export activities, the opportunities reported in Japan by Kitson and Hobson (1983) in Europe by Ministry of Agriculture (Anon, 1980) and generally by Rainey (1974) have not been taken up to any large extent.

Table 5.26. Methods by which respondents involved with export developed that activity.

Growers description of the method of export business development	Number	Percent
Requests from personal contacts	4	21
Contacts made while travelling	3	15
Advertising in magazines overseas	2	11
Because I'm an international expert	2	11
Gradual growth	1	5
Bought a business already exporting	1	5
Overseas buyers approached me	2	11
No comment	4	21
Total	19	100

5.3.4 Industry research and extension

Eighty percent of respondents reported that they believed that there was a need for research specifically for the nursery industry. The needs provided by respondents have been grouped by objective and are reported upon in Table 5.27.

Most of the issues respondents reported to be research needs related to technological issues. Aside from a few growers who provided unusual responses almost all respondents believed work on some technological issue was necessary. Yet few growers listed technological issues as being major limitations to the expansion of their businesses, or as challenges to their operations in the next five years. Only 8% reported upon the need for marketing research, and 3% the need for management research tailored to the nursery industry. The narrow concept of research provided by respondents is discussed in Chapter 6.

All of the forest tree growers listed the need for research specifically on their crops as being of major importance. No other group suggested work be performed specifically on their crop. Rather, the proposals were made in a more general manner.

Table 5.27. Types of research needs provided by respondents and the number and percentage of growers that reported them.

Type of research needed	Number of respondents	Percentage of respondents
Management	6	3
Marketing	14	8
General technology	72	38
New varieties	14	8
Plant quality	6	3
Chemical use	6	3
Forestry	5	3
"NRC does OK"	5	3
Not needed	8	4
Don't know	11	6
Missing	40	21
Total	187	100

Many proposals were made as to who should carry out and fund the research and extension work. The largest proportion of growers (37%) chose not to address either issue. Of the growers who did respond to this question, the greatest percentage believed that firstly the MAF/DSIR (or research institutes as they are now known) and secondly the NRC should carry out the work. A number of respondents listed other organisations as being suitable providers of research facilities for the industry. The research was, in the opinion of the largest percentage of growers (20%), best provided using a government subsidised industry funding approach. The next largest number of growers suggested using a levy system to fund the work. However, user pays was also a popular choice. A feature of the responses was the large number of growers who considered that research was needed specifically for the nursery industry but considered that someone (anyone) else should pay for this work to be done.

Growers reported similar views about industry extension. Eighteen percent believed that those who do the research should carry out the extension activities. But growers also made various other proposals about organisations that could perform research for the nursery industry including universities, grower organisations, NRC, and private companies. Respondents were even more unsure of the manner in which extension services should be funded. The largest percentage (40%) did not respond to the question. Twenty percent favoured the implementation of a NZNA levy for funding extension. However, the rest of the respondents suggested many different schemes for providing funding. Most of these other schemes involved the provision of extension service on a subsidised basis. Various propositions were made for the source of the subsidy including, government, universities, research organisations, private companies, and the industry²⁵.

A feature of the respondents approach to industry research and extension was to declare the need for research of specific interest to their particular business but then to propose that this research and the transfer of the results to them be paid for by others. The growers appeared to believe that their business should receive support from others, yet they did not want to pay to support either the rest of the industry, or other growers.

5.4 The telephone survey and response bias

To confirm that mail survey non-respondents were not substantially different to the respondents a sample of non-respondents were resurveyed using a six question telephone survey. From this survey seven variables were derived to enable the responses provided by these individuals to be directly compared with those provided by the mail survey respondents. Comparison of the response rates for woody plant growers from both the telephone and mail surveys

²⁵ Although this statement may appear anomalous it was frequently made by small scale producers who implied that resources should be supplied by the larger more successful businesses for the small scale producers.

showed that a higher proportion of businesses surveyed by telephone were woody plant growers (73%) than were woody plant growers in the mail survey (62%). Table 5.28 lists five of these variables and the mean and range of responses for each survey.

Table 5.28. Means and ranges of variables used to compare respondents involved with woody plant growing²⁶ from the mail survey and the telephoned non-respondents.

Variable used for comparison	Mail survey (n=35)		Telephone survey (n=187)	
	Mean	Range	Mean	Range
Business area ** (ha)	8.3	0 - 154	3.9	0 - 35
Volume of Potting mix used * (m ³)	361.5	4 - 4200	198.9	0 - 1000
Number of permanent staff (people)	5.4	0 - 99	3.4	0 - 16
How long have you owned your business (years)	11.97	0 - 48	12.5	2 - 27
Amount of income earned from export activity (\$)	2863	0 - 99999 ^(a)	40	0 - 1400

^(a) Businesses earning more than \$99,999 from export were coded as \$99,999 so that their privacy could be retained.

** The ranked means were significantly different at the 0.0006% level.

* The ranked means were significantly different at the 0.059% level.

The data were distributed in an extremely non-normal fashion so the non-parametric equivalent of the t-test, called the Mann-Whitney test was used to test the hypothesis that there were no significant differences between the two

²⁶ Two other variables were derived from the two surveys the first was the district the growers business was located in and the second was whether the individual operated a business that was undertook woody plant production.

populations. The data for each variable were ranked and compared pairwise for the two data sets, using the Mann-Whitney test. A highly significant difference ($P=0.006$) was found between the rank of business size for the mail survey non-respondents and mail survey respondents. A less significant difference ($P=0.059$) between the volumes of potting mix reported to be used by the two groups was also found. The mail survey non-respondents were found to be operating on significantly smaller business areas and to use slightly more potting mix than the mail survey respondents. Container growers in the mail survey used more potting mix than those who were not. The telephone survey respondents are thus likely to be mainly container growers. The non-respondents who were telephoned were only different in these two respects from the mail survey respondents.

Although it is likely that there is some respondent bias, this bias is not considered to be critical to the findings of this study as reported in 5.1, 5.2, 5.3 above, based on the analysis of those who responded and completed the questionnaire originally mailed out. The mailing lists for the survey were compiled so as to included all possible industry participants and possibly to commit an error of commission, rather than an error of omission. The mail survey respondents represent the larger, fulltime, commercial operations, while those who did not respond initially are small container growers who are involved in many crops, and tend to be part-time.

6.0 CONCLUSION

This chapter is organised into two sections. The first of these, provides the description of the woody plant industry to meet the first objective of this research. So that proposals for industry coordination, cooperation and development can be made, the opportunities for and constraints to the industry, its participants and their businesses are also described. An initial prioritisation of these is also made.

The second part of this Chapter (Section 6.2) provides conclusions about the role of researchers and extension agents in the woody plant industry. The conclusions are developed from discussion of the survey results, material provided from informal grower interviews and from the literature review generated as the first stage of a FSR/E programme with this industry. Discussion of the usefulness of the FSR/E approach together with proposals for ongoing FSR/E research in the woody plant industry are made.

From these conclusions, strategies for the University to develop its place as a research and extension provider for the woody plant industry are presented. The strategies are developed into general recommendations for further action.

6.1 Overview of the industry

Little information has been available about nursery industry participants, their businesses, the opportunities and the constraints they face. Since Salinger's 1968 survey of prescribed nurseries (NZHTA, 1969)²⁷, no industry-wide survey providing detail of respondents and their businesses has been performed. An economic review carried out by the Department of Statistics (1989) provides the most up to date information on the average economic position of the industry and its participants. However, Government sources, such as the annual

²⁷ The report from this survey has not been located. However, a summary of the survey is presented in the 1969 meeting report of the NZHTA.

agricultural census, which provided the recent official statistics for describing industries, only include businesses that earn more than 50% of their income from the industry in their sampling frame. They also exclude forest tree nurseries. Almost half (48%) of the businesses identified in this survey as being involved with woody plant production would have been excluded from official surveys.

6.1.1 Aggregate industry characteristics

For the reasons discussed above the number of woody plant growers in New Zealand is much larger than estimates provided by the Department of Statistics have indicated. Estimates made from this survey show 540 growers are propagating, growing on or wholesaling woody plants in New Zealand. Unfortunately, no direct estimate can be provided of the value, or volume of stock traded by survey respondents as they failed to provide sufficient information in the questionnaire. However, estimates prepared by the Department of Statistics (1989) using growers of "orchard trees, and ornamental trees and shrubs" who earn more than 50% of their income from this business indicated some \$58 million in turnover in the 1987/88 year. This value could well exceed \$100 million at the wholesale level today, if growers who earn any income from woody plants and forest tree growers are included and the value is expressed in 1993 dollars. Relatively little of the production of woody plants is exported (\$4 million) and the bulk of this income was earned by four dominant businesses.

Respondents' businesses were located throughout New Zealand although most were located in the North Island. The Northern North Island district, incorporating the Auckland region, contained the largest number of nurseries, followed by the Eastern North Island. Direct comparison with Salinger's 1963 survey (1964) cannot be made as district rankings were made on the basis of the numbers of plants produced rather than on the number or area of nurseries. However, Salinger (*op cit*) mentions the large area of nurseries in the Manawatu, Wanganui and Horowhenua regions. The area in nurseries in those regions is now much smaller than the area of nurseries in the Northern North Island and Eastern North Island districts.

Although the official estimates of numbers of industry participants were low, the hitherto unsubstantiated claim that the industry is very diverse is supported by this research. Businesses were diverse in terms of the area of land they utilised, the number of staff they employed, the crops they grew, the number of plants they produced and the technology they employed. The industry contained businesses run on a hobby basis using a fraction of a hectare of land to the comparatively enormous nursery operators that used more than 50ha of land; from growers who operated their businesses on a part-time basis and who employed no additional staff to those that employed in excess of 100 people. There was no representative producer, so growers, researchers and extension agents would find it difficult to make relative performance comparisons.

Although half the businesses were specialist growers of woody plants, that is, their businesses were involved with one or more woody plant growing enterprises²⁸, many businesses produced woody plants together with crops from other nursery enterprises. These diverse operations tended, with one exception, to cover a smaller land area (less than 2ha) than the growers who specialised in the production of woody plants, and to produce containerised crops. However, some of the diversified growers reported earning a substantial portion of their income from trade in woody plants. As the area of ground reportedly used by operations increased beyond two hectares the proportion of diversified-container growers declined until properties larger than 25 ha were almost all specialist woody plant growers using an open ground production system. One very large grower who was involved with many crops countered this trend.

The majority of the growers who reported the use of a container production system used conventional potting mixes with peat, bark or sawdust as the main organic component. The range in application of technology, from the use of soil and lawn clippings etc., as a potting medium to "high tech" laboratory techniques was enormous.

²⁸

The production of ornamental trees and shrubs, including roses, fruit trees and forest trees are the three possible woody plant enterprises.

The respondents declared themselves to be specialists in a wide range of crops, and few listed the same line as being their best earner. Almost one half (84) of the respondents derived most (76 to 100%) of their income from woody plant growing but many of these growers listed their primary activity as being the production of some other nursery crop. Few growers had appreciable earnings from activities beyond the nursery industry, and even fewer reported earnings from beyond the horticultural industry. Although twenty percent of industry participants described that involvement as part-time there was little difference between full-time and part-time growers in terms of the crops they grew.

6.1.3 Characteristics of the growers

Two thirds of the growers have had previous employment in horticulture. Yet, unlike the participants in the pastoral farming industries, most of the respondents reported they had established their own businesses. Few nurseries were run by second and third generation growers. The majority of businesses had been set up when their owners were 30 to 35 years old and most of the businesses reported upon were less than 15 years old. The growers average age was 44.

Woody plant growers have attained a higher level of basic education than similarly aged pastoral farmers. Although 45% of the industry have no formal training a high proportion of the remainder had attended a tertiary institution. Ninety percent of growers read the trade magazine *Commercial Horticulture*, and many reported reading a wide range of publications related to their crops. Growers reported seeking advice from a wide range of sources, but principally from other growers and from trade magazines. A few growers reported using individual research of issue to solve problems.

Most respondents reported that debt did not limit the operation of their businesses yet many described financial problems as being a major limitation to the expansion of their businesses.

Most growers reported goals which required them to stay in business and only 5% specifically mentioned leaving the industry (through retirement). The respondents most limited by debt were the young operators of container nurseries.

One quarter of growers belonged to no trade organisations, and many growers belonged to organisations with small local membership but which often had international affiliation associated with a particular crop. Participation by woody plant growers in so many organisations demonstrates a wide range of interests among growers. The NZNA only represented 46% of the total industry and as most growers indicated that they read industry related publications from many sources, and they attended conferences, seminars and meetings held to discuss various issues, the lack of high participation in the NZNA appears to be of little consequence to the industry.

6.1.4 Constraints and opportunities

The prime constraint identified at this stage by respondents for their businesses was that of problems that have reportedly developed with selling and marketing crops. Several growers reported that they believed their business could not expand because there was no market for any increased production. Commentary provided by respondents claimed the industry to be flooded with substandard product, and that crops were being sold at prices that were not sustainable. However, many of these growers reported using informal methods to select the crops to grow, and few respondents used any costings or budgets to plan or monitor progress. Only those growers supplying orchards, forests etc. reported growing plants on contract to avoid the reputed market over-supply problems.

Most growers believed there was a place for research specifically targeted at the nursery industry. However, most growers had a narrow view of the activities of researchers. The view of research, which is associated with simple

technology, husbandry practices, laboratory experiments, and "scientists", meant that few growers listed financial, market, or business issues as being important researchable industry issues. Growers instead provided a long list of technological problems they believed limited their businesses operation. Few of these topics for research related to the major issues reported by growers to face their businesses in the next five years, or to the constraints to business expansion also reported.

The main challenges to nursery businesses as reported by respondents were related to the problems of oversupply in the local market, to the effects of government policy on plant purchases, and then to a series of production related topics. The main limitations to business expansion were financial limitations, market related issues, staff management and procurement, together with a series of more minor issues such as site related problems and production issues. Although growers reported oversupply of the local market was a major concern, very few had become involved with the reputed export market.

6.2 The role of research and extension agents

In recent years the woody plant industry has had a poor record for providing funds to sustain research and extension programmes. Growers have been provided with services and technology at minimal costs. As "user-pays" philosophies have been adopted the research and extension activities of the NRC have come under scrutiny.

If the University were to continue to support research and extension activities in the nursery industry, the University as well as the industry would need to benefit from the work performed. To ensure mutual benefit is achieved the research would need to be well targeted to the needs of the growers; the research should be performed efficiently, and the results implemented by growers. The research provider would need to be paid for the work performed. If the University could capture even a part of a percent of the total value of woody plants traded, the returns could be considerable.

The key to the development of funded efficient and effective extension would be the development of a partnership relationship between growers, extension workers and researchers. To do this the attributes of the growers must be described and links between growers, extension workers and researchers must be developed and maintained. By using a FSR/E methodology the industry description, research needs and opportunities can be developed so that the research is performed to meet the needs of the growers who are prepared to use and pay for the research and extension service. The results of research must be used (and be seen to be being used) by growers. To meet the first objective of this project (provided in Chapter One) a survey was administered as part of a FSR/E methodology.

If research and extension are processes *...to assist growers to make informed decisions about the issues they face...* (Van den Ban and Hawkins, 1988) then the research agenda for the nursery industry should be focused on the major challenges and limitations provided by growers. But the respondents' narrow view of research, means that their immediate responses need to be evaluated as part of the FSR/E process. Through this survey respondents provided a series of technological topics for research. Few of these topics related to the constraints and challenges they believed their businesses faced. Most related to particular technological problems associated with each of the respondents businesses. To derive long term research, extension, and industry coordination strategies, further reviews using FSR/E team approaches need to be performed in order to better describe the growers needs. However, a useful first step toward the long term prioritisation can be made from the work to data.

Industry participants have the attributes of a group that is likely to be amenable to change. Most woody plant industry members had relatively high standards of education and had previous industry experience. Growers were likely to actively seek to improve financial performance in order to achieve their goals. These attributes are not those of a population which had the problem claimed by Richards (1977) of *deeply entrenched conservatism*. Young respondents were the only ones to report any effect of debt on their businesses although financial constraints were reportedly the major factor limiting ability to expand.

Growers belong to many organisations and they read widely. They have ready access to relatively cheap information for running their businesses. This information can be provided by their growers' organisations, associates, consultants and other research and extension agencies within New Zealand but may also be derived from similar sources internationally.

The implication of this is that unless research and extension services for most activities can be provided at low cost the growers will gain their assistance elsewhere. Research activities must be targeted so that growers are prepared to pay for work which will enable them to gain direct benefit.

By conducting a survey as part of a FSR/E methodology one of the major constraints identified for woody plant industry participants is the diversity of the industry. Comparisons between businesses growing the same crop but in different production systems, utilizing different resources are almost impossible. As a result of the diversity between nursery businesses, the complexity within them and the lack of obvious relationships between various inputs, resources and outputs, growers have many different needs. It is thus difficult to rank the various needs of the industry participants and even harder to rank the research and extension needs.

This diversity arises because firstly, there are no barriers to entry to the nursery industry. Individuals can start to grow crops and trade them as they wish. Thus the woody plant industry comprises many small operations many of which are newly established businesses. These growers tend to be involved with the production of a multitude of crops, within several enterprises. Few "new" businesses were "specialist" producers.

Secondly the diversity in the woody plant industry arises because businesses may be involved with many different crops within an enterprise or with many crops and many enterprises. Growers who earned more than 76% of their income from trading in the woody plant industry were considered as the

"important" growers because they were most dependant on returns from the industry for their income. These growers are those for whom research and extension activities in the woody plant industry should be targeted. However, many of these growers did not list themselves as being specialist woody plant growers, many of them were involved with woody plants and one or more other enterprises. Some growers declared their primary production focus to involve non-woody plant enterprises yet they earned most of their income from woody plants.

As growers who declared their interest to be mainly from one enterprise were involved with second, third and in some cases fourth enterprises, industry classification, and thus research and extension agenda, based on the first enterprise is inappropriate. Many growers appeared to have more than one enterprise in common yet the NZNA sector based classifications were at the enterprise level. Growers were more likely to be involved with different enterprises in the same production system than with many production systems for the same enterprise. Although growers could have belonged to many enterprise based sectors, few did so. By organising research and extension on a production systems basis, growers with similar production problems could work together with research and extension workers to attempt to solve them.

Some of the challenges described by woody plant growers, such as government economic policy and market situation, were beyond individual grower control, and thus fall into the political arena. Other challenges related to the way the individual businesses were managed and are researchable at the grower level. Financial, production and staff issues were listed as being the major challenges or limitations to respondent's businesses. Research related to further describing these problems and attempting to solve them needs to be the priority for industry research and extension. Many of the problems reported by respondents were the same as those facing small business operators in general. Small business agencies, polytechnics and high school evening classes provide elementary courses in small business management. Growers are likely to find

attendance at these courses assists them to solve their financial problems.

Growers are unlikely to be prepared to pay for specific research and extension in these areas as generally applicable assistance is readily available from many sources at low cost.

Marketing problems have been investigated in various New Zealand industries but present government policy does not favour marketing controls. The trade in cheap poor quality plants, reputed to exist by some respondents, is not likely to be regulated against. Also no recognised quality standards exist. Growers who find the market conditions unfavourable must change their businesses to meet these challenges. Growers need to plan production better, or change crops if market conditions are unfavourable. The diversity of crops that can be grown leads to opportunities for growers who can establish production of alternative crops relatively simply.

Furthermore, growers face different types of problems as they and their businesses develop. The "new" growers were likely to have a range of technological problems associated with the range of different crops they produced. The problems may be simple, which can be solved with existing technology or they may be complex requiring further research. These problems will keep re-occurring as new businesses are established so a level of demand for such service will remain. As many of the operators of these small businesses indicated that they believed that other people (either other larger nursery businesses, other organisations, or the tax payer) should bear the costs of research and extension, these growers are unlikely to be willing to spend money on research and extension if it shows no immediate direct benefit to their businesses. Furthermore, some of these operators are unlikely to be able to pay the full costs of their research and extension needs as their businesses are very small. The demand for services will vary and from time to time only a few growers will need any assistance. The maintenance of a service to meet these growers needs will thus be expensive.

The second group of businesses interested in research and extension services and are the relatively larger, more established operations. As these growers may also produce a range of many different crops they too may need technological information on their crops. All nurseries need to keep up to date lines, to follow fashion trends, so "new" problems are continually being faced.

Unlike pastoral farming where at most only marginal benefits are to be derived from new technology the nursery industry and all its participants still stand to make considerable gains from the development and implementation of new technology.

The large businesses are also likely to be those for which the management, staff, and production issues are also challenges. As the businesses expand and capital investment in them increases the operators may be unwilling to expose themselves to as much financial or business risk as they had done when they were less established because the losses associated with a poor decision would be greater. These larger growers are in a position to pay for research but are unlikely to be willing do so when it may enable direct competitors to use the same technology. These larger growers favoured the private purchase of more research and extension on a "user pays" basis.

Thus two markets for research and extension are found to exist. The first, that is the small growers, may not seem worth considering as being a worthy target for any research and extension activity because of the likely lack of loyalty by growers and their inability to pay the full costs of research performed. However, the results from the survey indicate that many of the large, specialist woody plant growing businesses, being run by their founders, have developed from these small businesses. To promote the University's role in the industry and to provide a "public good" service to the community and to the large growers of the future the service must be maintained provided it can be funded through other nursery industry research and extension activities.

The larger or more developed businesses which are more likely to be able to pay for services comprise the second market for research and extension services. For research and extension organisations to continue to be able to interact with the nursery industry they must develop profitable programmes. For research and extension organisations to provide simple solutions for the wide range of problems of all growers and their crops is an impossible undertaking. As research and extension cannot provide solutions to all the industry problems, research needs to be targeted to the needs of the growers who can pay for the work to be performed, and who can see a direct benefit from the application of the results. It is unlikely that the provision of low cost information will be profitable focus for any organisation. If research and extension organisations cannot supply a "captive technology" which can't be resold or transferred, they must be prepared either to carry the nursery industry as part of some other activity, or be prepared to carry the cost of subsidising the real cost of research and extension in order to continue to do the work.

To meet objective three of this project the development of "captive" technology programmes is suggested. These "captive" technologies need unique and of high value to be able to recover the costs associated with their development, and in order to avoid the fierce competition associated with the supply of general information. The High Health programme is an example of such a development. By developing the plants, and issuing propagation rights under license, the NRC has gathered income for a technology which is characteristically its own.

To decrease the problems associated with competition on the local market, initial work to set these projects in motion should include a review of the reputedly large export market for New Zealand grown woody plants. The export activities would also generate business related to developing and supplying appropriate information packages to enable growers to produce the plants for the markets identified. In the longer term the development and patent of new plant varieties by NRC for both export and local markets could provide it with ongoing financial returns.

In order to capture benefits from being associated with the nursery industry Massey University through the NRC should continue to support the specific research and extension in the nursery industry provided it is fully funded by the users. Although the NZNA is an important organisation, its claims to represent 80% of the volume of plants traded are unsubstantiated. The NRC should work with all industry participants, and avoid halving the number of likely clients for its services. By continuing to work with all industry organisations the University can assist the industry to develop while funding its research, extension and post-graduate teaching activities with nursery industry money. To do this the University will have to establish a good record of producing research of direct benefit to growers. To ensure that the University continues to perform the work required by the industry further FSR/E studies will need to be undertaken by using a panel of randomly selected industry participants together with an NRC facilitator. Further information on grower needs and on uptake of information generated by the centre should be obtained from repeated case studies of selected businesses.

To keep the wider industry participants informed, the NRC should provide a low cost information service, such as a newsletter and conferences on various issues, funded by monies earned from the proceeds of the targeted work. The large readership of the Commercial Horticulture Magazine indicates that this could initially be used to distribute information to growers.

These proposals and recommendations have been created by considering the needs of the growers as central to the development of industry coordination, organisation and growth. In order for the system to function in the long term, the interests of the service organisations must also be met. The costs of services must be met with funds generated one way or another. The assumption by some growers that government research institutes, Universities or trading companies should be prepared to fund research for the nursery industry on anything other than a commercial basis is unrealistic in the present economic climate.

This attitude may be sustainable in the short term as providers of research and extension services are prepared to subsidise growers initially. In the long term this selfish approach will result in a reduction in support services to the industry. In the long term the woody plant growers will have to pay for their own research.

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8.0

APPENDICES

Appendix i Strengths and Weaknesses of the Nursery Industry
(From NRC, 1991)

Strengths

- domestic market: sympathetic now and possibly for the next decade
- export market: potentially significant
- climate
- people: enthusiastic and committed growers

Weaknesses

- Industry organisation: does not overcome a sense of fragmentation, there is a lack of a strategic plan, of industry standards, of guards against entry to the industry and of long term R & D investment.
- People: lack of profit orientation, business and marketing skills
- products: perishable long development times
- markets: domestic market small

Opportunities

- taking advantage of lifestyle changes
- promotion of the industry and its products through TV and other media to the buying public
- coordinated marketing
- exports
- environmental opportunities for promotions
- better industry cooperation/organisation

Threats

- Political (economic) climate (affecting discretionary spending, quarantine standards, research funding, business confidence, research education funding, costs).
- Slow population growth
- potential loss of green image through use of chemicals or other factors
- Internal/external competition

Appendix ii

A summary of the advantages and disadvantages of mail, telephone and face to face surveys.

Mail Surveys	
Advantages	Disadvantages
Successfully gain the answers to personal or embarrassing questions from respondents	Can only be used when questions are simple enough to be understood by all respondents
Cheaper than interview surveys	Lower response rate than other methods
Easy to contact respondents	The number of questions must be limited or response rate falls further
Centralised control	The amount of work involved must be limited or response rate falls further
Can be faster than other methods	There is no chance of discussion around the issue
Telephone surveys	
Advantages	Disadvantages
Very fast compared to other techniques	Information sought must be very simple for accurate answers to be derived
Relatively cheap to administer	List of questions must be kept short
Easy to make repeat calls	Unconsidered answers may be given
	Inbuilt bias, as only those who have a phone, and answer it are contacted
	Hard to establish rapport with respondents
Face to face surveys	
Advantages	Disadvantages
Can produce a very high response rate	Expensive in terms of cost and time
Can enable full, accurate answers to complex questions to be provided	Dependant on the interviewer, and the bias that may be introduced by poor interview technique
Opportunity for discussion of questions	
Information may be collected informally from the appearance of the respondent, or from the respondents property	

Reference: (O'Donnell, 1969; Erdos and Morgan, 1970; Linsky, 1975; Parker and Hughes, 1989)

Appendix iii Introductory letter sent with the mail survey

06 3505606

Ref: Nursery Survey

Date: May 19, 1993

To: All Tree and Shrub Growers
 in New Zealand

Dear Owner/Manager

I am trying to develop a series of recommendations for the tree and shrub industry to use to guide its development into the future. This survey aims to provide me with the background necessary to describe your industry so that I can get information on your needs.

I would like you to take part in this survey so that I can get as balanced and representative a view as possible.

I have taken your name and address from the New Zealand Nursery Register or from various trade magazines and I would be grateful if you would agree to participate in this survey by completing the attached questionnaire. Your voluntary involvement will help achieve a good response rate making it more likely that your needs will be served by the recommendations developed.

You may be ensured of complete confidentiality. The questionnaire has an identification number for mailing purposes only. This permits me to check your name off the mailing list when your questionnaire is returned, and guarantees that you won't receive any additional mailings. Your name will never be placed on a questionnaire.

If the tree and shrub industry is to flourish, your contribution to discovering and prioritising the common problems involving industry participants is important.

Should you have any questions regarding this research please contact Ewen Cameron on (06) 3569099 Ext 8011.

Thank you for your time and co-operation. It is much appreciated.

Yours sincerely

Ewen Cameron

Appendix iv The mail survey questionnaire.

SURVEY OF WOODY PLANT GROWERS

SUMMER 1992

DEPARTMENT OF AGRICULTURAL AND HORTICULTURAL SYSTEMS MANAGEMENT,
MASSEY UNIVERSITY

SURVEY OF WOODY PLANT GROWERS

Could the person most responsible for the physical and financial management of the business please answer the questionnaire. In this survey you are presented with several yes or no choices. Please circle the appropriate answer in each case.

SECTION ONE : PRODUCTION INFORMATION

- 1 Are you or your business involved with the production of any of the following?

	Yes	No	
Trees and Shrubs			4 <input type="checkbox"/>
Fruit Trees			<input type="checkbox"/>
Bedding Plants			<input type="checkbox"/>
Indoor Plants			<input type="checkbox"/>
Tissue Culture			<input type="checkbox"/>
Forest Trees			<input type="checkbox"/>
Herbaceous Plants			<input type="checkbox"/>

IF YOU HAVE CIRCLED "NO" TO ALL THE ITEMS IN THE ABOVE LIST THE REMAINDER OF THIS SURVEY IS NOT RELEVANT TO YOU. IN THIS CASE PLEASE RETURN THIS QUESTIONNAIRE IN THE ENCLOSED FREEPOST ENVELOPE. THANK YOU.

- 2 Are you a specialist in particular item(s) or line(s)? Yes No

If Yes, briefly describe your specialisation(s).

_____	<input type="checkbox"/>
_____	<input type="checkbox"/>
_____	<input type="checkbox"/>
_____	<input type="checkbox"/>
_____	<input type="checkbox"/>

- 3 How much land does your total nursery business cover?
(Include leased and owned land).

___ ha or ___ acre

☐☐☐☐

- 4 How much of the total area land
is used for nursery production?

___ ha or ___ acre

20 ☐☐☐☐

- 5 How much area do you have under glass or plastic? ... sqm or ... sqft 24
- 6 How much area do you have under shadehouses? ... sqm or ... sqft
- 7 How much land do you have for open ground or field production? ... ha or ... acre
- 8 Do you handle containerised plants? Yes No ☐
- 9 If you are involved with tissue culture, how many laminar flow workstations do you have?
number.....
- 10 Which growing media do you use? (Please circle which ever is relevant).
- | | | | |
|--------------|-----|----|--------------------------|
| Potting Mix | Yes | No | <input type="checkbox"/> |
| Soil | Yes | No | <input type="checkbox"/> |
| Other media, | Yes | No | <input type="checkbox"/> |
- please describe this other media
- ☐
- ☐
- ☐
- 11 If you used potting mix during 1991:
- a) What volume did you;
- | | | |
|-------------------|--------------------|--|
| Buy in pre-mixed? | ... m ³ | <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> |
| Make up yourself? | ... m ³ | <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> |
- b) What proportion of your mixes are based on the following organic components
- | | | |
|-----------------|---------|--|
| Peat | % | <input type="text"/> <input type="text"/> |
| Bark | % | <input type="text"/> <input type="text"/> |
| Sawdust | % | <input type="text"/> <input type="text"/> |
| Other, | % | <input type="text"/> <input type="text"/> |
| (Specify.....) | | 64 <input type="text"/> <input type="text"/> |

- 12 Can you please indicate in the spaces provided the maximum number of staff who were employed in your business in 1991:

Permanent persons, of these were family members

Casual persons, of these were family members

Contract persons, of these were family members

Other, (what) persons, of these were family members

Total people.

Please comment on any changes in the number of staff you employ over the year.

- 13 Please estimate the number of plants and the percentage of your 1991 sales of plants from each of the following situations.

Propagation of (No.)..... plants for sale as propagules % of \$ sales

Propagation of (No.)..... plants for sale as growing on lines% of \$ sales

Propagation of (No.)..... plants for own retail sales % of \$ sales

Purchase of (No.)..... plants for wholesale % of \$ sales

Purchase of (No.) plants for own retail sales % of \$ sales

100 % of sales

- 12 Please list in descending order your three best earning items or lines - in terms of total sales volume for 1991.

Best earner		Comment
-------------	--	---------

Second best Comment.....

Third best Comment.....

- 13 Do you use your own truck or ute to transport your plants to your markets, (the wholesalers, retailers etc that sell your plants)?

Yes

No

If not, can you describe how you transport your plants to your market and describe any problems associated with this.

SECTION TWO : BUSINESS INFORMATION

Please remember to circle the most appropriate selection from the lists you are provided with.

15 Is managing and working this business your

Part-time occupation? or, Full time occupation?

1 ☐

17 Approximately what percentage of your net income is derived from:

Your tree and shrub operation ----- %

☐ ☐

Other nursery business ----- %

☐ ☐

Other horticultural business ----- %

☐ ☐

Other business or employment ----- %

☐ ☐

100 %

18 What is the ownership structure of the business?

Sole proprietor

☐

Partnership

Private Company

Public Company

Trust

Other, what.....

☐ ☐

19 If you have short or long term debts do you consider your current debts limit the day-to-day operation or long term development and viability of your business?

Yes

No

☐

20 Please rank the importance of each type of debt to your business, on the scale of 1 to 5.
(Circle the most appropriate number)

	Doesn't limit, or affect			Great effect, or impact	
	1	2	3	4	5
Short term debt	1	2	3	4	5
Long term debt	1	2	3	4	5

☐

15 ☐

21 Do any of your products go directly from your property to overseas markets?

Yes

No

16 ☐

If Yes, approximately how much did you earn from this trade in 1991? \$ _____

☐☐☐☐

From your export business in 1992, do you expect to earn

more or about the same or less

☐

If you are an exporter please comment on the main opportunities and problems arising from your involvement.

☐☐

22 How often do you prepare and use cash forecasts, or gross margin budgets for your tree and shrub operation? (Circle which ever best represents your situation.)

Never

☐

Annually

About half yearly

About quarterly

About monthly

More than once a month

Please comment on the place budgets and written plans have in your business.

25 ☐☐

SECTION THREE : PERSONAL INFORMATION

23 How old are you? years

1 ☐☐

24 (a) How far did you go in school? (Please circle the most appropriate).

Left school at or before 15

☐☐

Left school after getting School Certificate

Completed sixth or seventh form.

(b) After leaving school did you attend a tertiary institution?

Yes

No

☐

25 What formal training or qualification do you have in horticulture?

6 ☐☐

25 To which trade organisations or societies do you, or your business belong?

1.
2.
3.
4.

8 ☐ ☐
☐ ☐
☐ ☐
☐ ☐

27 Do you attend conferences on related horticultural issues?

Yes No

☐

If yes, what and when was the last conference you attended?

☐ ☐

.....

☐ ☐

23 Do you subscribe to, or read,

Commercial Horticulture?	Yes	No
Horticulture News?	Yes	No
The New Zealand Gardener?	Yes	No
Australlan Horticulture?	Yes	No
Other	Yes	No
.....	Yes	No

☐
☐
☐
☐
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☐ ☐
☐
☐ ☐

28 Who are your main sources of information for operating your business?

Consultant			
—	MAF	Yes	No
—	Nursery Research Center	Yes	No
—	Private	Yes	No
—	Other.....	Yes	No
Other growers		Yes	No
Other (please give details)	Yes	No	

☐
☐
☐
☐
☐ ☐
☐
☐
☐ ☐
☐

29 Did you set up this business?

Yes No

☐

31 Before managing this business were you employed in horticulture?

Yes No

If Yes, in what area

☐

.....

☐ ☐

32 For how many years have you managed this business ? years

45 ☐ ☐

SECTION FOUR : COMMENTARY

33 How do you choose which lines to grow, or sell in your nursery?

47 ☐ ☐

☐ ☐

34 Describe the location of your nursery in relation to the services you use and need to run it. How easy are banking, etc facilities to obtain?

☐ ☐☐ ☐

35 What are your long term goals for this business, and are you satisfied with your progress to date?

☐ ☐☐ ☐

36 If you want to expand your business, what do you consider is the factor which most limits expansion?

☐ ☐

37 If you export plants directly how did you become involved in and develop this market?

61 ☐ ☐

- 33 What do you believe will be the two most important challenges to the success of your business over the next five years?

Challenge 1: _____

63 ☐ ☐

Challenge 2: _____

☐ ☐

- 34 Do you consider there is need for research specifically for the nursery industry? Yes No ☐

If yes, how would you describe the needs?

☐ ☐

Who should do the research and how should it be funded?

☐ ☐

☐ ☐

- 40 Who should carry out extension (technology transfer) for your industry and how should it be funded?

☐ ☐☐ ☐

- Do you have any additional comments on your industry which you believe have not been covered in this questionnaire?

☐ ☐80 ☐ ☐

(Continue overleaf if necessary)

THANK YOU FOR TAKING THE TIME TO COMPLETE THIS QUESTIONNAIRE. THE INFORMATION YOU HAVE PROVIDED IS EXTREMELY IMPORTANT TO THE AIMS OF THIS STUDY.

WOULD YOU LIKE TO BE SENT A COPY OF THE RESULTS?

Yes

No

WOULD YOU BE PREPARED TO PARTICIPATE AGAIN IN THIS STUDY AT A LATER DATE?

Yes

No

Please place the completed questionnaire in the prepaid self-addressed envelope provided and mail as soon as possible. Thank you for your participation.

TELEPHONE SURVEY FOR MAIL SURVEY NON-RESPONDENTS

Number

GOOD AFTERNOON, it's Ewen Cameron here, from Massey University, may I speak with the owner or manager of

(BUSINESS NAME)

If no Thank you, goodbye

If yes.

(WAIT)

GOOD AFTERNOON.

MY NAME IS EWEN CAMERON, I'M DOING A FOLLOW UP TO A SURVEY ON THE NURSERY INDUSTRY I'VE BEEN DOING AS PART OF MY STUDIES AT MASSEY UNIVERSITY.

WOULD YOU MIND ANSWERING 7 QUICK QUESTIONS ABOUT YOUR BUSINESS.

If no I UNDERSTAND, THANKYOU FOR YOUR TIME, GOODBYE.

If yes

(Turn over page to questions)

Q1 Is your business involved with the production, or growing on of trees or shrubs, forest trees, fruit trees, or roses?

Yes

No

If no Well thats easy, your business is beyond the scope of my survey.
Thank you for your help.
Goodbye.

If yes

Q2 What area of land is used for your nursery business?

.... acres or Ha

Q3 What volume of potting mix do you buy in or make up each year?

..... litres or m³

Q4 How many permanent staff do you employ?

..... No.

Q5 How many years have you managed or owned this business?

..... yrs

OK, last question, this is a financial one, but please be assured your answer will remain confidential.

Q6 How much did your nursery business earn in 1991 from exports?

..... \$NZ

THANK YOU VERY MUCH FOR YOUR HELP, I HAVE NO MORE QUESTIONS.
IS THERE ANYTHING YOU'D LIKE TO ASK ME?

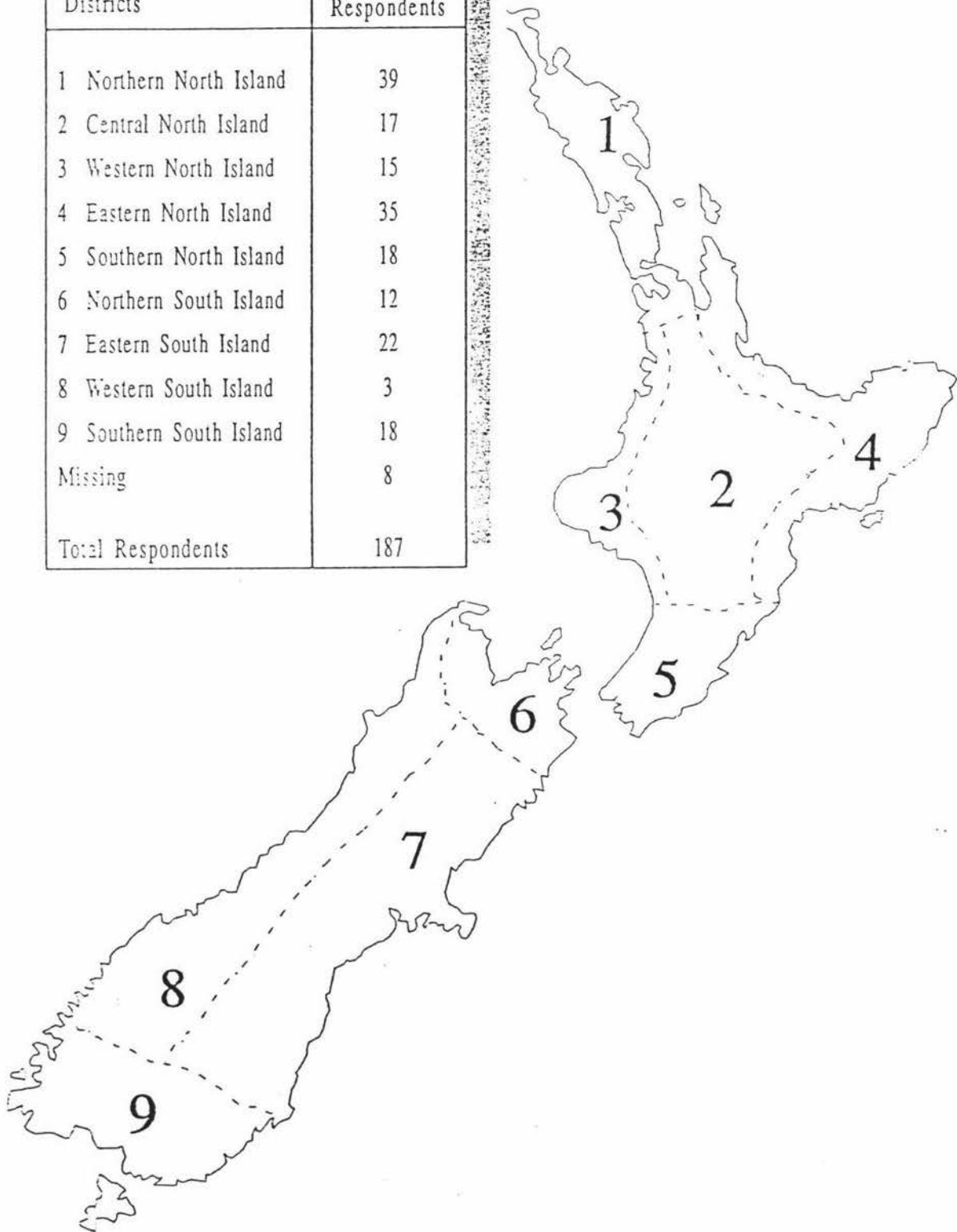
If yes Go ahead.

If no THANYOU VERY MUSH I REALLY APPRECIATE YOUR HELP
HAVE A GOOD AFTERNOON.
GOODBYE.

Appendix vi

Map of New Zealand showing districts by which woody plant growing businesses were classified.

Districts	Number of Respondents
1 Northern North Island	39
2 Central North Island	17
3 Western North Island	15
4 Eastern North Island	35
5 Southern North Island	18
6 Northern South Island	12
7 Eastern South Island	22
8 Western South Island	3
9 Southern South Island	18
Missing	8
Total Respondents	187



Appendix vii

Table 1. Number of growers in each Group by districts.

District	Grower Group ^(a)					
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
North Island						
North NI	9	8	2	10	7	3
Central NI	4	2	2	3	5	1
West NI	6	1	0	5	3	0
East NI	11	8	3	10	0	3
South NI	5	3	0	5	2	3
Total NI	35	22	7	33	17	10
South Island						
North SI	4	1	0	3	2	2
East SI	3	4	0	10	3	2
West SI	0	0	0	1	2	0
South SI	3	5	0	4	4	2
Total SI	10	10	0	18	11	6
Missing	6	0	0	1	0	1
New Zealand						
Total (187)	51	32	7	52	28	17

- ^(a) Grower Group 1 comprises growers involved with one woody plant enterprise
 Grower Group 2 comprises growers involved with two woody plant enterprises
 Grower Group 3 comprises growers involved with three woody plant enterprises

Grower Group 4 comprises growers involved with woody plants and one other nursery enterprise
 Grower Group 5 comprises growers involved with woody plants and two other nursery enterprise
 Grower Group 6 comprises growers involved with woody plants and three other nursery enterprises

Table 2. Number of growers in each Group by length of time the business has been established for full-time and part-time growers.

Age of business (years)	Number in each Grower Group n=143					
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
(a) Full-time growers:						
0 to 5	7	5	0	7	8	3
5 to 10	8	5	1	10	3	4
10 to 15	7	3	2	11	6	3
15 to 20	8	1	1	5	2	1
20 to 25	1	5	0	2	2	1
25 to 30	3	1	2	1	1	1
30 to 35	1	1	0	3	0	0
35 to 40	1	1	0	2	1	0
40 to 45	0	0	0	1	0	0
45 to 50	1	0	0	0	0	0
Total	37	22	6	42	23	13

Age of business (years)	Number in each Grower Group n=38					
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
(b) Part-time growers:						
0 to 5	1	4	1	2	2	2
5 to 10	3	3	0	4	1	1
10 to 15	4	1	0	2	0	0
15 to 20	1	1	0	1	1	0
20 to 25	0	1	0	0	1	0
25 to 30	1	0	0	0	0	0
Total	10	10	1	9	5	3

Table 3. Effect of debt on business operation by age categories of respondents.

Age of respondents (years)	Does debt limit business operation	
	Yes	No
25 to 30	4	5
30 to 35	9	10
35 to 40	21	13
40 to 45	25	20
45 to 50	7	19
50 to 55	1	10
55 to 60	2	12
65 to 70	1	3
70 to 75	0	1
Total	70	103

Table 4. Grower group plotted against the lines rated: (1) best earners; (2) second best earners, and (3) third best earners by respondents.

(1) Best earning lines

Specialisation	Number in each Grower Group					
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Forest trees	4	12	3	4	2	0
Fruit and nuts	5	5	3	2	0	0
Shrubs	13	3	1	10	3	2
Specimen trees	16	4	0	2	13	2
Other lines ^(a)	0	4	0	14	6	8

^(a) Other lines includes lines which are not woody plant crops, or retail sales of products such as dry goods.

(2) Second best earning lines

Specialisation	Number in each Grower Group					
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Forest trees	4	8	1	5	3	1
Fruit and nuts	5	3	3	2	0	0
Shrubs	10	1	0	7	3	4
Specimen trees	15	9	0	9	5	1
Other lines	0	3	3	16	11	6

(3) Third best earning lines

Specialisation	Number in each Grower Group					
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Forest trees	3	8	2	5	2	1
Fruit and nuts	3	3	1	1	1	0
Shrubs	10	3	1	7	5	4
Specimen trees	7	6	2	8	2	0
Other lines	3	1	0	12	9	7

Table 5. Percentage of growers' earnings from other nursery activities.

Grower Group	1 to 25%	25 to 50%	50 to 75%	75 to 100%	Missing	Total
Group 1	8	2	2	4	84	100
Group 2	9	3	3	6	78	100
Group 3	0	0	0	0	100	100
Group 4	19	6	12	8	56	100
Group 5	18	14	18	7	43	100
Group 6	24	12	12	24	28	100

Table 6. Percentage of growers' earnings from horticultural activities.

Grower Group	1 to 25%	25 to 50%	50 to 75%	75 to 100%	Missing	Total
Group 1	8	0	4	0	88	100
Group 2	19	6	3	0	72	100
Group 3	14	0	0	0	86	100
Group 4	15	8	2	2	73	100
Group 5	14	11	0	4	71	100
Group 6	12	0	18	6	65	100

Table 7. Percentage of growers' earnings from other business activities.

Grower Group	1 to 25%	25 to 50%	50 to 75%	75 to 100%	Missing	Total
Group 1	12	2	6	10	70	100
Group 2	12	7	9	9	63	100
Group 3	0	14	28	28	28	100
Group 4	15	8	8	6	63	100
Group 5	25	0	7	7	61	100
Group 6	18	0	0	6	76	100