Markets for Non-Wood Forest Products

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First published in 2004 by COFORD, National Council for Forest Research and Development, Dublin, Ireland.

ISBN 1 902696 40 9

Title: Markets for non-wood forest products.
Authors: P. Collier, I. Short and J. Dorgan.

Citation: Collier, P., Short, I. and Dorgan, J. 2004. Markets for non-wood forest products. COFORD, Dublin.

Réamhfhocal

Is fáschoillte den chuid is mó iad foraoisí na hÉireann, a fhástar go príomha ar son an adhmaid. Is soláthraí iad afách freisin d'iliomad tairgí agus seirbhísí eile, beagán acu a théann tríd an mhargadh nó a fhaigheann aitheantas cuí. Is sampla soiléir é caitheamh aimsire; tá bealach chuig an talamh ard le hagaidh siúlóidí in alán áiteanna trí fhoraoisí Coillte. Úsáidtear bóithrí agus línte marcaíochta lastigh den fhoraois féin don siúl- úsáideann an-chuid de na siúlóidí fada iad don chuid fada. Ní thugann an soláthar seo ach ioncam an-bheag, nó ioncam ar bith don tionscal foraoiseachta, i bhfoirm íocaíocht dhíreach ón úsáideoir nó i bhfoirm deontais rialtais le haghaigh caomhnú na gcarrchlós agus na gcomharthaí riachtanacha. Cuimsíonn nithe seachtracha eile, más fíor, iargúltacht carbóin agus caomhnú bhitheagsúlacht.

Glacann an tsochaí go ginearálta agus daoine aonair leis an bhforaois mar atá, gan aon tuisicint acu gur gá foraoisí a bhainistiú leis na seirbhísí a mbaineann an oiread sin daoine taitneamh astu, a sholáthar. In álán cásanna tugann tairgiúlacht adhmaid fóirdheontas don soláthar seo, rud atá míchothrom go minic. Cuireann sé seo brú breise ar úinéir na foraoise ar gá dó maireachtáil sa domhan trádálach agus brabús a dhéanamh le go mbeidh sé in ann maireachtáil agus athinfheistiú. Féadfar cás láidir a dhéanamh ar son na seirbhísí seo a bheith maoinithe ag an sochaí go díreach nó trí idirghabháil rialtais.

Ar an lámh eile, tá margaí ann le haghaidh iliomad táirgí foraoise eile nach táirgí adhmaid iad- ar nós géim, torthaí, fungais agus duilliúr. Tá siad seo ag staid an-luath forbartha in Éirinn. Tá scóip suntasach don fhorbairt sna réimsí duillúir agus seilge.

Ábhar machnaimh fiúntach eile é fungais a thiomsú ar scála trádála. Is é an rud tarraingteach faoi na táirgí seo ná go n-aimsítear iad sa bhforaois ar aon chaoi- cé gur féidir an fhoraois a bhainistiú i gceart leis an toradh tráchtála a mhéadú. Mar shampla, is fadhb í atá ag dul i méid ná na fianna in an-chuid codanna na tíre- ó na fianna óga ag ithe na nduilliúir go dtí crann a fheannadh. An t-aon rogha réadúil smachta atá ann ná iad a bhaint. San áit a ndéantar é seo a smachtú agus a bhainistiú i gceart, is toradh bua ag gach taobh é don úinéir- déantar uimhreacha fianna a smachtú, agus ag an am céanna faightear ioncam trí tháillí seilge.

Is é an foilseachán COFORD an chéad plé cuimsitheach riamh in Éirinn ar tháirgí foraoise nach táirgí adhmaid iad. Tuairiscíonn sé ar thogra maoinithe ag COFORD a raibh focás láidir aige ar na margaí agus ar na margaí insaothraithe do na táirgí seo. Beidh sé úsáideach d'úinéirí foraoise príobháideacha a bhfuil fonn orthu an t-ioncam a mhéadú agus an réimse a leathnú. Beidh an foilseachán úsáideach freisin do choilleoirí i dtaobh dearadh foraoise agus conas roghanna a athrú le hioncam insaothraithe a dhéanamh as duilliúr agus táirgí eile.

Creidimid go bhfuil sé seo tráthúil agus go gcuirfidh sé go mór le forbairt na hearnála a bhfuil maoin gan tarraingt aisti ann.

David Nevins
Cathaoirleach

An Dr Eugene Hendrick
Stiúrthóir

Translation from English by DCU Language Services.

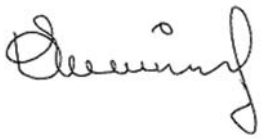
Foreword

Ireland's forests are predominantly plantations, mainly grown for wood. They are also, however, providers of many other goods and services, few of which pass through the market place or receive due recognition. Recreation is an obvious example; access to the uplands for walking is in many places through Coillte forests. Roads and ridelines within the forest are themselves used for walking – many of the long-distance walks use them for the greater part of their length. This provision brings little or no revenue to the forestry sector, either in the form of direct payment by the user or government subvention for the upkeep of the necessary car parks and signage. Other so-called externalities include carbon sequestration and biodiversity conservation.

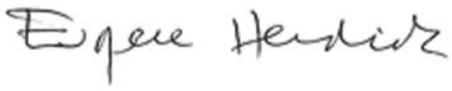
Society at large and private individuals often see the forest as a given, not realising that forests need to be managed to provide the services enjoyed by many. Wood production in many cases, often unfairly, subsidises these provisions. This places an increased burden on the forest owner who has to live in the commercial world and turn a profit in order to survive and reinvest. There is a strong case for these services to be funded by society, either directly or through government intervention.

On the other hand markets do exist for a variety of other non-wood forest products such as game, fruit, fungi and foliage. These are at a very early stage of development in Ireland. There is considerable scope for development in the foliage and hunting areas. Collection of fungi on a commercial scale is also a possibility that merits consideration. What is attractive about these products is that they are found in the forest in any event – though the forest can be managed to increase their commercial return. For example deer are an increasing problem in many parts of the country through browsing young and bark stripping. Culling is the only realistic control option. Where this is properly controlled and supervised it can result in a win-win situation for the owner – deer numbers are controlled, while at the same time income is provided through hunting fees.

This COFORD publication is the first comprehensive treatment of non-wood forest products in Ireland. It reports on a COFORD-funded project that had a strong focus on the markets and potential markets for these products. It will be useful to private forest owners who are interested in increasing their income and widening its base. Foresters will also find the publication helpful in terms of forest design and how species selection may be varied to provide potential income from foliage and other products. We believe it is timely and will contribute to the development of a sector that has untapped potential.



David Nevins
Chairman



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Contents

Acknowledgements

The authors would like to acknowledge the assistance of a number of individuals and organisations in the preparation of this report: COFORD, Teagasc personnel, Coillte, Bord Bia, Bord Glas, the National Association of Regional Game Councils and Wicklow Upland Council. A list of individuals and organisations who contributed to the study is given in Appendix A. The main pictures in the report are provided courtesy of Mike Hartwell.

List of Abbreviations

AUM	Animal Unit Months (of grazing)
b	Billion
CAP	Common Agricultural Policy
CITIES	Convention on International Trade in Endangered Species
CBD	Convention on Biological Diversity
COFORD	National Council for Forest Research and Development
FAO	Food and Agricultural Organisation (UN)
GAP	Good Agricultural Practice
HACCP	Hazard Analysis Critical Control Point
m	Million
NWFP	Non-wood Forest Products
REPS	Rural Environment Protection Scheme
SAC	Special Area of Conservation
£	Pound sterling
$	US Dollar
€	Euro

1. Executive Summary and Overall Conclusions

1.1 BACKGROUND AND INTRODUCTION

Since the early 1980s the government has pursued a policy to increase the forest cover to 17% of the land area of Ireland. Since the early 1990s this has resulted in a substantial increase in private planting. The long delay before gaining returns from the forest enterprise raises the question whether other income could be generated from non-wood forest products (NWFP) from afforested areas.

Almost 80% of Irish forests are coniferous, with spruce and pine the dominant species. Spruce and pine have the potential to produce a wide range of NWFP including essential oils, tannin and boughs for foliage. In addition to the NWFP from the trees, there are other products that can be produced from fungi, herbs and shrubs; the forest itself can also provide services such as tourism and recreation.

This study examines the potential market for the main categories of NWFP products. It examines market requirements, feasibility of production, indicative returns and obstacles to the development of markets.

1.2 NON-WOOD FOREST PRODUCTS

Foliage

Foliage is used as filling with flower bouquets and more recently has been used with other products such as candles, pottery and oils.

The Netherlands auction-houses function as a pivot around which the international floriculture trade revolves. They determine prices in world trade and have 30–40% of the European market. Because of the importance of these markets in floriculture and the presence of wholesalers, supporting and other sundry items also tend to be Netherlands based.

Florists are the major distribution channel in most of the main EU markets (Germany, Italy and France) but supermarkets account for an increasing and larger share of distribution in the UK.

The EU market for cut flowers and foliage is worth approximately €12b and growing. Foliage accounts for between 8 and 10%. The Irish and UK market for foliage is estimated to be worth about €145m. Developing countries have a significant share of the foliage market in the UK and Europe. Apart from the different range of products, which they can offer, they are also likely to be cost competitive.

The specific products reported to be experiencing increasing demand in the UK market include willow (*Salix*), blackthorn (*Prunus spinosa*) and hazel (*Corylus avellana*) foliage, all native to Ireland.

Research shows that there is a sizeable market for a number of cultivated foliage plants produced in Ireland such as eucalyptus, pittosporum, and willow. Furthermore, there is a sizeable and growing demand for a number of wild species in Ireland, namely, rhododendron, and holly and ivy with berries. Willow with catkins and cotoneaster are listed as potential growth areas. Products including bog myrtle, corkscrew hazel and mistletoe were also deemed to have good potential.

Both UK and Dutch buyers emphasised the importance of complying with the MPS* and Eurogap protocols. In this context there was a wide range in the rating of Irish foliage product from very good by Marks & Spencer to below average by Waitrose.

The forest foliage industry started in Ireland in the 1960s. Cultivated foliage began to be grown in 1993 and has increased steadily to over 150 ha in 2001. The industry is concentrated in the southern counties of Kerry, Cork, Waterford and Wexford.

* MPS = Milieu Project Sierteelt (Floriculture Environmental Project).

Forest Tourism

There have been high growth rates recorded for world, European and Irish tourism over the last ten years. This growth is expected to continue up to 2020.

A number of existing tourism centres are located in forest parks throughout Europe, mainly within 60 miles of major population centres. Facilities at the centres that report the highest number of visitors include swimming pools, conference centres, restaurants and accommodation. Tourists engage in fishing, trekking, hunting and various educational tourism products such as nature trails, fungus hunts, and season spotter sheets (checklists of flora and fauna to wtch out for on a nature walk).

In Ireland, the facilities at Trabolgan just 28 miles from Cork are similar but on a smaller scale than those described for the other European centres. Coillte owns the other two forest tourist facilities in Ireland with mainly outdoor activities at Lough Key Forest Park and Killykeen Forest Chalets.

The main markets served by these facilities are short break holidays, schools and family holiday packages.

A recent feasibility study was conducted on setting up and running an outdoor pursuits centre in a forest in the mid west of Ireland equipped to a standard which would provide most of the outdoor activities of those mentioned in the European centres.

While the site was well located in relation to the tourist trail (Kerry to Connemara) and within easy distance of Limerick city, the feasibility study showed that the project was not commercially viable.

In addition to hosting the aforementioned tourist facilities, Irish forests provide opportunities for locals and tourists to engage in a range of outdoor pursuits. The main activity is walking. An estimated 8.5 million visits take place annually.

Only a very small (2–3%) percentage of visitors pay a fee. As Coillte has an open forest policy the introduction of charges for recreational use of forests is unlikely to be feasible. Consequently Coillte are subsidising the provision of these facilities for local and tourist uses.

Most of the revenue arising from people walking in forests is from overseas visitors. An estimated 2,000 overseas visitors may have paid to walk in forests and are likely to have spent in the region of €1.6m, at 2002 prices. Of this expenditure, 60% was on food, drink and accommodation.

Thirty thousand overseas visitors engage in trekking on horseback; the average expenditure per person is €800. It is not known how many of these use forests on part or all of their treks and what income, if any, accrues to forest owners.

There are no data on the size of the mountain biking market in Ireland. Estimates of the value of mountain biking in Wales are in the region of €6.3m but this is with world-class mountain biking trails and facilities.

Estimates of the value of deer hunting in the Republic of Ireland are put at €1.3m, at 2002 prices.

Alternative Healthcare

There has been a great increase in the popularity of alternative healthcare in the last 10 years. This study looked at three areas in the alternative healthcare, namely herbal medicines, aromatherapy and homeopathy.

Herbs have a long history of being used as medicines and this is the basis of their safety and efficacy. Herbal medicines are produced from whole plant material and contain a range of active ingredients rather than a single active compound as found in pharmaceuticals.

The EU market for herbal medicines is estimated at around $1.1b. The average annual growth rate in the market over the period 1985 to 1995 was 10%. The herbal medicine market in the UK was estimated to be worth £72.7m and grew at 14% per annum in the period 1996 to 2000.

The aromatherapy market in the UK has had an average annual growth rate of 15% over the period 1996 to 2000. The market was valued at £63m in 2000.

The UK homeopathic market is smaller in size at £12.4m but experienced a strong average annual growth rate of 11% between 1996 and 2000.

These growth rates are expected to continue in the UK at 14% per annum for the period 2002 to 2005. China, USA and mainland Europe are the main sources of herbs imported to the UK.

There is increasing demand for certified raw material and valued-added products. Buyers are interested in establishing close relationships with producers of herbs who they know well, can trust and ensure consistency of supply. They wish to avoid getting unauthenticated herbs from producers scattered overseas. The area under cultivation in Europe is small with an estimated 62,700 ha across eight countries. There is a decline in the production of low value products such as evening primrose, thyme and milk thistle. These are being imported from low cost countries such as Albania, Bulgaria and Hungary. On the other hand, production of more specialised plants is increasing in Europe. Furthermore, homeopathic medicines must use freshly harvested materials, thus putting distant suppliers at a disadvantage.

The EU is the largest single commercial market for medicinal plants and herbal medicines, with imports at around 100,000 tonnes and a value of $250m. Germany, France and Italy are the highest importers.

Traditionally health food shops were the main market outlets in Europe. However, supermarkets are taking an increasing share of alternative healthcare markets. Furthermore, producers and retailers are using the Internet to sell their products directly to the consumer.

The threat to many harvested medicinal plants from the wild from rising demand has resulted in the control of export of many regulated species. There are two main international conventions covering this area: the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Convention on Biological Diversity (CBD).

In the UK the Medical Control Agency tends to reject compounds if it is unsure of what they contain. A small change in classification from a food supplement to a medicine can mean the difference between access to a market or not.

Insurance companies in Germany, Japan and Switzerland treat herbal medicines that are licensed and prescribed in the same way as synthetic drugs. In other European countries this is not the case, but as competition in the health insurance market increases, cover may be extended in the future to these products.

A wide range of herbs can be grown under a forest canopy including some that are top selling in world markets. Some of these are successfully grown in other countries but their cultivation under Irish conditions has yet to be established. A number of Ireland's native trees including ash, birch, cherry, elder and yew have a long tradition of use in alternative medicines.

Oils and Oleoresins

Essential oils are aromatic oily liquids obtained from plant material such as flowers, buds, seeds, leaves, twigs, bark, woods, fruits and roots. They are used in the food industry as flavouring, in the perfume industry for fragrances and in the pharmaceutical industry for their functional properties.

It is difficult to identify the size of the market as the products are used in a range of industries and sectors.

EU imports of essential oils and oleoresins grew by 10.5% in volume between 1995 and 1997 to reach 57,000 tonnes in 1997. Although the EU is a net importer, it also exported 28,000 tonnes in 1997. Developing countries supply 52% of total imports; Brazil is the dominant source, accounting for 40% of total imports.

The main determinants of quality of essential oils used in the cosmetic industry are physical indicators. In the food industry producers must have, or be working towards, a Hazard Analysis Critical Control Point (HACCP) system. The client specifies the requirements in the pharmaceutical industry if the essential oil is to be used as a raw material. If it is to be used for herbal medicines then laws govern its use.

The processes of extracting oils are very well established and vary in level of sophistication.

Edible Forest Products

Wild foods include such products as wild mushrooms, berries, nuts etc. These are consumed fresh or sometimes frozen. Some are used for the production of jams, juice and concentrates. Others are used for adding value through drying, slicing, converting them into powder form or preserving them in brine etc.

The market for wild mushrooms has been studied in Scotland. The size of the market in Scotland based on the combined turnover of four companies in 2002 is estimated to be in the region of £1m. There may be an equivalent amount sold in the black economy and some are also picked for personal consumption.

The market for products from the wild is closely linked with the organic food market. The share of organic produce in food markets ranges from 0.4% in Ireland to 2% in Europe. Some forecasts estimate that organic food will comprise 7% of total food sales by 2006. The average annual growth in demand for organic food is in the region of 30-40% in European countries.

Products are sold directly to consumers through market places, restaurants, and also via the Internet.

Many of the issues identified for processors of organic food are also relevant for wild food. These include issues related to standards, customer awareness of the food and the consistency of volume of product available.

All the mushrooms produced in Ireland are cultivated indoors. However, mushrooms can be cultivated in forests, particularly on decaying timber. Mushrooms associated with conifer forests include *Boletus*, Chantrelle, *Craterellus*, *Suilis* and *Tricholoma*.

Given the right soil conditions and elevation, it is possible to integrate the cultivation of a number of common berries such as blackberries, blueberries and blackcurrants with forest management.

Pines and spruces provide good windbreaks for hives and therefore honey production can be integrated with forestry in certain situations.

The returns from wild food products are very low based on the experience in other European countries and the US. The income arising from the enterprise is supplementary to the main income earned elsewhere. But the Scottish experience with wild mushrooms suggests that there might be a niche opportunity for one or two companies in Ireland.

Forest Grazing

At present in British Columbia 2,000 ranches with 260,000 cows graze on 10 million ha of land, 80% of which is afforested. Plantation forestry is not conducive to grazing, particularly on wet mineral soils. Furthermore, damage from livestock precludes grazing until the crop is well beyond the thicket stage. Grazing is not permitted, however, where the owner is in receipt of a forestry premium.

1.3 OVERALL CONCLUSIONS

The study has found that the greatest potential within NWFP is to generate income from foliage sales.

Relatively high costs and poor climatic conditions make alternative healthcare, oils and oleoresins uncompetitive.

There may be limited opportunities for specialist products in the edible forest products and tourism sectors.

The potential business opportunities related to forest-based tourism depends on substantial investment by Coillte alone or in association with other interests developing and maintaining a world class infrastructure.

Further research is required in relation to edible forest products, foliage, and to a lesser extent, on forest-based tourism.

2. Recommendations

2.1 HORIZONTAL ISSUES

There is no one organisation with a mission in which the development of NWFP would fit. There is a need to develop the skills and knowledge of development staff to facilitate a cross organisation response to the delivery of support services.

2.2 FOLIAGE

National Strategy

Market information suggests that there are opportunities for the development of foliage as a subsector of the forest industry. A strategy needs to be put in place to realise this. In this strategy, technical research, market research and enterprise development need to be developed in a co-ordinated way. The following recommendations are some of the elements of this proposed strategy.

General Principles

Research needs to be linked to commercial realities and to focus closely on areas capable of significant growth.

While research needs to be conducted in association with enterprises in the field, procedures need to give equal access to all enterprises to the findings from such research.

Product

An inventory of locations and estimated volumes of selected species should be prepared.

Research should be done on the design and methods of adding value to the current product.

Linkages

The implications for wood quality of removing foliage needs to be investigated.

Husbandry

Husbandry needs to be adapted to the development of foliage. Branches tend to be too green in Irish forests. Foliage requires to be more blue-coloured since it is more acceptable in the trade. This requires investigation of different species and provenances.

Potential solutions to the problem of needle necrosis should be investigated as this condition leaves many trees and shrubs unsuitable for foliage purposes.

The most suitable type of fertiliser programme (use of compounds, straights, etc.) suitable for growing should be identified and specified.

The optimum spacing and timing of respacing should be identified.

Performance of individual species in terms of shelf life, harvest period etc. should be identified.

The optimum cutting regime should be identified, noting specifically whether it is best to cut a little every year, or at longer intervals.

Harvest methods and the most effective way to harvest as the crop grows should be investigated.

Market

There is need for general market information, which is independent and keeps pace with the rapid rate of change in prices and demand and supply.

There should be an investigation into the possibility of producing in Ireland many of the plants currently being imported to Europe from South America and Africa, as well as the potential for other species such as birch, western hemlock and others.

Logistics

Foliage is transported back and forth across Europe. Ways of improving the logistics associated with this need to be examined.

2.3 FOREST TOURISM

Product Development

An investigation should be done of best practice in relation to development of forest parks overseas (UK, Netherlands etc.).

Analysis should be undertaken of the patterns and linkages between different types of uses and the implications should be elaborated for services such as refreshments, toilets, and environmental management.

The changing needs of these users and customers should be monitored and information made available to forest managers.

Research and development of materials should maximise the potential for educational tourism in forestry by linking activities and subjects related to forestry and the natural environment to the curriculum at primary and second level.

Profile of Users

Information should be compiled about the requirements of people who use the forest for tourist and recreation purposes.

Benefits and Impact

A model should be developed to show the likely benefits to the local area/community from the development of forestry tourism infrastructure.

Inter-sector Conflicts

There should be an investigation of how forest managers can provide services to tourists and visitors in a way that is compatible with sustainable forest management.

2.4 EDIBLE FOREST PRODUCTS

The research and development needs of edible NWFP have been identified as:

- A national survey of wild food (berries mushrooms and honey) producers in Ireland leading to the preparation of a database of all producers in Ireland;
- A wild food inventory that identifies comparative advantages of species and site combinations;
- Research of techniques of growing wild species of mushrooms outdoors;
- The feasibility of setting up a laboratory in Ireland to produce substrate for wild mushroom production;
- Market intelligence regarding trends in wild food products;
- Knowledge of the resilience of many NWFPs to harvesting pressures and on the full implications of the ecological roles played by these products.

Other Recommendations

Leaflets and point of sale material need to be developed to educate consumers about wild food.

There is need for ongoing education and training of pickers of wild berries in relation to market requirements and ways and means of improving quality.

3. Introduction

Total forest cover in Ireland is 650,000 ha, or 9.4% of the land area of the country. While this is a considerable increase on the 1% cover recorded in the early years of the last century, it is well below the EU average of 33%.

State support for forestry dates back to the first decade of the last century and until the 1980s mainly consisted in afforestation of state owned lands. But since the Western Package of 1981, the level of financial support for private forestry has increased significantly. This support, administered by the Forest Service, has been the primary driver behind the rapid expansion of the private forest estate in the last twenty years.

3.1 OBJECTIVES OF FOREST POLICY

In *Growing for the Future*, published in 1996, the government set out the ultimate and immediate objectives of the forestry sector. The ultimate objective was stated to be the expansion of forestry so as to maximise its contribution to national and social well being, compatible with protection of the environment. The strategy adopted the target of afforesting 25,000 ha per annum up to 2000, and 20,000 per annum thereafter up to the year 2030. It was estimated that this would bring the total productive forest area from 464,000 ha (7% of land area) in 1996, to 1.2 million ha (17% of land area) by 2030 and annual wood production would increase from 2.2 million m^3 to 10 million m^3 over the same time period.

Afforestation is supported in the National Development Plan 2000-2006, where it is one of four measures making up the CAP Rural Development Plan 2000-2006. In conjunction with the other three measures, forestry has somewhat broader objectives in this plan than is stated in *Growing for the Future*. The CAP Rural Development Plan states the objective of forestry is to provide additional income to farmers and rural dwellers, in a context in which other forms of agricultural production are limited and/or yield low incomes, and by this means to ensure the survival of a vibrant rural society. Other considerations include the possibility of increasing exports, or reducing imports at little marginal cost (since most afforested land was presumed to be marginal), removing regional disparities (since a high proportion of marginal land is in the west), and improving the environment.

3.2 POLICY AND THE RATE OF AFFORESTATION

Since the foundation of the state, successive governments have provided grant-aid schemes for afforestation, with the overall objective of increasing forest cover. Up to 1980 the uptake of private forestry grants, with some notable exceptions, was very limited. This situation began to change in 1981 when the Programme for Western Development included significant tax-free incentives for afforestation. In 1987 improved incentives were offered to farmers in the rest of the country. Further improvements were made in the 1989-93 Forestry Operational Programme and again in the Operational Programme for Agriculture Rural Development and Forestry, 1994-99. These policy changes produced a sharp increase in private planting from 5,500 ha per annum in the first half of the 1980s to about 12,000 ha per annum in the decade 1985-95. Since then performance has been less consistent. Afforestation dropped from 1996 to 1998, as a result of competition from other land uses.

3.3 FOREST TYPES AND NON-WOOD FOREST PRODUCTS (NWFP) USES

The breakdown of the forest by type in 2000 (Figure 3.1) shows that almost 80% of the forests are coniferous.

An estimate of the area by species is shown in Figure 3.2. This shows that spruce and pine are the main species of trees in Irish forests

presently. Nonetheless there are also significant areas of broadleaf and mixed forests in Ireland.

The FAO (1998) gives a broad classification of the various NWFP uses by species (Table 3.1). The table shows that Norway spruce, Douglas and noble fir have the potential to produce NWFP of national and international importance.

3.4 RETURNS TO FORESTRY

The main drawback to forestry as an enterprise is the absence of returns for 15-20 years even under the fastest rotations. Indeed, first thinnings are not likely to yield significant returns; this occurs only from the second and subsequent thinnings up to clearfelling at around 40 years. The annual premium is designed to overcome this. Studies show that it is the most important

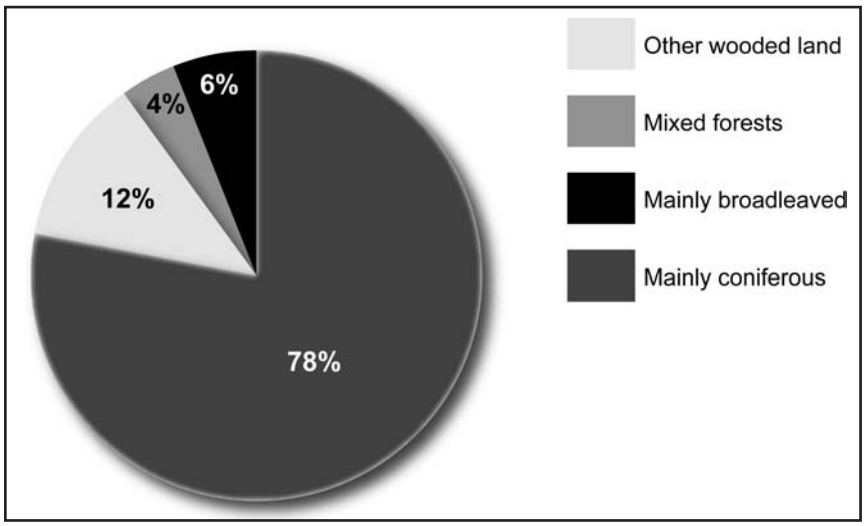

FIGURE 3.1: Breakdown of forests by species group, 2000.

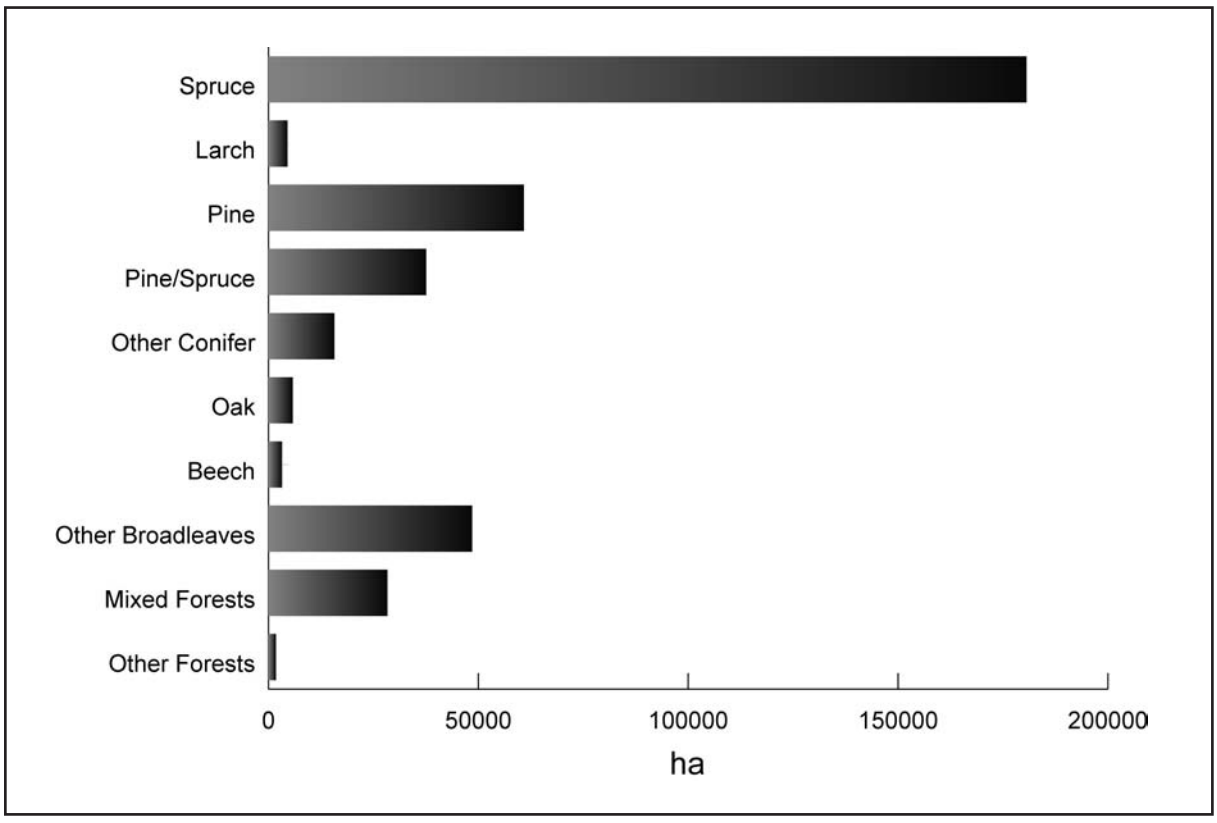

FIGURE 3.2: Breakdown of total forest area by species type, 2000.

TABLE 3.1: Breakdown of non-wood forest products use by tree species and national or international importance.

SPECIES	COMMON NAME	PRINCIPAL USES	TYPE OF USE*
Abies alba	Silver fir	Essential oils	C
		Christmas trees and boughs	C
		Landscape material	C
Abies balsamea	Balsam fir	Essential oils	C
		Christmas trees and boughs	C
		Curios (pillows filled with foliage)	L
		Landscape material	C
		Resin	T
Abies grandis	Grand fir	Christmas trees and boughs	C
		Landscape material	L
		Resin (medicine and wood finish)	T
Abies procera	Noble fir	Christmas trees and boughs	C
Chamaecyparis lawsoniana	Lawson cypress	Boughs	C
		Landscape material	C
Cupressus macrocarpa	Monterey cypress	Landscape material	C
Ginkgo	Ginkgo	Bonsai	C
		Landscape material	C
		Medicinal uses	C
Juniperus spp.	Junipers	Boughs	L
Juniperus communis	Common juniper	Berries (seasoning, gin)	C
		Essential oil	C
		Dye	L
Juniperus vulgaris		Essential oil	C
Larix decidua	Japanese larch	Bonsai	C
Picea abies	Norway spruce	Bonsai	C
		Christmas trees and boughs	C
		Landscape material	C
		Resin	T
		Tannin	T
Picea sitchensis	Sitka spruce	Roots (basketry)	T
Pinus contorta	Lodgepole pine	Bark (food, construction)	T
		Boughs	C
		Cones	C
Pinus nigra	Austrian pine	Bonsai	C
		Christmas trees	L
Pinus radiata	Monterey pine	Bark (tannin)	L
		Landscape material	C
		Resin	C
Pinus sylvestris	Scots pine	Bark (food)	T
		Bonsai	C
		Essential oil	C
		Resin	C
Pseudotsuga menziesii	Douglas fir	Bark (landscaping)	C
		Boughs	C
		Christmas trees	C
		Resin	L
Sequoia sempervirons	Coast redwood	Tannin (potential source)	L
Taxus baccata	English yew	Foliage (taxotere)	C
		Landscape material	C
		Topiary	C
Thuja plicata	Western red cedar	Bark (clothing, woven articles)	T
		Boughs	L
Tsuga heterophylla	Western hemlock	Resin	T
		Bark	T

C – Commercially important at a regional or international level;

L – Commercially important in individual countries or portions of countries;

T – Traditional, used or in current use by tribal cultures.

Source: FAO (1998).

quantifiable factor in the decision to afforest. Other factors include the attractiveness of alternative enterprises and, as a positive factor, the availability and rate of remuneration from off-farm employment. Returns from sales of thinnings and clearfells, being heavily discounted, have very little weight in the afforestation decision.

In these circumstances, it is highly desirable to explore the possibilities of generating revenues from NWFPs (including services). As a result of changes in consumer preferences there is increasing demand for uncultivated food products (as paralleled by the demand for organic food) and alternative medicines for which forests are a potentially important source. Likewise, more discrimination in the tourism market is generating demand for special interest holidays, which can be provided in forests. There is also an important market for forest foliage as a complement to cut flowers.

It is useful to examine the areas of possible production within the forest.

3.5 AREAS OF POSSIBLE PRODUCTION

The possible areas of production of non-wood forest products include under the canopy as well as open spaces at the edges and on corridors left unplanted to facilitate services running through the site.

Ride Edges

The edges of the ride network are possible sites for the production of some non-wood forest products, particularly those harvested informally by the public. The production of NWFPs on a formal basis would be more difficult due to the ease of access and the potential of theft and poaching. On the other hand, the ride network would allow for easy access to the product for management purposes.

Service Corridors

In forest plantations that qualify for Forest Service grant assistance there is a requirement that corridors be left unplanted if electricity (ESB) lines or water mains traverse the site. The width of the corridor must be a minimum of 15 m for water mains (Forest Service 2000a). For ESB lines, the width varies, depending on the power line type (Table 3.2).

Trees can still be grown within the ESB corridors provided that they not exceed a maximum height of 3 m and that there is a 4 m width corridor left totally clear (Forest Service 2000a). Ginkgo (a medicinal plant) is one example of a plant that could be grown in ESB service corridors.

TABLE 3.2: Corridor widths under ESB lines.

POWER LINE TYPE	CORRIDOR WIDTH (CENTRED) m
Low voltage (230/400 volts)	None (clearance from branches and tree tops only)
10 kV and 38 kV	20
110 kV	61
220 kV	68
400 kV	74

Riparian Buffer Zones

Plantations that receive funding from the Forest Service are required to provide riparian buffer zones adjacent to aquatic zones. The width of the required zone varies with the slope of the land adjacent to the aquatic zone and the erodability of the soil (Table 3.3).

The riparian zone is actively managed to maintain and encourage vegetative growth and cover for the protection and enhancement of water quality. Planting of native tree species such as birch, willow, and the occasional alder, oak and ash is permitted in the buffer zone and within 5 m of the aquatic zone if, in the view of the Regional Fisheries Board, this would have a beneficial effect (Forest Service 2000b). Some of these species are potential sources of foliage that could be harvested and sold.

Any NWFP system in a riparian zone must not be detrimental to the function of the buffer zone. There must be the minimum of soil disturbance and no use of fertilisers.

TABLE 3.3: Riparian buffer zone minimum widths.

AVERAGE SLOPE LEADING TO AQUATIC ZONE	BUFFER ZONE WIDTH ON EACH SIDE OF THE AQUATIC ZONE m	BUFFER ZONE WIDTH FOR HIGHLY ERODABLE SOILS m
Moderate (even to 1 in 7)	10	15
Steep (1 in 7 to 1 in 3)	15	20
Very steep (> 1 in 3)	20	25

Source: Forest Service (2000b).

Firebreaks

Firebreaks are fuel free zones, 6 m wide, that are normally placed along external boundaries of plantations in high fire risk areas. Large plantations (> 100 ha) may also have internal firebreaks (Forest Service 2000a). Firebreaks may be integrated with a road and ridge network and, therefore, the entire 6 m width may not be available for forestry use.

Sediment traps

Two types of sediment trap are associated with areas left unplanted (Forest Service 2000a):

1. Run-off type;
2. Swamp type.

The run-off type requires the area within 4 m of its lower side to be left unplanted. The area to be left unplanted around the swamp type varies, depending on the needs of the site, but may be as much as 20 m^2 (Forest Service 2000b). Much of this area is likely to experience water logging and therefore will not be suitable for NWFPs. However, a productive use of the boundary of this area may be the production of mushrooms on logs or coppice willow or poplar for basketry.

Other Open Spaces

Open spaces are required for plantations that receive Forest Service grant assistance next to railway lines (20 m), public roads (20 m for conifers, 10 m for broadleaves) and dwellings (60 m, or 30 m with the permission of the dwelling owner). The open spaces are often incorporated into the ride network but may allow for the production of some NWFPs.

Open space is also required around archaeological sites. There may be potential within this space to produce NWFPs provided the products are derived from species other than trees and the roots do not penetrate deeply into the soil. Soil cultivation would also need to be curtailed.

Under the Canopy

The microclimate under the forest canopy may be suitable for some NWFPs, e.g. black cohosh (*Cimicifuga racemosa*). If this space is to be used in the long term, management of the forest must ensure that there is always sufficient hospitable area to produce the NWFP. This may entail a rotational felling system or the monitoring and modification of the canopy on a single site.

3.6 TERMS OF REFERENCE

It is against this background of production possibilities and changing consumer demands that COFORD commissioned this study with the following terms of reference:

- Review market for non-wood forest products and services;
- Establish market potential for each product;
- Assess feasibility of supplying the markets;
- Identify obstacles to the development of the markets;
- Identify gaps in knowledge of commercialisation of the products and recommend necessary research.

The methodology of the study consisted of desk research covering web sites and hardcopy publications accompanied by telephone and face-to-face interviews with suppliers and buyers.

4. Foliage

4.1 INTRODUCTION

Foliage is the greenery which is used to add volume and appearance to flower bouquets. Cut foliage previously was used in flower bouquets and more recently foliage is used on its own or in combination with candles, pottery and oils to give value-added products. These uses are popular on the continent and are now being introduced to the Irish market. Foliage consists of cultivated and wild plants.

4.2 MARKET

The consumption of fresh flowers and foliage in the EU markets is shown in Table 4.1. As can be seen, the EU market for cut flowers and foliage has been increasing annually over the period. Germany is the biggest consumer followed by Italy, France and the UK in order of importance.

Dyke and Primrose (2002) found that in the UK on average 10% of revenue from 19 businesses in the florist and floristry products was accounted for by non-floral products (inclusive of foliage). Bord Glas (2002) figures for the Irish market in 2001/2002 showed that foliage as a percentage of fresh flowers and foliage was 7.7%.

Based on these figures the market for foliage in the UK and Ireland is estimated at €195m.

4.3 PRODUCTION

The production of cut flowers and foliage in selected EU countries is shown in Table 4.2.

More than three quarters of the production is grown in the Netherlands, Italy, Germany and France. In recent years Spain has increased its production strongly becoming one of the major producing countries.

TABLE 4.1: EU consumption of cut flowers and foliage, 1996 – 2003.

COUNTRY	YEAR			
	1997	1998	1999	2003
	€ MILLION			
Germany	3,082	3,105	3,146	3,693
Italy	1,773	1,867	2,025	2,704
France	1,710	1,801	1,825	2,485
UK	1,442	1,602	1,795	2,324
Spain	591	651	1,117	990
Netherlands	488	499	511	593
Belgium and Luxembourg	393	405	409	533
Austria	369	371	359	486
Sweden	299	309	162	427
Denmark	193	198	195	304
Finland	198	196	189	245
Greece	144	140	153	212
Portugal	121	131	139	219
Ireland	60	73	92	111
EU	10,864	11,350	11,891	15,327

Source: Centre for the Promotion of Imports from Developing Countries (2001, 2003).
Notes: Figures for 1999 are estimates and 2003 is a prognosis by the Flower Council of Holland (1999).

TABLE 4.2: Production of cut flowers and foliage in selected EU countries.

COUNTRY	PRODUCTION $m	%	YEAR
Netherlands	2,802	30	2000
Italy	2,167	23	1994
Germany	1,268	13	1997
France	1,013	11	1999
UK	431	5	1999
Spain	438	5	1990
Denmark	397	4	1998
Belgium	219	2	1999
Sweden	253	3	1990
Austria	254	3	1999
Finland	81	1	1999
	9,323	100	

Source: Profound Ltd. and Lanning J. (2001).

With the exception of Denmark the number of producers in EU countries decreased (Profound Ltd. and Lanning 2001). Furthermore several countries such as Belgium, Finland and Switzerland reported declines in profits.

4.4 IMPORTS

The EU was the world's leading importer of flowers and foliage in 2000 with total imports amounting to more than €3.3b (see Appendix B) (Profound Ltd. and Lanning 2001). Germany was the largest European importer, accounting for 29% of total EU imports. The second largest importer in the EU was the United Kingdom (19%), followed by France (15%) and the Netherlands (14%). Smaller markets like Portugal and Italy showed the largest growth of flower and foliage imports in the period 1997 to 1999. A greater part of the Netherlands imports was re-exported to other countries, in particular to Germany.

Re-exported imports plus domestic production make the Netherlands the main supplier of cut flowers and foliage to other EU countries. In 1999 it accounted for €1.88b or 69%. Other major suppliers to the EU were Kenya (largest non-EU supplier), Israel, Colombia, Spain, Ecuador and Italy. Kenya's exports to the EU increased strongly between 1997 and 1999.

The largest importer of cut flowers and foliage from outside the EU was the UK with imports of €103m in 1999 followed by Germany (€68m) and Italy (€37.6m).

The leading suppliers of foliage to the main EU markets in 1999 are shown in Table 4.3.

The table shows that, with the exception of France, developing countries have a significant share of the EU market for foliage. In addition to the different range of plants available in developing countries, these are likely to be very competitive on costs.

TABLE 4.3: Leading suppliers of foliage to main EU markets, 1999.

EU MARKET	SOURCE OF FOLIAGE	% SHARE OF DC* IN IMPORTS
Netherlands	India (33%), Germany (14%), China (8%)	64
UK	India (28%), the Netherlands (22%), Colombia (12%)	53
Italy	India (29%), France (16%), the Netherlands (12%)	52
Germany	Italy (18%), he Netherlands (17%), India (17%)	44
France	The Netherlands (48%), Italy (14%), Spain (11%)	7

Source: Profound Ltd. and Lanning (2001).
**DC = Developing Countries.*

4.5 EU TRADE CHANNELS

Growers and traders exporting cut flowers and foliage to the EU send their products either to a wholesaler or to an auction (Figure 4.1).

There are 11 flower auctions in Europe and six of these are in the Netherlands. Four of the 11 flower auctions import flowers to complement their range. The Netherlands auctions in particular function as a pivot around which the international floricultural trade revolves. These auctions have 30% to 40% of market share in Europe and dominate the world trade and determine the prices. Wholesalers who distribute to local retailers or export to other EU countries buy products sold at the auctions. The huge volume of product going through these markets has meant that supporting and sundry items are also based there because of the presence of the wholesale buyers.

Products handled by import wholesalers are either sold directly to a wholesale buyer or are submitted to auction. Export wholesalers re-export the products to other EU member countries, where the flowers and foliage find their way to wholesalers and retailers.

4.6 RETAIL LEVEL

There is a difference across EU countries in the market shares of the distribution channels. Table 4.4 shows the distribution channels for a selection of EU countries including the UK.

Florists are the major distribution channels in most of the selected EU countries, except in the UK, where supermarkets account for a larger share of distribution than florists.

4.7 PRODUCTS

Dyke and Primrose (2002) conducted a survey of 19 UK buyers and found that the products shown in Table 4.5 have been experiencing the highest growth.

The specific woodland branches mentioned were willow, blackthorn and hazel. Buyers expressed preference was that they be supplied in their natural state and treated by the florist if necessary.

Both Dyke and Primrose (2002) and Profound Ltd. and Lanning (2001) report that buyers are seeking novelties to take over some of the market from the species preponderant at present. However, buyers were unable to be

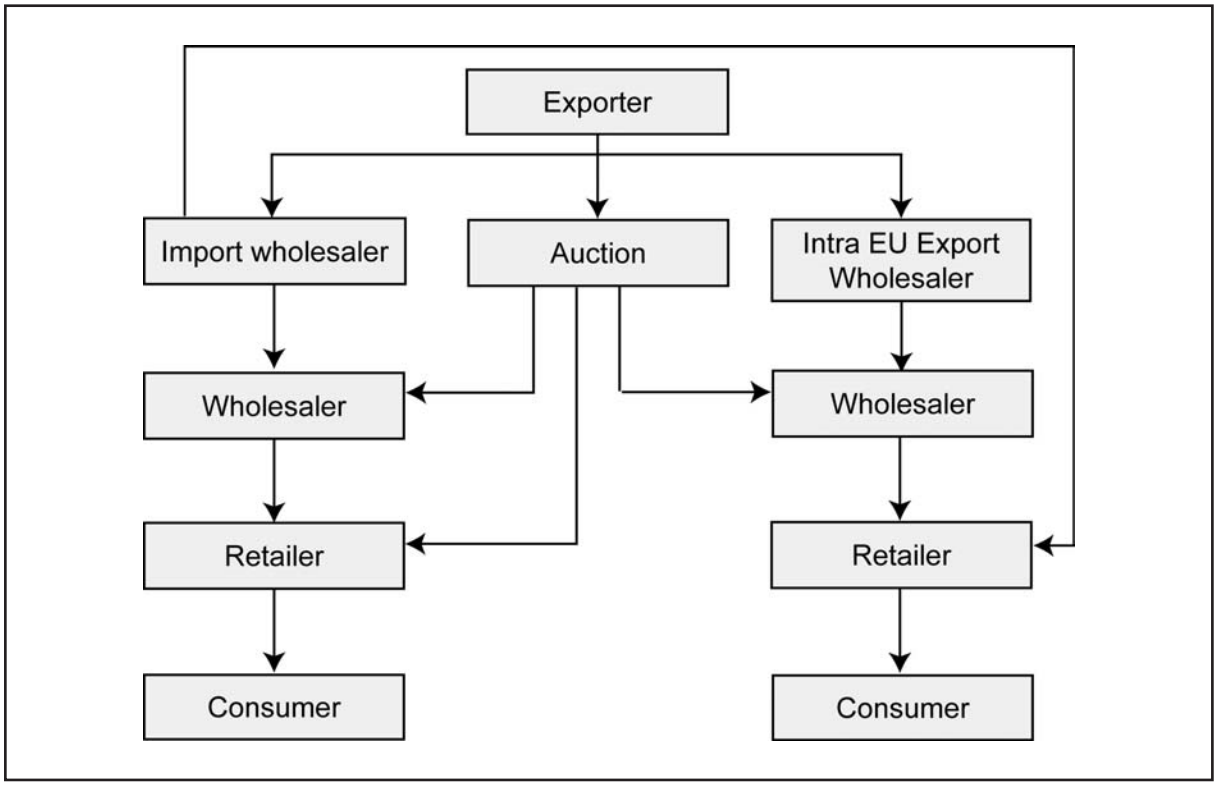

FIGURE 4.1: The distribution network of the cut flower and foliage trade in the European Union.

TABLE 4.4: Percentage of total sales of flowers and foliage at retail level in select EU countries, 1999.

COUNTRY	FLORISTS	SUPER-MARKET	MARKET/ STREET VENDORS	GARDEN CENTRES	OTHERS	TOTAL
Germany	64	10	8	-	18	100
Italy	80	2	15	2	1	100
France	58	16	9	8	9	100
UK	35	41	9	4	11	100
Netherlands	48	18	26	3	5	100

Source: Estimates from different publications (Horticultural Commodity Board).

TABLE 4.5: Foliage products experiencing growth.

PRODUCTS	PERCENTAGE OF BUYERS
Willow	52.6
Branches (willow, blackthorn and hazel)	42.1
Hazel	31.6
Ferns	26.3
Bamboo	21.0
Twigs	15.8
Moss	15.8
Holly	5.3
Ivy	5.3
Peat	5.3
Logs	5.3

specific about what these new products were.

The products mentioned by buyers as being in decline are shown in Table 4.6.

A survey of seven UK buyers on cultivated and wild cut foliage in 2003 was conducted by Kelly and Whelton (2004).

The most important foliage products used by these florists and multiples are shown in Table 4.7. Three of the 25 products for which there is known to be a big demand are rhodendron, eucalyptus and bear grass. Tesco alone has a demand for over 500,000 stems at Christmas of each of these products. Marks and Spencer use up to 15 million foliage stems per year and need as many as 10,000 stems per week over 8 weeks.

Three of the four buyers currently sourced material in Ireland. These were the three multiples, namely, Marks and Spencer, Tesco and Waitrose. Waitrose were critical of Irish produce and rated it from poor to average on a number of criteria as shown in Table 4.8. Tesco rated it average to good whereas Marks and Spencer were much more positive and considered it very good.

The general demand seemed to be for stem lengths over 50 cm long. Both Tesco and Waitrose stated they were not interested in variegated foliage. Waitrose were interested in foliage with fragrance, strong colour, good shape, berries and sticky buds.

For Marks and Spencer and three other florists interviewed birch and willow twigs painted (gold, lilac, and silver) were important foliage products.

Some of the florists interviewed emphasised that the demand in springtime was for catkins and flowers, in summertime for herbs and scented geranium and for hips and berries in the autumn time.

There seems to be potential for inclusion of natural products (mosses, bark, cones, essences etc.) in arrangements. All three multiples insist

TABLE 4.6: Foliage products experiencing decline.

PRODUCTS	PERCENTAGE OF BUYERS
Dried flowers	47.4
Large full head flowers	10.5
Moss	10.5
Flowers and foliage with bright colours	5.3
Carnations	5.3

TABLE 4.7: Cultivated and wild foliage products used by seven UK buyers, 2003/2004.

PRODUCTS	SOURCE	VOLUME NO. OF STEMS	COMMENTS
Abies	Ireland		
Arbutus			Good at Christmas (Waitrose)
Bear grass		700,000	Tesco demand only
Ceanothus			
Cotinus	Ireland		
Contorted willow			
Elaoagnus			
Eucalyptus	Ireland and Italy	500,000	Tesco demand only, Tome Browne & Co. demand 20,000 stems per month all year round
Golden conifer			
Hebe			> 60 cm length Waitrose
Hosta			
Inus	Ireland		
Ivies			Very important recently
Leatherleaf fern*			Constant demand
Ozothamnus	Ireland		
Peony rose		50,000/wk	Waitrose demand
Pinus			Good at Christmas (Waitrose)
Pittosporum	Israel		Gap in June/July (Waitrose)
Rhododendron		700,000	Tesco demand only
Rose hip	Ireland		
Ruscus	Israel		20,000 Tome Browne & Co.
Salix	Germany		Good at Christmas (Waitrose)
Skimmia			Good at Christmas (Waitrose)
Tree fern			Constant demand
Viburnum	Ireland		

** A product profile of Leatherleaf fern in shown in Appendix C.*

TABLE 4.8: Rating of Irish foliage by three UK multiples, 2003.

CRITERIA	MARKS & SPENCER	TESCO	WAITROSE
Perception of Irish Produce	Very good	Good	na
Grading	na	na	Falls short
Quality Service & Reliability	Very good	Good	Average
Range of Materials	Very good	Very good	Average
Added Value	Excellent	Poor to average	Poor
Pricing	Good	na	Fair

na = not available

that their suppliers comply with MPS and Eurogap protocols in relation to preservation of the environment.

Table 4.9 shows the results of market research from a select number of sizeable operators selling product into the key European markets. The results show that there is an interest in new products but these are not specified. Pittosporum, rhododendron and leatherleaf fern are identified as key stable products. Holly and ivy with berries, willow with catkins and cotoneaster are listed as growth areas. One of the buyers interviewed also stressed the importance of complying with MPS and Eurogap protocols in relation to environment preservation.

The view of the primary researcher who conducted the market survey reported in Table 4.7 to 4.9 was sought in relation to the potential of cultivated and wild product available in Ireland. The results are shown in Table 4.10.

Products including bog myrtle, corkscrew hazel, mistletoe and holly with berries were deemed to have good potential. Good quality forest mosses, larch, forsythia and Serbian spruce were considered to be of medium potential whereas Douglas fir, birch and mountain pine have low potential.

Lawson cypress, Norway spruce, Sitka spruce, western hemlock, Japanese cedar, common box, rowan, Weymouth pine that are also available in Ireland were not considered to have potential in the foliage market.

Kelly and Whelton (2004) state that there was reluctance by those interviewed to reveal data about the state of the market now or in the future.

4.8 MARKET REQUIREMENTS

The market requirement for novelties was also confirmed in earlier research conducted (Kelly 1997). The results are shown in Table 4.11.

There was general consensus by buyers from the six companies interviewed that the market was growing and that the market has a constant requirement for new ideas. Guaranteed supply of well-graded products was also emphasised in the interviews.

4.9 PRODUCTION FEASIBILITY

The main cultivated foliage species in Ireland are eucalyptus, heather, pittosporum and ozothamnus. Minor species include hypericum, paeony rose and viburnum. The main wild/forest species sold as foliage are rhododendron, pine, noble fir (*Abies procera*), bog myrtle, ivy and birch (Bord Glas 2002)

The Irish foliage industry started in 1993 and has grown steadily to over 150 ha in 2001. The value of production in 2001 was €1.8m of which €1.5m was exported. The main growing region for foliage in Ireland is the southwest because of its mild climate. However, production has increased in other areas of the south and south east including Cork, Waterford and Wexford.

The following paragraphs demonstrate that it is sustainable to harvest from trees over a period of up to 25 years.

In the Pacific Northwest, boughs are harvested from Pacific silver fir (*Abies amabilis*), subalpine fir (*A. lasiocarpa*), noble fir (*A. procera*), lodgepole pine (*Pinus contorta*), Western white pine (*P. monticola*), Douglas fir (*Pseudotsuga menziesii*), junipers (*Juniperus* spp.), incense cedar (*Calocedrus decurrens*) and western red cedar (*Thuja plicata*) (Thomas and Schumann 1992).

Boughs for use in Christmas decorations are normally harvested from October to early December. Boughs are clipped from young trees because older trees do not provide the type of branches required by the industry. Harvesting is usually carried out on a rotational basis, each tree being harvested every two to three years. Bough harvests of noble fir in western Washington can begin when the plantation is eight years old and can be sustained for up to 25 years.

In Denmark, a 21-year-old stand of noble fir, harvested for 13 years for boughs, gave annual yields of 1.8 kg per tree (Murray and Crawford 1982).

TABLE 4.9: Profile pf cultivated and wild foliage products used by Dutch buyers, 2003/2004.

	BLOOMINESS*	**HORTIFLOWER****	**HEIMBLUME*****	**METZ******
Established		>40 years	40 years	20 years
Turnover	€25m		€80m	€40m
Growth in T/O			+12%/an last 5 yrs	+20%
Employees	100			130
Markets	Germany, Norway, Russia, Poland	Swiss		German, Italy, England, France, Ireland
Sources	Austria, England, Italy, Ireland		Scot.	
Cost of foliage	€5m/annum	10 cents per stem of Leather leaf fern & salal	7 to 9 cents per stem	€2.8 m/annum
Products	Bouquets, other floral seasonal items	Bouquets		
Volume	30,000 bouquets/week	10,000/week to Swiss	120,000/week from Scotland of Rhododendron	
Interests	Foliage template with seasonal variation	Natural & woodland products Rosemary and herbs in summer Range extension	Pittosporum Rhododendron Leatherleaf Fern Salal	New items Novel species Exotic foliage Herbs in summer
	New products			
Growth areas	Wreath & pine rings		Cotoneaster Holly and ivy with berries Willow with catkins	Aspidistra
REQUIREMENTS				
Good quality	X	X		
Stable supply	X	X		
Bunches of known stem number	X			
Fair price	X			
30 cm	50%			
40 cm		80%		
50 cm			X	
55 cm	50%			
60 –65 cm			X	
Comply with MPS & Eurogap		X NB		
Freshness		X		X
Reliable service		X		

* *Packers/Bouquet Makers*
** *Packers/Bouquet Makers*
*** *Wholesalers/Importers/Exporters*
**** *Suppliers to Florists*

TABLE 4.10: Expert assessment of cultivated and wild foliage available in Ireland, 2004.

FOLIAGE	COMMENTS	POTENTIAL
Bog myrtle	Competes well with other twig types. Its slight fragrance and plenty of side shoots make it attractive	Good
Mistletoe	Very popular, but needs a marketing boost to put it into the 'must have'.	Good
Corkscrew hazel	Its strong branches have a role in giant arrangements (e.g. reception areas, hotels, street fairy light displays, etc.).	Good
Holly	Berried selections are and will be important. Variegated ones hold a certain charm.	Good
Serbian spruce	The branches of younger trees are very attractive.	Medium
Forsythia	Is marketable in flower bud state. A good packing system is required to overcome a problem of disturbance in transport. It is certainly used in the market and there are currently many Dutch suppliers.	Medium
Larch	The larch I saw were metre-long branches heavily coated with lichens. These were selling at Christmas. Early soft-green foliage is definitely sought. There may be shelf-life problems.	Medium
Forest mosses	The market is well supplied with product now, but the quality leaves a lot to be desired and there may be opportunity for good quality product.	Medium
Mountain pine	This might be of interest in small hand or table arrangements.	Low
Birch	There are vast quantities from central Europe, Britain and Ireland arriving in European markets now – mostly for painting. Consequently the market may soon become over-supplied.	Low
Douglas fir – Scots pine	May have innovative arrangement potential. Difficulty is that to make a significant break into this market, you have to dislodge some of the older habits in foliage usage and prove you have a better product.	Low

Source: Personal communication with Jim Kelly.

TABLE 4.11: Themes from interviews with key market informants in relation to foliage.

	LING ARDEN	FLOWER PLUS	SUN FLORA	GEEST	SUPERIOR	ZWETS LOOT
Uniform, consistent and well graded (incl. Wild)	✔	✔	✔	✔		
Market needs new ideas	✔	✔	✔	✔	✔	✔
Volume is guaranteed	✔	✔	✔		✔	
Market is growing	✔	✔	✔	✔	✔	✔
More discerning market place and less price driven	✔	✔				
Only 55 – 60 cm lengths required	✔				✔	
Full top appearance	✔		✔			
Sensitive to chemical usage	✔		✔	✔	✔	
Traceability and ecolabelling			✔			
Supermarket share is increasing				✔	✔	✔

Trees that are grown for foliage tend to not be suitable for timber due to their management. Trees for foliage are encouraged to have a branchy habit and a low crown.

4.10 CONCLUSIONS

There is a very definite and sizeable European market for cultivated and wild foliage that is available for harvest in Ireland. This market is strongly inter-connected with a market which is more than ten times the size of the foliage market.

Some of the leading UK multiples rate Irish foliage product as very good whereas others rate it as at, or below, average.

Pittosporum, rhododendron and leatherleaf fern are identified as key stable products and there is strong demand for large quantities by the multiples. Holly and ivy with berries, willow with catkins and cotoneaster are listed as growth areas.

Other products deemed to have good potential include bog myrtle, corkscrew hazel and mistletoe.

4.11 FOLIAGE RESEARCH PROGRAMME

National Strategy

The market information suggests that there are opportunities for the development of foliage as a sub-sector of forestry. To realise this a strategy needs to be put in place. In this strategy, technical research, market research and enterprise development need to be developed in a co-ordinated way. The following recommendations are some of the elements of this proposed strategy:

General Principles

Research needs to be linked to commercial realities and to focus closely on areas capable of significant growth.

While research needs to be conducted in association with enterprises in the field, procedures need to give equal access to all enterprises to the findings from such research.

Product

Preparation of an inventory of locations and estimated volumes of selected species is now required.

Furthermore, research into the design and ways of adding value to the current product must be undertaken.

Linkages

Implications for wood quality of removing foliage should be investigated.

Husbandry

Husbandry needs to be adapted to the development of foliage. In Irish forests, branches are too green. Foliage requires to be more blue-coloured since it is more sought after in the market.

Potential solutions to eradicate the problem of needle necrosis in foliage plantations must be investigated as this problem leaves many trees and shrubs useless for foliage purposes.

Identify and specify the most suitable type of fertiliser programme (use of compounds, liquids, etc.) for growing.

Identify the optimum spacing and timing of respacing.

Identify performance of individual species in terms of shelf life, harvest period etc.

Identify the optimum cutting regime, specifically, whether it is better to cut a little every year, or at longer intervals.

Harvest methods and the most effective way to harvest as the crop grows should be investigated.

Market

There is need for general market information, which is independent and keeps pace with the rapid rate of change in prices, and demand and supply.

There should be an investigation into the possibility of producing in Ireland many of the plants currently being imported to Europe from

South America and Africa, as well as the potential for other species such as birch, western hemlock and others.

Logistics

Foliage is transported back and forth across Europe. Ways of improving the logistics associated with this need to be examined.

5. Tourism

5.1 INTRODUCTION

This section examines the market potential for forestry-based tourism. The general recent trends in the tourism industry at world, EU and Irish levels are first examined as a backdrop to expected future trends in key tourist markets relevant to Ireland. This is followed by a review of a number of award-winning case studies of forest-based tourism products throughout Europe, including Ireland. The results of a recent feasibility study conducted in relation to a forest site in the mid west of Ireland into setting up and running a commercial enterprise providing services similar to those provided in European centres are reported. General issues hindering the development of markets and strategies for overcoming them are reported in addition to a research programme.

5.2 MARKET

Between 1970 and 1993 international arrivals more than trebled from 165 million to 500 million. Within the same time period, international tourism receipts experienced an 18-fold increase from $17.9b to $324b. It is forecast that the number of international arrivals will reach 964 million by 2010 (WTO 1998).

Although Europe continues to maintain its overall dominance as a tourist destination it has experienced a significant loss of 10.2 percentage points in its share of arrivals since 1975. It is forecast that Europe will remain the largest receiving region up to the year 2020, though its below global average rate of increase will result in an overall decline in market share. The more mature European destinations will need to continuously strive to seek product and market differentiation to avoid the spread of a tired image in generating markets. European tourism will continue to be boosted by increased tourism development and marketing in the former Soviet bloc countries of Eastern Europe. These countries have the potential to become Europe' tourism tigers in the period to 2020.

Overseas tourist visits to Ireland increased by 6% in 2000 to 6.3 million – the ninth successive year of growth. Since 1990 tourist visits have grown by 103%. Britain is Ireland's premier source of tourism and has been so for a long time. The number of British tourists doubled from 1.5 million in 1988 to 3.2 million in 1998. Six out of 100 British holidaymakers come to Ireland. In 2000 tourist visits from Britain grew by 2%, with those from mainland Europe growing by 10%.

Mainland Europe is the second biggest market, particularly Germany, France, Italy and Netherlands. More than 90% of the North American tourists come directly from the USA to Ireland. In 2000 visits from North America grew by 11%, while growth from other long haul destinations increased by 9%.

Future trends in main markets relevant to Ireland

Table 5.1 sets out where growth in demand is expected in terms of tourism products by socio-economic group and market.

The five tourism products where there is a potential link between forest tourism and the products likely to experience growth in our main markets are:

1. Environmental;
2. Wildlife;
3. Culture;
4. Learning;
5. Health.

5.3 FOREST-BASED TOURISM PRODUCTS IN EUROPE

Appendix D contains short case studies of a number of tourist enterprises throughout Europe that are located in forests.

TABLE 5.1: Growth in demand by tourism product and main market.

	UK	GER	FRA	ITA	NETH	USA
Young People/Young Couples						
Beach	✔			✔	✔	
Winter sun		✔	✔	✔	✔	
Cruises	✔		✔		✔	✔
Theme parks	✔	✔		✔	✔	✔
Event related	✔				✔	
Learning			✔		✔	
Wildlife		✔			✔	
Cultural		✔			✔	
Multi city tours		✔		✔		
Self driving tours		✔		✔	✔	
City tours		✔				
Special Interest		✔	✔		✔	
Sports related	✔		✔		✔	
Skiing			✔	✔	✔	
Diving	✔	✔	✔	✔	✔	
Activities					✔	✔
Walking				✔		
Trekking		✔	✔	✔		
Families						
Beach				✔		
Winter sun		✔		✔		
Cruises	✔		✔	✔	✔	✔
Theme parks	✔	✔		✔	✔	✔
Wild life	✔	✔				
Multi city tours		✔				✔
Self-drive touring	✔	✔			✔	✔
City touring	✔				✔	✔
Sport related	✔	✔	✔			
Skiing				✔		
Diving					✔	
Walking			✔			
Trekking		✔				
Health					✔	
Independent Family Members						
Winter sun		✔		✔		
Cruises	✔			✔	✔	
Theme parks		✔			✔	
Learning					✔	
Wildlife		✔			✔	
Cultural	✔				✔	✔
Multi city tours	✔	✔				
City touring	✔	✔			✔	
Coach touring					✔	
Special interest	✔	✔	✔			✔
Sport related		✔	✔		✔	✔
Skiing					✔	
Diving		✔		✔		
Walking	✔	✔	✔			
Trekking			✔		✔	
Golf	✔				✔	
Event related		✔			✔	✔
Health	✔		✔	✔	✔	
Retired People						
Beach			✔			
Winter sun	✔	✔		✔		
Cruises	✔		✔	✔	✔	✔
Event related	✔	✔			✔	
Learning		✔	✔			
Wildlife	✔	✔				

	UK	GER	FRA	ITA	NETH	USA
Cultural	✔	✔	✔		✔	✔
Multi city tours	✔					
Self drive touring	✔	✔				
City touring	✔					
Coach touring	✔				✔	
Special interest	✔	✔	✔	✔		✔
Activity						✔
Walking	✔				✔	
Trekking	✔	✔	✔	✔		
Golf	✔		✔	✔	✔	
Environmental			✔			
Health	✔	✔	✔	✔		✔

Source: WTO.

Below are number of key features and critical success factors extracted from these case studies.

The parks and centres are located approximately 100 km from major population centres such as London, Manchester, Birmingham and Lisbon.

Visitor Numbers

The number of visitors per annum ranges from 14,500 to 60,000 depending on the facilities. Those with some or all of the following facilities have the higher number of visitors.

1. Swimming pool/tropical water complex;
2. Restaurant/tea room;
3. Tennis court;
4. Conference/exhibition centre;
5. Volleyball;
6. Mini golf.

Activities

Visitors attending these centres engage in the following outdoor activities:

Bird watching tours;
Fallow deer and boar hunting;
Range field archery;
Woodland assault;
Trekking;
Fishing;
Sight seeing.

Environmental education products on offer include:

Spring bluebell walk;
Autumn fungus hunts;
Children's activities - bug hunts, teddy bears' picnics, barbeques and campfires, seasonal spotter sheets, wooden adventure playground;
Self guided woodland trail with discovery sheets.

Other products include:

Wood and wood products;
Christmas trees 'dig your own';
Conferences;
Mini train drive;
Tearoom;
Exhibition.

Markets

The following markets were identified in the case studies:

Schools market (environmental education);
Short breaks;
Family packages (including outdoor activities).

5.4 TOURISM AND RECREATION USE OF IRISH FORESTS

Ireland has a number of existing tourist and recreation parks similar to those described at locations throughout Europe. These include:

- Trabolgan Holiday village situated on a 54 ha seaside site in East Cork;
- Lough Key Forest Park owned and operated by Coillte;
- Killykeen Forest Chalets, in Cavan, which is also owned and operated by Coillte.

Trabolgan is similar to the European centres in that it is 47 km from Cork city and airport with easy proximity to the city's ferry services to France and Britain. Facilities offered include an indoor sub-tropical swimming pool, 18 hole par-3 golf course, crazy golf, sports centre playgrounds and a range of adventure activities. Accommodation consists of 172 3-bedoomed holiday houses located in woodland setting.

Lough Key is located in 350 ha of parkland. Facilities include service buildings containing a recreation room, toilets, showers and launderette. Water-based activities include swimming, wind surfing, water skiing and sailing. There is also a nature trail and bog garden. Accommodation includes a caravan and camping area within the park.

Killykeen Forest Park comprises 200 ha of mixed woodlands on the shores of Lough Oughter, Co Cavan. On-site facilities include an equestrian centre, angling, tennis court, children's play area, boat and bicycle hire, forest walks and trails. Accommodation includes self-catering chalets and single storey log cabins.

While the facility is well run and enjoys high levels of occupancy the return on investment is low considering the scale of the investment.

General Use of Forest for Tourism and Recreation

Irish forests provide opportunities to engage in a range of outdoor pursuits such as walking, orienteering, biking, scrambling, pony trekking and hunting including (deer shooting and fishing).

A recent survey of users of three Wicklow forests (Wicklow Uplands Council) shows the reasons why people visit woodland sites (Table 5.2).

The most important reason for people using woodland sites was to walk and take some fresh air and exercise.

Data on the current use of forests for tourism and recreation at national level are not readily available. Bord Failte do not record statistics on the numbers of tourists in Ireland participating in hunting or the numbers visiting forests on whom a charge is levied.

Clinch (1999) estimated that 42% of Irish households generated 7.7 million visits to forests in 1998. He found that 31% of foreign tourists generated 773,850 visits to forests or forest parks during their stay in Ireland. The total number of visits to forests is estimated to be 8.5 million per annum.

The survey of forest users by Wicklow Uplands Council conducted in 2002 found that 4% of the users were holidaymakers. Although the percentage is lower than the estimates made by Clinch, the two may be consistent as the Wicklow survey was conducted in March which is outside the main tourist season of June to September.

Clinch reported that there was 142,000 day visits to Coillte Forest Parks for which a charge was levied in 1993. Statistics from Bord Failte show that the number visiting attractions in forest and forest parks was 199,500 in 2000. This indicates that only a very small percentage (2-3%) of visitors to forests pay a fee.

Brennan estimated the revenue generated from visits to Coillte Parks in 1994 to be €339,090 and the costs, excluding public liability claims, to be €670,000 (Clinch 1999). Charges are levied at some Coillte parks seven days per week during the peak tourist season of July and August and otherwise on main public holidays and at weekends. Therefore, the use of Coillte forests for tourism and recreation is subsidised to the extent of 50%. Even well-

TABLE 5.2: Reasons for visiting three woodland sites in Wicklow, March 2002.

REASON	PEOPLE	% RESPONSE
Walking (long distance)	110	67
Fresh air and exercise	77	47
View sculpture (1 of 3 sites)*	17	35
Woodland experience	42	25
Relax and picnic	24	15
Dog walking	24	15
Watch wildlife	16	10
Mountain biking	4	2
Cycling	2	1

** Devil's Glen.*

known and visited centres such as Lough Key and Avondale forests operate at a deficit.

In addition to admissions, visitors to forests make other local purchases. The Wicklow Uplands Council survey found that the average amount of money spent locally by forest users was €4.45. Based on Clinch's estimates of the number of visits to forests for recreational purposes (8.5 million) the expenditure within the local economy is estimated to be €37.8m per annum.

5.5 WALKING

On average 252,000 overseas visitors came to Ireland for hill-walking or cross-country walking each year between 1998 and 2002. Of these, 186,000 (71%) were holiday-makers.

The total spend in Ireland by visitors engaging in hiking/cross-country walking in 2002 was €161m. This equates to €735 per visitor.

The breakdown of spend by holiday makers engaged in walking/hiking in Ireland is shown in Table 5.3.

Most of the expenditure (approximately 60%) is on food, drink and accommodation.

The regions visited in 2000 and 2001 are shown in Table 5.4.

The south west and west were the two regions where most holiday-makers came on walking holidays.

The type of walks engaged in by overseas visitors are shown in Table 5.5.

TABLE 5.3: Breakdown of spend by holidaymakers engaged in hiking/walking, 2000 and 2001.

	2001	2000
	%	%
Bed and Board	25	24
Other Food and Drink	34	34
Sightseeing/Entertainment	8	9
Internal Transport	12	11
Shopping	18	18
Miscellaneous	4	4

Up to one third of overseas tourists (86,000) who engaged in walking/hiking are likely to have walked in forests based on the type of walks used (Table 5.5). This is consistent with the estimates (31%) made by Clinch as shown above. Based on Clinch's other estimates approximately 2,000 (2–3%) of these overseas visitors using the forests may have paid a fee to do so.

Accommodation Type

The type of accommodation used by overseas tourists who engaged in walking is shown in Table 5.6.

Guest houses/B&Bs, hostels and rented accommodation were the three main types of accommodation used by walkers.

TABLE 5.4: Regions where overseas holidaymakers engaged in walking and equestrian activities, 2001 and 2001.

	WALKING		EQUESTRIAN ACTIVITIES	
REGION	**2001**	**2000**	**2001**	**2000**
Dublin	6	4	12	11
Midlands/East	17	18	14	14
South East	6	6	6	7
South West	41	48	22	23
Shannon	14	16	18	15
West	32	31	22	22
North West	11	10	5	8

Source: Bord Failte various fact sheets.

TABLE 5.5: Type of walks engaged in by overseas tourists, 2002.

TYPES OF WALKS	%
Walking on roads	33
Walking on footpaths	47
Cross-country walks	30
Hill walks	34
Waymarked ways	19
Other	12

Source: Failte Ireland (personal communication with Brian Maher).

TABLE 5.6: Percentage distribution of tourists on holidays in Ireland engaged in walking and equestrian acitivites by accommodation type, 2000 and 2001.

ACCOMMODATION TYPE	WALKING		EQUESTRIAN ACTIVITIES	
	2001	2000	2001	2000
Hotels	9	8	13	13
Guesthouses/B&Bs	36	35	35	37
Caravan/Camping	9	10	4	6
Rented	14	15	16	13
Friends/Relatives	10	7	14	17
Hostels	15	15	5	6
Others	8	10	13	9

Length of Stay (Nights)

The length of stay for overseas tourists engaged in walking and equestrian activities is shown in Table 5.7.

More than 70% of walkers spent between one and two weeks on holiday. Forty percent spent up to two weeks and 30% one week. The opposite situation occurred for equestrian activities whereby 40% spent one week and 30% up to two weeks.

More than one third (36%) of overseas visitors engaged in hiking/walking walked up to 5 km on a typical days walking. The remaining 64% typically walked more than 5 km. A guide accompanied one in ten on their walk.

Kerry, Wicklow and Ballyhoura Waymarked Ways

There are presently 31 official National Network waymarked ways open in 24 counties, offering over 3,000 km of waymarked walking routes (Irish Sports Council 2003).

A research study conducted by DIT (1999) investigated the profiles of users of three waymarked ways (Wicklow, Kerry and Ballyhoura) and the contribution made to the

TABLE 5.7: Length of stay for overseas tourists engaged in walking and equestrian activities in 2000 and 2001.

NIGHTS	WALKING		EQUESTRIAN ACTIVITIES	
	2001	2000	2001	2000
1 – 3	4	3	5	5
4 – 5	9	7	13	13
6 – 8	31	33	40	37
9 – 14	40	40	26	31
15+	16	17	16	15
Length of stay	12	12	11	10.5

local economies by users. The data collected in 1997 and 1998 show the contributions (excluding day walkers) were €35.43 per walker in Wicklow and €50.89 in Kerry. Approximately one third of walkers in Kerry and Wicklow spent no money in a 10 km range of the route, these were mainly day walkers. For the Kerry way the contribution to the local economy was between €854,079 and €1,203,209 during the months of March to September. Ninety-five percent of this came from overseas visitors. The corresponding figure for Wicklow was €281,032. The lower figure for Wicklow is partly due to the higher proportion of day walkers relative to Kerry and the lack of data on the peak activity in the summer months. The total distance of the Wicklow Way is 132 km and 214 km for the Kerry Way.

Overseas visitors spent 3.4 to 3.6 days walking in Wicklow, while in Kerry they walked 6.6 days on average. This contrasted with 1-1.5 days for Irish walkers in Wicklow and 1 day in Kerry. Almost 85% of those interviewed in Wicklow walked for a day or less. This fell to 62% in summer; 66% of walkers on the Kerry way walked for just one day.

The average length of walk in Kerry at 16.5 km exceeded Wicklow (13.4 km) by 3 km.

Where accommodation was sought B&B was the most frequent type used (35% of those staying in Wicklow and 40% of those staying in Kerry).

Local knowledge and word of mouth were the most important ways in which people learned of the existence of the route they were using. Guides to the ways were used by 44% of summer walkers in Wicklow and 25% in Kerry.

5.6 EQUESTRIAN ACTIVITIES

The number of overseas visitors who engaged in equestrian pursuits while in Ireland is shown in Table 5.8.

The number has been constant (average of 61,000) between 1998 and 2001 with a fall in 2002. More than half (54%) of those engaged in equestrian pursuits involve trekking. No data are collected as to what number or percentage of these use trails in forests.

The total spend by visitors engaging in equestrian pursuits in 2002 was €40m or €800 per person. The breakdown of spend is shown in Table 5.9.

Food, drink and accommodation account for nearly 60% of total expenditure by holiday-makers engaged in equestrian activities

TABLE 5.8: Number of overseas visitors engaged in equestrian pursuits, 1998 to 2002.

	1998	1999	2000	2001	2002
			'000		
Britain	25	28	27	28	18
Mainland Europe	21	21	23	21	18
North America	14	13	13	13	12
Other areas	3	2	3	3	3
Total	62	63	65	65	50

TABLE 5.9: Breakdown of spend by holidaymakers engaged in equestrian activities, 2000 and 2001.

	2001	2000
	%	%
Bed and Board	25	24
Other Food and Drink	34	34
Sightseeing/Entertainment	8	9
Internal Transport	12	11
Shopping	18	18
Miscellaneous	4	4

Accommodation Type

The type of accommodation used by overseas tourists who engaged in equestrian activities is shown in Table 5.10.

Guesthouses/B&Bs, and rented accommodation were the main types of accommodation used by those engaged in equestrian activities. This preference is very similar to that shown for walkers.

Length of Stay (Nights)

The length of stay for overseas tourists engaged in equestrian activities is shown in Table 5.11.

Forty percent of people engaged in equestrian activities spend one week and 30% up to two weeks in Ireland. This is the opposite situation that exists for length of stay for walkers.

5.7 MOUNTAIN BIKING

No statistics are available in Ireland on the participation in mountain biking either domestically or by tourists. In recent years there has been a major growth in the development of mountain bike trails in Wales and there may be an opportunity for this niche product in Ireland, particularly in close proximity to urban centres or traditional tourist destinations.

Woodlands extend over 269,000 ha in Wales, representing 13% of the land area. The policy of the Forestry Commission is to provide free access for recreation on foot to those forests it manages. This policy has been extended to mountain biking and horse riding. The commission manages about 130,000 ha in Wales and approximately 82% of this resource is available for public access.

It was estimated that there were 11 million visits to woodlands and forests annually by people living in Wales. Three percent of all people making a day visit went to a woodland or forest during the year.

Welsh Case Study – Mountain Biking

Since the mid 1990s there has been a major development by a wide variety of interests in

TABLE 5.10: Percentage distribution of tourists on holidays in Ireland engaged in equestrian by accommodation type 2000 and 2001.

ACCOMMODATION TYPE	EQUESTRIAN	
	2001	2000
Hotels	13	13
Guesthouses/B&Bs	35	37
Caravan/Camping	4	6
Rented	16	13
Friends/Relatives	14	17
Hostels	5	6
Others	13	9

TABLE 5.11: Length of stay for overseas tourists engaged in walking and equestrian activities in 2000 and 2001.

NIGHTS	EQUESTRIAN	
	2001	2000
	%	%
1 – 3	5	5
4 – 5	13	13
6 – 8	40	37
9 – 14	26	31
15+	16	15
Length of stay	11	10.5

the establishment of cycling tourism products in Wales. Cycling tourism products cover a wide range including quiet road cycling, dedicated cycling lanes as well as mountain biking tourism.

The Welsh National Cycle Route first opened in 1996, other routes have been developed since. The current strategy envisages the development and promotion of four key cycle tourism products for Wales (Wales CYMRU 1999), namely,

1. Mountain biking;
2. Cycle breaks;
3. Family cycling;
4. Cycle touring.

There are very different cycling activities undertaken in each of the cycling products.

Mountain biking is where either purpose-built mountain biking trails or forest tracks and right-of-ways networks are used. There are two main segments to the mountain bike market. Occasional users are predominantly males in their 20s and 30s who go riding once a month. They look for purpose built and signed mountain bike trails. Mountain biking enthusiasts are also predominantly male and of an older age profile than the occasional mountain biker. They will plan their own routes and seek out trails using right-of-ways. No information exists to quantify the size of the UK mountain biking market and no information exists to quantify the size of the various segments of the market. Estimates have been made that cycle tourism is worth £18.25m to Wales.

Forest Enterprise has developed a world-class mountain biking centre at Coed y Brenin in Snowdonia and has plans for four more mountain biking centres in Wales. The Cyclists Touring Club has developed five new mountain biking routes from Llandrod Wells and is working closely with Forest Enterprise to develop further off–road routes on Forest Enterprise land and the right-of-ways network in other parts of Wales.

The Forest Enterprise Coed y Brenin site is geared particularly towards the needs of occasional mountain bikers, the new centres will also be targeted at this segment.

The centres appear to be attracting both day and weekend mountain bikers. The less rugged terrain of south Wales does not attract the same level of demand as the more rugged terrain of north and mid Wales.

In addition to developing the centres, Forest Enterprise is active in promoting its mountain biking trails:

It has succeeded in getting:

- 15–page feature in a mountain biking magazine;
- BBC 2 coverage of the launch of its first centre within its features *Visions of Snowdonia*;
- A national leaflet covering cycling in forests in Great Britain;
- A detailed trail leaflet for sale at each of its centres.

The product requirements of occasional mountain bikers are:

- Purpose-built and signed mountain bike trails;
- Mountain bike hire;
- Car parking;
- Cyclist friendly accommodation (particularly camp sites and self catering).

The product requirements of mountain bike enthusiasts are:

- Information on where to go mountain biking;
- Car parking;
- Cyclist friendly accommodation.

Cars are the primary means of access by cycling tourists in Wales, hence the requirement for safe off-road car parking.

No specific research has been done on the mapping requirements of cycle tourists to Wales. However, other research in the east of England gives some insight as follows:

Maps need to:

- Be OS based;
- Contain one route per map, possibly with short cuts;
- Fold to fit into map cases;
- Include simple route directions adjacent to the route map;

- Include brief details of places to visit;
- Include lists of refreshments stops with telephone numbers;
- Include essential information about the route such as length, riding surface, description of terrain, where to car park.

A key product requirement for cycling holiday visitors is cyclist friendly accommodation, providing safe overnight cycle storage and drying facilities.

Other key product developments requirements include routes from centres which provide facilities for cyclists, such as parking, cyclist friendly accommodation, cycle hire and cycle repair.

Destinations offering strong competition in the cycle tourism market include Scotland (Dumfries and Scottish borders), Switzerland (3,500 km of cycle routes), Netherlands (strong cycle culture), Germany (the Romantic Road and Three Castle Routes), Austria (the Donauradweg) and the Loire valley in France.

5.8 GAME

The National Association of Regional Game Councils has approximately 23,000 members in 900 clubs who participate in hunting for game. An additional 3,000 tourists come to Ireland to hunt for game and create a demand for a range of services in the tourist industry. These members participate in a wide range of sports and shooting of game, which is not strongly linked to forest. Deer hunting is one sport where there is a strong link between the forest and the sport.

In Co Wicklow there are an estimated 20,000 Sika deer in all the forest areas. All deer species are protected under the Wildlife Acts, 1976 and 2000 and a licence is needed for culling. The deer hunting season opens in September and runs until the start of January. In the 2000–2001 season over 4,300 Sika deer were culled in Co Wicklow.

The estimated expenditure on deer hunting in the Republic of Ireland by visitors and residents in 1995 was €1m (Corbally *et al.* 1997) or €1.3m in 2002 prices (inflated using the Consumer Price Index).

5.9 OUTDOOR ACTIVITY CENTRE - IRISH FEASIBILITY STUDY

A feasibility study into setting up and running as a commercial enterprise an outdoor activity centre based in an Irish forest setting was recently conducted by a consortium including Limerick County Council, Coillte and Shannon Development.

The feasibility study investigated the provision of a range of services in the form of an outdoor adventure centre based at a forest site and park in the mid west of Ireland. The site was an excellent location in close proximity to Limerick city and also in close proximity to a popular tourist route from Kerry to Connemara.

The study examined the feasibility of setting up and running a business on a fully commercial basis. The concept was to have a low level charge for part of the site, to include car parking, picnic tables and barbeque areas. Admission to the second part of the site would incur a higher admission rate.

Market

Customers could use the centre for a range of outdoor pursuits such as:

Cycle on a BMX trail;

Walking ;

Orienteering;

Events;

Fishing;

Play area;

Climbing frame etc.;

Range of tree top houses;

High wires and a range of similar facilities;

Environmental related activities.

The study forecasted visitor numbers up to 95,000 in the first section and 75,000 in the second section and participation on a progressive basis reaching the above targets after 3.5 years. The site was ideally located and in excellent condition. All other aspects of the project were deemed feasible to develop and run. However, the project was found not to be

financially feasible, notwithstanding the fact that the proposed development costing €4m was to open almost debt free.

5.10 ISSUES HINDERING DEVELOPMENT

Information

Data on various tourist activities (walking, equestrian, mountain biking, outdoor activity pursuit centres, game and other forest-based activities) are not available.

Insurance

The aforementioned feasibility study highlighted the cost of insurance and the cost of staff as constraints on development of centre based activities.

The cost of public liability insurance is a major constraint on using forests for tourists or recreational purposes, regardless of the provision of facilities, since the forest owner could be liable for injuries. Coillte had a contingent liability of €292,000 for the period 1986 to 1999. The introduction of the Occupiers Liability Acts 1995 and 1997 offer some protection for landowners who are not covered by insurance. While a legal view suggests that a farmer who erects warning signs and disclaims liability should be able to defend himself against claims, this has not been tested in the courts and therefore the situation is somewhat uncertain (McHugh and Gallagher 2004). Landowners may find that they are responsible for people who are using their lands for recreation or indeed to harvest wild fruits and foliage. Consequently insurance cover is still required.

Infrastructure

The use of forests for tourism and recreational purposes requires building infrastructure such as paths, stiles, car parks etc. These facilities have to be maintained and developed and thus there is an ongoing maintenance cost arising from wear and tear and also from damage caused by users. Conflicts may arise between different users of forests, such as bikers and walkers, and this in turn may require setting up different trails and types of infrastructure. Furthermore, there may be a cost in terms of management time to resolve these conflicts. The Wicklow Uplands Council survey found that most forest users believed that motorised sports, mountain biking, pony trekking and paintball activities should be confined to areas within the forests, which adds to the cost of development of infrastructure.

Open Forest Policy

Another obstacle to developing a market around forest-based tourism and recreation is that there has been a culture of using the forest for free. Coillte promotes an Open Forest Policy which it inherited from the Forest Service. This policy allows free access to the public to all state owned forests for walking. Some other activities, such as pony trekking and collection of plants for use as foliage are carried out under licence. In Wicklow alone there are 18 official forest car parks and eight adjacent picnic sites maintained by Coillte.

Conflicts

Another constraint on using forests for tourism and recreational purposes is the conflict between managing forest sustainability and use by people.

Seasonality

The tourist season in Ireland is very seasonal and the window of opportunity for most of the country is the three months of June, July and August. For well-established tourist destinations such as Kerry the season starts in Easter and runs until the end of September.

5.11 CONCLUSIONS

The overall picture is that forestry plays a very important role in tourism and particularly recreation in Ireland. Forests are part of the infrastructure that supports tourism and outdoor recreation. They provide trails for walking,

biking, horse riding etc. The set up of the trails, stiles, signs, car parks is done by Coillte in Ireland and Forest Enterprise in Wales. However, the overall potential to generate income directly from forest-based tourism activities is poor. Opportunities arise for those who provide food, drink and accommodation, and especially for those who provide facilities catering for special needs of people engaged in outdoor pursuits. The Welsh experience shows that world class standards are needed in order to be competitive in attracting tourists. If Coillte on its own or in association with tourism interests were to provide facilities for mountain biking similar to Forest Enterprise in the UK then there would be potential for private entrepreneurs to generate income in the provision of related services.

There may be other niche opportunities within well-established tourist destinations and some sites might be attractive for holiday homes. Farmers afforesting lands should consider the option of tourist accommodation and related services in the context of their own situation and local market.

5.12 RESEARCH PROGRAMME

Product Development

Investigation of best practice in relation to development of forest parks overseas (UK, Netherlands etc.)

Analysis of patterns and linkages between different types of uses and the implications for services such as refreshments, toilets, and environmental management.

Monitoring of the changing needs of users and customers and supply of information to forest managers.

Research and development of materials to maximise the potential for educational tourism in forestry by linking activities and subjects related to forestry and the natural environment to the curriculum at primary and second school level.

Profile of Users

Compilation of information relating to people who use the forest for tourist and recreation purposes.

Benefits and Impact

Development of a model showing the likely benefits to the local area from the development of forest tourism infrastructure.

Inter-sector Conflicts

Investigation of how forest managers can achieve the provision of services to people engaged in tourism and recreation in a way that is compatible with sustainable forest management.

6. Alternative Healthcare

6.1 INTRODUCTION

In the last ten years there has been a great increase in the popularity of alternative healthcare. Products formerly sold in small specialist shops, often without licensing or control, have now become mainstream consumer products, manufactured by large companies and sold through supermarket outlets. These products include health foods as well as medicines.

Many medicines are derived from plants that have active ingredients. Where it is possible, the active ingredients in plants are synthesized such that dose and quality can be standardised. However, in many plants it is not possible to synthesise the naturally found ingredients and the whole plant continues to be used.

Pharmaceutical companies conduct research into many plant species for active ingredients. Research into cultivation of some of these plants is also ongoing in UK universities. Many of these plants can grow inside and outside of woodland settings (Dyke and Primrose 2002).

Herbal medicines, as distinct from pharmaceuticals, are produced directly from whole plant material. Consequently they contain a range of active ingredients rather than single or isolated active compounds. Unlike pharmaceutical products, in many instances herbal medicines have not been scientifically proven. However, they have long histories in traditional uses, which may be accepted as a guarantee of safety and efficacy.

Table 6.1 shows the claimed activity of top selling herbal medicines.

Herbal medicines represent a large range of product types. These include products sold as raw herb (dried or fresh) and others that are processed to varying degrees including tinctures (an infusion of herbs in alcohol) and extracts (greater concentration of the active materials in the plant).

Medicinal and aromatic plant material is obtained from plants growing in the wild and also from cultivated stock. Material obtained from wild plants remains very important because many wild plants have proven difficult to cultivate, the quantities required are small and the quality of the wild material is considered superior to the cultivated.

6.2 MARKET

Trade in herbal medicines is estimated at $9b annually. The EU market for licensed herbals is estimated at around $1.1b while estimated sales of herbal remedies, dietary supplements and functional foods combined exceed $7.5b (Commonwealth Secretariat 2001). The average annual growth rate for herbal medicines in the period 1985 to 1995 was 10%.

There are an estimated 2,000 medicinal and aromatic plants used in Europe for commercial

TABLE 6.1: Claimed activity of selected top selling herbal medicines*.

PRODUCT	PLANT PART	ACTIVITY
Gingko	Leaves	Improves energy, mood and brain function
Valerian	Root	Relieves insomnia, anxiety, menstrual cramps, headaches
Hawthorn	Fruit	Lowers blood pressure
Ginseng	Root	Increases energy and sex drive
Psyllium	Seeds	Anti-constipation, helps weight loss
Echinacea	Root, flowers	Boosts immune system, prevent colds
Camomile	Flowers	Alleviates mood and skin problems, calming

* *Claimed activities of other top selling herbal medicines are shown in Appendix E.*

TABLE 6.2: Top selling medicinal plants in Europe*.

PRODUCT	$ MILLION	PRODUCT	$ MILLION
Gingko	600	Butcher's broom	120
Valerian	300	Evening primrose	110
Horse chestnut	250	Pygeum	105
Saw palmetto	230	Melilot	100
Bitter orange extract	220	Grape seed	90
Garlic	200	Milk thistle	80
Hawthorn	140	Melissa	65
Ginseng	140	Nettle	60
Psyllium	125	Bilberry	60
Echinacea	120	Camomile	45
Total			$3.16 billion

** Other researchers include St. Johns wort, black cohosh and vitex in the top ten list of herbs consumed in Europe. In 1999 sales of St. Johns wort exceeded $250m while vitex and black cohosh sales were each in excess of $100m.*

Source: Commonwealth Secretariat (2001).

purposes. The top selling plants are shown in Table 6.2.

There is considerable variation in per capita consumption of herbal medicines between EU Member States, reflecting the different cultural, legislative and environmental influences in each country (Table 6.3).

Germany has the highest level of consumption followed by France. Switzerland and Austria also have high levels of consumption. Consumption of herbal produce in the UK is well below that of many European countries. However, consumption of herbal medicines and dietary supplements has been growing faster there than in much of continental Europe (Commonwealth Secretariat 2001). The following section looks at the UK market in more detail.

TABLE 6.3: Per capita consumption of herbal medicines in some EU Member States.

COUNTRY	$ PER HEAD
Germany	37.0
France	28.0
Italy	10.5
Netherlands	6.5
Spain	6.0
UK	5.0
Belgium	4.0
EC Average	17.4

Source: Commonwealth Secretariat (2001).

UK

According to Key Note (2002), in 1999 36% of adults in the UK took health supplements and/or herbal remedies and this was expected to increase to 50% by 2002.

An analysis of the alternative healthcare market in the UK by product category for the period 1996 to 2000 is shown in Table 6.4.

The table shows a steady growth in each category each year over the period 1996 to 2000. Aromatherapy experienced the highest growth with an average annual of 14% followed by herbal and then homeopathic products.

The Key Note forecast for the period 2002 to 2005 is shown in Table 6.5.

The average annual growth rate of 14% for the period 1996 to 2000 is forecast to continue up to 2005.

The products mentioned in the Key Note report as expected to experience growth are shown in Table 6.6.

Currently the majority of herbs are imported to the UK from China, USA and mainland Europe. Four to five tonnes of herbs are used by Chinese practitioners per year but none of them can be classed as organic.

TABLE 6.4: The UK alternative healthcare market by product category, 1996 to 2000.

PRODUCTS	1996	1997	1998	1999	2000	AVERAGE ANNUAL 1996–'00
	£ million					
Herbal	43.4	49.1	56.0	63.8	72.7	13.8
Aromatherapy	36.0	41.5	47.7	54.8	63.0	15.0
Homeopathic	8.1	8.9	9.8	11.0	12.4	11.2
Total	87.5	99.5	113.5	129.6	148.1	14.1

Source: Key Note (2002).

TABLE 6.5: Forecast for UK alternative remedies, 2002 to 2005 (£ Million).

PRODUCTS	2002	2003	2004	2005	AVERAGE ANNUAL 2002–'05
	£ million				
Alternative remedies	189	215	245	279	13.9

Source: Key Note (2002).

TABLE 6.6: Products expected to experience growth.

Black cohosh	Kola nut
Chaste tree berry	Korean ginseng
Devils claw	St. John's wort
Green tea	Tribulus
Hawthorn	

Source: Dyke and Primrose (2002).

Presently there is ongoing research in Bristol University on the growing of Chinese herbs in the UK. Results from trials of growing ginseng in Scotland are favourable.

6.3 MARKET REQUIREMENTS

The emphasis on safety, efficacy and quality has resulted in a shift toward standardised products and a requirement for high quality raw materials. There are guidelines based on Good Agricultural Practices (GAP) for the cultivation of Medicinal and Aromatic Plants.

A number of requirements in the EU market have been identified:

- There is increasing demand for certified raw material and value added products. Certified organic products need to comply with Regulations 2092/91 and 1804/99.
- In some cases manufacturers may require a large minimum supply but in others they may only require 10 kg of extract or 100 kg of flowers.
- Most buyers in the Netherlands are only interested in plant extracts and not in plant material.
- Manufacturers of herbal products are increasingly interested in having a direct relationship with producers of required materials in order to ensure sustained supplies.
- In Germany a number of manufacturers of plant and herb-based remedies have signed a joint declaration for the Health of the People and Nature.

It is expected that further regulation of healthcare products will be introduced in the future. At present there is a series of Europe-wide efforts to review all available scientific

literature on the safety and efficacy of various medicinal plants. The WHO is conducting similar research on a global scale.

6.4 PRODUCTION

Medicinal and aromatic plants are cultivated on 63,000 ha in Europe as shown in Table 6.7.

France and Spain are the two main producers. Some of the producers of herbal medicine have their own plantations. The leading species are lavender, opium poppy, caraway and fennel.

There are two distinct trends in European medicinal plant production. Large-scale production of relatively low value products such as evening primrose, thyme and milk thistle is generally on the decline and is being replaced by imports. For example, the area under cultivation in Germany declined from 10,000 ha of medicinal plants during the Second World War to 7,000 ha in 1990 and 5,000 ha in 1997. The costs of production in Eastern European countries is much lower than in Western Europe and consequently Albania, Bulgaria and Hungary are major suppliers of medicinal and aromatic plant materials.

On the other hand, production of more specialised plants in Europe is increasing, especially using organic or biodynamic cultivation techniques. The largest buyers of medicinal herbs, particularly for teas or specialist uses, prefer to purchase their materials locally from farmers they know and trust (Commonwealth Secretariat 2001). Moreover, homeopathic medicines must use freshly harvested materials. Many companies find it difficult to get regular supplies of authenticated herbs from scattered overseas suppliers.

The feasibility of producing medicinal herbs in a forest environment is explored in Appendix F.

TABLE 6.7: Medicinal and aromatic plant production in Europe.

COUNTRY	ha
France	25,000
Spain	19,000
Germany	5,700
Austria	4,300*
Netherlands	2,500**
Italy	2,300
UK	2,000
Finland	1,900
Total	62,700

**Excludes pumpkin seed*
*** This fluctuates considerably.*
Source: Commonwealth Secretariat (2001).

6.5 IMPORTS

The European Union represents the largest single commercial market for medicinal plants and herb medicines in the world, with imports estimated at around 100,000 tonnes and valued at $250m.

Germany is the most important EU importer with 38% of the EU market and France the second largest with 17% and Italy with 9%. The most important sources of crude medicinal plants to the EU market are shown in Table 6.8.

6.6 ROUTE TO THE MARKET

The main retail outlets for alternative healthcare products have traditionally been health food shops, the major chain in the UK being Holland and Barrett, followed by the retail chemists. Other non-chemist retailers also stock certain alternative healthcare products, particularly aromatherapy products. The most notable of these is the Body Shop, which has its own range of aromatherapy products. Supermarkets are increasing their share of the alternative healthcare markets.

The distribution to alternative independent health food stores in the UK is controlled primarily by the following three wholesalers:

1. Brewhurst Health Food Supplies Ltd;
2. The Health Store Ltd;
3. Nature's Store Ltd.

In addition to the above there are many thriving on-line operations. Very small producers advertise to consumers and alternative healthcare professionals through the Internet.

TABEL 6.8: Top 12 suppliers of crude medicinal plants to the European market.

COUNTRY	TONNES	$ MILLION
China	140,450	326
USA	11,650	120
Germany*	14,900	73
Singapore	14,400	63
India	35,650	53
Chile	11,700	26
Egypt	11,300	14
Albania	7,100	14
Bulgaria	7,350	12
Morocco	7,150	12
Mexico	8,250	9
Pakistan	8,500	5

**For re-export to other European countries.*

Source: Commonwealth Secretariat (2001).

Italy has a unique distribution channel with an estimated 4,250 herbalist shops. These are staffed by herbalists and sell a wide range of non- prescription drugs.

6.7 ISSUES HINDERING DEVELOPMENT

Increasing demand for many wild harvested medicinal plants has led to the over-exploitation and virtual disappearance of certain species. This has caused national and international authorities to control the export of designated and endangered species.

The two main international conventions, which deal directly or indirectly with the exploitation and trade in medicinal plants are:

1. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITIES) and
2. The Convention on Biological Diversity (CBD).

CITIES came into force in 1976 and has 150 signatories to date. CBD came into force in 1993 and had been ratified by 170 countries and the EU. Ireland is a signatory to both conventions.

The signatories of CITIES all agree to regulate the international trade in wild life and set up a management and scientific authority to undertake this work. Species covered by CITIES are listed in three appendices to the convention. Some 21,000 plant species are subject to CITIES control. Plants are added or removed from the list at a bi-annual conference of all CITIES members. In some cases trade is totally forbidden, in other cases trade is allowed if a permit is issued and some are subject to conditions.

Monitoring of this convention is undertaken by TRAFFIC, which is a joint programme between the International Union for the Conservation of Nature (ICUN) and the Worldwide Fund for Nature (WWF).

In Ireland a number of species are protected under the 1999 Flora Protection Order and include those in Table 6.9.

In addition there is a requirement to seek permission to harvest wild plants from any area designated as a Special Area of Conservation or other areas of conservation.

The main objectives of the CBD are the sustainable use of biological resources and the promotion of a fair and equitable sharing of the benefits arising from the exploitation of these genetic resources. The CBD endorses a state's authority to regulate access to its genetic resources, but also obliges it to facilitate access to these resources for environmentally sound uses by other parties without undue hindrance.

TABLE 6.9: Scientific and common names under the 1999 Flora Protection Order.

SCIENTIFIC NAME	COMMON ENGLISH AND IRISH NAMES	
Acinos arvensis	Basil thyme	*Lus Mhic Ri*
Allium schoenoprasum	Chives	*Siobhas*
Asparagus officinalis ssp. prostratus	Wild asparagus	*Lus Sugach*
Hypericum canadense	Canadian St. John's wort	*Beathnua Gaelach*
Hypericum hirsutum	Hairy St. John's wort	*Beathnua Gaelach*

Source: Duchas (2002).

The Convention provides a framework for national legislation on access to genetic resources.

The Medical Control Agency* in the UK is increasingly prone to rejecting compounds as they cannot be sure what they contain. As a result there is increasing demand for single unit herbs, which can be mixed by professionals.

6.8 INFLUENCERS

The entry of the large pharmaceutical companies and the over the counter companies has placed herbal medicines more strongly on the mass market. Increased advertising budgets and media campaigns have contributed to rapid growth in demand.

The entry of the large pharmaceutical companies could result in the replacement of certain herbal medicines with chemical analogues of identified active ingredients.

In Germany, Switzerland and Japan private insurance companies treat herbal medicines and synthetic drugs equally, provided the products are licensed and bought on prescription. In other countries such as UK and Spain hardly any herbal remedies can be bought on prescription and they are all sold over the counter and paid for fully by the user.

With increased competition between private healthcare companies alternative healthcare is likely to be a selling feature of policies in the future. On the other hand the increasing cost of sustaining the health services means that curbs may affect medicines whose safety and efficacy are in doubt.

The rise of the green consumption movement is also a positive factor influencing demand for alternative healthcare products.

Health and safety issues play an extremely important role in the trade in medicinal plants. A small change in product classification from being a food supplement to a medicine, a revision in the market authorisation or a change in the labelling requirements can make the difference between a thriving export business and a trade embargo. Growing regulation could threaten the traditional herbal market in the long term.

The EU has been working toward mutual recognition of European licences so that companies could forego market authorisation in each member state. To date only three herbal products, including, notably Valerian, have been registered under this system and so most products must undergo national registration.

6.9 CONCLUSIONS

There is a strong positive growth in the alternative healthcare markets.

Ten of the 12 top suppliers of crude medicinal plants are low cost countries and they supply 90% of volume and 73% of the value of crude medicinal plants.

The climate in these 10 countries is very hot relative to Ireland.

The production of low value medicinal and aromatic plant material has moved to low cost Eastern European countries such as Bulgaria, Hungary and Albania.

Growing regulation and the focus of pharmaceutical countries may result in the production of chemical analogues of active ingredients.

* The Medical Control Agency is the official licensing authority in the UK. Any new herbal product that makes a therapeutic claims is considered a medicine under UK law and must be licensed in order to receive market authorisation.

7. Oils and Oleoresins

7.1 INTRODUCTION

Essential oils are aromatic, or odourous, oily liquids (sometimes semi-liquid or solid) obtained from plant material, for example flowers, buds, seeds, leaves, twigs, bark, woods, fruits and roots.

Oleoresins are liquid preparations, which are made by percolating a volatile solvent through a ground spice or herb.

Essential oils, also known as volatile oils, are produced from the aromatic oils of leaves, flowers, seeds, bark, roots and the rinds of some fruits. When produced from trees, essential oils are usually produced by a steam distillation process applied either to the resin, the wood or the foliage and branch ends (FAO 1998). Before distillation, the plant material is often field cured, partially dried or disintegrated to some extent. Essential oils and derivatives can also be obtained from the plant material by expression, distillation, fermentation or enzymolysism, enfleurage or extraction.

There are an estimated 3,000 essential oils known of which 300 are of commercial importance.

Essential oils are applied in the food industry as flavouring, in the perfume industry for fragrances and in the pharmaceutical industry for its functional properties. Oleoresins are applied in processed and canned food products.

Essential oils are the most highly flavoured part of many spices and herbs and are probably the most important single category of flavouring substances currently available.

Because essential oils and oleoresins are used in various industries (cosmetic, food and pharmaceutical) it is very difficult to get information regarding the demand for them.

7.2 PRODUCTION

No figures are available concerning production of essential oils and oleoresins in the European Union.

There are around 2,000 plants from which essential oils are produced. Lavender and peppermint are among the most popular. Production is particularly successful in the Mediterranean countries of Turkey, Spain, France and Italy.

7.3 IMPORTS

The main essential oils imported to the EU in 1997 by source are shown in Table 7.1.

Developing countries supply 52% of total imports. Brazil is the dominant source and accounts for 40% of the total imports of essential oils and oleoresins in 1997. The key product group is orange oil.

The volume and value of imports of oils and oleoresins into EU in the period 1995 – 1997 is shown in Table 7.2.

The EU imported 57,000 tonnes of essential oils and oleoresins in 1997. The average annual

TABLE 7.1: Source of main imported essential oils.

ESSENTIAL OIL	SOURCE
Orange	Brazil (68%), the Netherlands (10%), USA (6%)
Peppermint	USA (43%), India (13%), China (12%), Germany (12%)
Lemon	Italy (37%), Argentina (21%), USA (11%)
Lavender	France (65%), Austria (4%), Croatia (4%), Ukraine (4%), Italy (4%)
Lime	Mexico (37%), UK (15%, USA (12%), Germany (12%)
Bergamot	UK (42%), Italy (26%), France (10%)

TABLE 7.2: Essential oils and oleoresins imported into the EU, 1995 – 1997.

	1995		1996		1997	
	VOLUME t	VALUE '000 ECU	VOLUME t	VALUE '000 ECU	VOLUME t	VALUE '000 ECU
UK	11,005	95,142	12,374	115,838	15,307	129,193
France	8,530	112,425	9,118	129,954	10,021	146,144
The Netherlands	5,280	38,295	6,676	42,491	9,318	39,530
Germany	8,470	75,116	7,541	72,665	9,036	83,768
Spain	3,674	26,769	3,977	26,799	4,391	34,953
Italy	4,040	22,152	2,456	18,321	2,712	24,923
Austria	1,321	8,882	1,440	11,361	1,878	14,671
Belgium & Luxembourg	1,117	16,860	1,649	18,455	1,569	21,221
Ireland	1,735	22,258	1,709	24,735	1,247	22,183
Denmark	449	7,014	512	7,340	558	8,110
Sweden	250	3,226	248	2,922	454	3,741
Portugal	230	1,047	250	1,225	247	1,073
Finland	500	1,096	222	1,279	214	1,473
Greece	146	1,429	122	1,291	176	1,064
EU	46,747	431,705	48,294	474,657	57,128	532,030

growth in the period 1995–1997 was 10.5% in volume and 11.0% in value. The UK, France, Netherlands and Germany are the main importers. They import more than they consume as they engage in a considerable re-export trade.

The main product groups imported to the UK are orange oils, peppermint oils, lime oils and lavender. The main suppliers are Brazil, China, Argentina, India, Mexico, Madagascar, Indonesia and Vietnam.

The EU was a net importer in 1997. It exported 28,000 tonnes of essential oils and oleoresins while importing 57,000 tonnes. The main export products were orange oils, lemon oils, lavender oils and terpenic by-products of essential oils.

7.4 MARKET REQUIREMENTS

Because of the different end uses in terms of cosmetic, food or pharmaceutical there are different quality requirements for the ingredients.

In the cosmetic industry essential oils and oleoresins have to conform in terms of:

- Odour and flavour
- Physical properties
- Chemical composition
- Purity
- Absence of adulteration

The physical indicator is the main determinant of the quality of essential oils used in the cosmetic industry.

Certification by ISO (International Organisation for Standardisation) and CEN (European Committee for Standardisation) will confer a competitive advantage. However, it is essential to comply with the standards of the importer.

Furthermore, producers need to comply with the Good Manufacturing Practice (GMP) of the European Cosmetic Toiletry and Perfumery Association (Colipa) for cosmetics. This requirement states minimum quality and hygiene requirements for the production process of cosmetic products.

In the food industry essential oils and oleoresins have to observe the following standards:

- The levels of any element must not exceed a toxicologically dangerous quantity;
- The methods of production of flavouring,

including physical processes or enzymatic or microbiological processes for the production of flavouring preparations, should be strictly and accurately defined.

Producers must comply with the EC Directive on Hygiene for Foodstuffs (93/43/EC) and thereby have a HACCP plan or they must be working on a HACCP system. An important aspect is the purity of essential oils and oleoresins used in the food industry.

In the pharmaceutical industry the requirements for essential oils and oleoresins depend on whether it is to be used as a raw material or as a medicine. The client specifies the requirements if it is to be used as a raw material.

Laws in EU Member States on procurement of medicines apply if the herbs are to be used as medicines.

7.5 PRODUCTION FEASIBILITY

There are many different methods of processing plants. Some are extremely basic, simply involving the crushing of the fresh whole plant or parts of the plant. Others are extremely complex involving solvent extraction, steam distillation, purification and drying using highly sophisticated equipment. Mobile equipment can be used at the site of collection to maximise the extraction from fresh materials. Investment costs related to such processing depend on the level of sophistication and range from a few thousand dollars to several million (Commonwealth Secretariat 2001).

The process of steam distillation involves passing steam or a mixture of water and steam through partially wilted material. The volatiles are liberated by the steam and pass through a condenser where the steam is converted back into water. The oil is then removed by a separator. In some instances essential oils require further processing, either to make them stable (e.g. removal of terpenes from citrus oils) or to isolate an active ingredient (menthol from peppermint oil). These refining and separation processes may require high-pressure distillation equipment as well as a fractioning column. Examples of the extraction processes are given below for a selection of oils.

Cedar leaf oil

Cedar leaf oil is produced from the ends of branches and foliage of the northern white cedar (*Thuja occidentalis*) and the western red cedar (*T. plicata*). The predominant areas of production of cedar leaf oil are the north eastern United States and adjoining portions of Canada. Local farmers are the predominant producers and distil the oil in fairly crude equipment during times when they are not doing other farm work (FAO 1998).

Essential oils from *Juniperus* and *Cupressus*

A number of essential oils are derived from the foliage, fruits and wood of *Juniperus* and *Cupressus* species worldwide. The production of the majority of perfumes and colognes on the world market use oils distilled from the heartwood of *Juniperus*. Almost 60% of the fragrances produced contain cedarwood oil (Anderson 1995).

Oil derived from *J. virginiana* is produced by steam distilling sawdust, wood shavings, old stumps and chipped logs. These materials would otherwise be considered as waste.

Essential oils from *Cedrus*

Steam distillation of *Cedrus deodara* wood yields a reddish-brown oil with a characteristic balsamic odour whilst the steam distillation of sawdust yields a pale yellow oil with a pleasant odour and is known as Himalayan cedarwood oil.

Essential oils from the *Pinaceae*

Several species of *Abies* are sources of fragrant essential oils. They include *A. balsamea, A. alba, A. sibirica*, and *A. pindrow.* Most of them are extracted from the foliage and are pale yellow to colourless liquids. An exception is the essential oil derived from the crushed cones of *Abies alba* (FAO 1998).

Several essential oils are distilled from the fresh twigs and needles of *Pinus* species. 'Pine Norway oil' is derived from Scots pine (*Pinus sylvestris*). The dryout characteristic of this oil is of interest because there is no odour left on a blotter after 24 hours.

In northern Europe, pine oil distillation takes place from spring through winter. When the forests are thinned or felled, the needles and branch tips are collected as the raw material (FAO 1998).

7.6 CONCLUSIONS

There is little or no potential for import substitution as the main imported oils into Europe are orange, lemon, lime which are sourced from hot fruit growing countries. Furthermore, orange and lemon oils come at low cost from countries such as Brazil and Mexico.

Lavender and Tea Tree oil, which are the most popular in aromatherapy are sourced from hot countries. Only a very small volume of the other main oils used in aromatherapy are sold in the Irish market.

7.7 RESEARCH REQUIREMENTS

Dyke and Primrose (2002) established that research on essential oils should concentrate on identifying gaps in existing knowledge and particularly geographical differences in harvesting times.

8. Edible Forest Products

8.1 BACKGROUND AND INTRODUCTION

Forests generate a number of wild edible products. Many organic consumers view 'wild' products as being the most organic products available. The close connection between products from an organic production system and 'wild' products suggests that a review of the organic food market will give an indication of the size of markets within which wild foods fit.

The value of organic European food market in 1999 reached €5.7b, up €3.8b on the level in 1990. The annual growth rate in the last few years has been 20-30%. Table 8.1 shows that Germany is the single biggest market for organic food, at four times the level in the UK and France.

Organic food accounts for 2% of the European food market and just over 1% of the US food market. In Austria and Denmark the total market is estimated to be in the region of 10%.

The total size of the organic food market in Ireland in 1999 is in the region of €23m. This represents about 0.4% of the retail value of total food consumption. In Ireland organic fruit and vegetables accounts for 40% of the organic market at €10m (Western Development Commission 2000). Key informants estimate that this market is growing at 25-30% per annum. In the UK demand for organic food is increasing at the rate of 40% annually whereas the actual supply is rising by 25%.

TABLE 8.1: Retail organic food market in some EU countries, 1999.

	€ BILLION
Germany	2.00
France	0.55
UK	0.45
Sweden	0.20
Denmark	0.20

Source: Bord Bia (2001).

A strong feature of the EU market for organic food is the very high level (60–70%) of imports. Various forecasts predict that organic food will represent up to 7% of all food sales by 2006. Consequently there exists opportunity on the domestic and foreign market for organic produce.

Wild foods are typically associated with subsistence living but in developed countries such as Finland they are increasingly recognised for their preventative and curative properties.

Data in relation to wild foods are hard to find. Those that are harvested from the forest include berries, mushrooms, nuts and maple syrup. These foods are harvested in developed and developing countries.

8.2 BERRIES

Finland

Gathering wild forest food is extensive in Finland. Approximately 67% of the adult population in Finland pick wild berries, 45% pick mushrooms and 20% pick herbs.

Table 8.2 shows the estimates of the annual berry yields in Finland in poor and good crop years.

Lingonberry, crowberry and blueberry are the main berries that grow in Finland. Variation in yields can be 100% between a poor and good year.

In Finland it is estimated that people picked 50 million kg of berries in 1997: 70% of these were for own use or domestic consumption, with the remainder (15 million kg) for commercial use.

Table 8.3 lists wild berries picked commercially in Finland. Other berries picked in Finland include bog whortle, cranberry, artic bramble, wild blueberry, rowanberry and buckthorn berry.

The picking season is relatively short and runs from the middle of July for cloudberry and

TABLE 8.2: Estimates of annual berry yields in Finland in poor and good crop years.

BERRY	POOR YEAR	GOOD YEAR
	(MILLION KG)	
Lingonberry	200	500
Crowberry	150	250
Blueberry	150	200
Bog whortleberry	20	50
Rowanberry	10	50
Cloudberry	20	30
Cranberry	10	20
Raspberry	5	10
Juniper	0.1	0.2
Wild strawberry	0.1	0.3
Buckthorn	0.1	0.3
Arctic bramble	-	0.1
Black bearberry	-	0.1
Stone bramble	-	<0.1
Bearberry	-	<0.1
Total	565.3	1,111.2

Source: Salo (1994).

TABLE 8.3: Wild berries picked in Finland.

	DOMESTIC MILLIONS KG PER YEAR	COMMERCIAL MILLIONS KG PER YEAR	TOTAL MILLIONS KG PER YEAR
Lingonberry (*Vaccinium vitis-idaea*)	14 – 15	9 – 10	25
Bilberry (*Rubus arcticus*)	10 – 12	3 – 5	15
Cloudberry	5 – 7	1	6 – 8
Crowberry		1	1 – 2
Rasberries	2 – 4		2 – 4

bilberry to the end of September for cranberries.

Nearly 4 million kg of wild berries are exported. The most important market for these is the jam industry. Another market is the supply of concentrates to the juice industry. Frozen and fresh berries are also sold to wholesalers and retailers.

The value of berries to the Finnish economy is estimated to be €200m annually.

It is also possible to cultivate a range of fruits and berries in the forest. Table 8.4 outlines the main fruits and berries and conditions required for their cultivation. A more complete elaboration is given in Appendix G.

Potential for Agroforestry

Blackberry can be used to keep animals (including people) away from stream banks or other sensitive areas. It is especially well suited to planting along fence lines, either on its own or planted between widely spaced trees to ensure adequate light for berry production. It could also be planted as a component of windbreaks, especially on edges where adequate light is available (Forest Renewal BC 2001).

Forest Renewal BC (2001) suggests that blackcurrants may have potential in intercropping systems as they have shallow

TABLE 8.4: Conditions required for production of various berries.

BERRY	ENVIRONMENT	SOIL TYPE
Strawberry	Sunny, warm.	Sandy. Loams and well-drained clays.
Blackberry	Sunny or partial shade.	Deep, well-drained.
Raspberry	Sunny or partial shade	Free draining and humic.
Blackcurrant	Sunny or partial shade	Deep, moisture retentive, pH 6.5 – 7.
Redcurrant and whitecurrant	Sunny or partial shade	Heavy, moisture retentive and free-draining.
Blueberry	Sunny or partial shade	Free draining and acidic.

rooting systems and therefore will not compete with the more deeper rooting trees.

Blueberries may have potential on the outer edges of riparian zones provided that run-off is controlled and seasonal flooding does not occur (Forest Renewal BC 2001). Due to their shallow rooting, blueberries may also have potential in widely spaced plantations, particularly those composed of tree species with moderate to deep roots, provided adequate light is available for fruiting. Blueberries may also be planted along fence lines, edges (particularly south facing edges) and as part of a windbreak.

Ireland

The range of fruits grown in Ireland is restricted by climate. The main crops grown for further processing in Ireland are apples, strawberries, raspberries and blackcurrants, which are variously used for cider production, juicing, jam making, baking and canning (Bord Glas 2001).

Soft Fruit Production Trends, 1980 – 2000

The trend in soft fruit production in Ireland in the last 20 years is shown in Table 8.5.

There has been a substantial decline in the area under strawberry and raspberries production over the period. Blackcurrants and other soft fruit production are the only soft fruits showing an increase in area and value.

Blueberries are native to the Eastern seaboards of the USA but are now grown wordl-wide. They are a relatively recent arrival to Irish fruit growing. Currently there are only a few mature orchards but there are several others

TABLE 8.5: Soft fruit production in Ireland, 1980 to 2000.

YEAR	80		85		90		95		00		
	AREA	VALUE	AREA	VALUE	AREA	VALUE	AREA	VALUE	AREA	VALUE	VALUE
	HA	£	HA	£	HA	£	HA	£	HA	£	€
Strawberries (F)	206	1.7	142	2.0	223	3.4	180	4.5	113	1.5	1.9
Strawberries (P)	430	1.3	273	1.2	311	1.8	264	1.1	48	0.34	0.4
Raspberries (F)	44	0.04	68	0.4	55	0.5	64	0.9	47	0.45	0.6
Raspberries (P)	82	0.1	34	0.1	50	0.2	15	0.08	4	0.03	0.04
Blackcurrants (F)	15	0.02	11	0.09	14	0.1	4	0.04			
Blackcurrants (P)	145	0.14	85	0.3	106	0.5	256	1.0	180	0.6	0.8
Gooseberries (F)	31	0.1	12	0.04	16	0.08	9	0.15			
Gooseberries (P)	15	0.03	6	0.01	5	0.02					
Other Soft Fruit	10	0.03	5	0.02	5	0.03	7	0.06	50	0.3	0.4
Total	978	3.46	636	4.16	785	6.63	799	7.83	442	3.22	4.14

YSource: Bord Glas (2001).

nearing maturity (typically it takes 4 years to establish a crop before the first harvest). Blueberries are best suited to growing in acid soil conditions.

The main soft fruits imported to Ireland include grapes, strawberries and raspberries (Table 8.6).

Of particular note is the increased importance of other fruits, which shows increased demand for more adventurous and exotic fruits. The main importation of fruit crops takes place outside the fruit-growing season.

The requirement by the retail multiples (accounting for c. 70% of fresh produce) for quality fruit on a continuous basis has resulted in an increased amount of soft fruit crops being grown in glasshouses or polythene tunnels (Bord Glas 2001). The move indoors was in response to supermarket demands to improve fruit quality, shelf life and continuity of supply. Quality and traceability have become as important a trading issue as price.

The Irish fresh produce industry is competing in a global market. There are many other countries worldwide with more favourable weather conditions, as well as the availability of suitable land and/or cheaper labour to make them more competitive. The current Irish produce is not sufficiently profitable to export due to the transport costs and the small-scale production.

There may be opportunity to grow some of the minor fruits such as blueberry, and blackberry in a forest context.

8.3 MUSHROOMS

Finland

The two main wild mushrooms picked for commercial purposes in Finland are northern milk cap and *Boletus*.

The collection of northern milk cap at 300 tonnes for commercial purposes has been relatively stable over the period 1994 to 2000. Over the period 1994-2000 the collection of *Boletus* varied from less than 100 tonnes at the beginning of the period, to 550 tonnes in 2000. Other mushrooms such as chantrelle are also picked but the volumes are relatively small at less than 20 tonnes per annum.

The value of wild mushrooms to the Finnish economy is estimated to be €100m.

Scotland

Wild fungi are the most prominent woodland food in the UK. The main woodland species harvested in Scotland are chantrelle, cep, hedgehog mushroom, winter chantrelle, saffron milkcap and wood blewit. In addition to these wild fungi there are also mushrooms grown on a wood substrate. The main species cultivated is shiitake.

In some cases value is added to these mushrooms through drying, slicing and turning them into powder or preserving them in brine.

They are sold directly to local restaurants and into markets in England and Europe. Distribution centres for the European market

TABLE 8.6: Soft fruit imports to Ireland, 1997 to 2000.

	97	98	99	00	00	97	98	99	00
	VALUE					VOLUME			
	IR£				(€M)	TONNES			
Strawberries	1.0	1.5	2.2	1.6	2.0	556.6	619.6	947.5	696.3
Raspberries	0.1	0.3	0.2	0.2	0.25	18.5	37.9	41.5	40.2
Black currants						6.4	3.3	3.8	2.5
Gooseberries		0.1	0.1	0.2	0.25	3.3	26.3	24.1	38.4
Grapes	5.4	6.4	8.9	10.6	13.5	4181.8	4689.4	5169.5	5632.8
Other Soft Fruit	0.2	0.3	0.2	0.4	0.5	60.3	82.6	37.0	92.0

are based in Italy and France. The European market is also supplied from North America.

8.4 MARKET REQUIREMENTS

The issues identified in the Bord Bia 2001 survey for existing organic food processors to allow them to expand their business and develop new products included are relevant to the 'wild' food sector:

1. The need to determine the volume of product that will be available in the year ahead;
2. The need to educate the customers about where to get organic food and to be sure that the food they are getting is certified organic;
3. The need to harmonise organic standards to help remove the confusion in relation to the three labels at present stating they are all organically produced.

These issues apply equally to wild foods where is even less knowledge and a general lack of awareness of what is safe and unsafe. In the case of cultivated organic foods, land is certified to be farmed organically. However, wild produce is collected over a wide area, which would make the certification of produce more difficult. There is no internationally recognized system of certification for NWFP.

Consumers and retailers alike now demand produce which has been grown, handled, packaged and transported to the highest standards of quality and hygiene, in a clean and environmentally friendly manner (Bord Glas 2002). Consumers are also becoming increasingly concerned about food safety and traceability within the food chain. To this end Bord Glas have put in place a Quality Programme to assist the industry in addressing consumer concerns and to ensure that the required standards are in place.

8.5 POTENTIAL RETURNS

The potential returns from edible NWFP products can be illustrated from experiences in other countries as outlined below.

Finland

Kangas (2001) reported that most people who pick wild berries in Finland make a few percent (in most cases no more than 3%) of their gross annual income from the activity. A few professional pickers were able to earn 10% of their gross annual income.

The average income earned from berry picking ranged from FIM 1,000 (€168) per household in Ilomantsi and Inari to FIM 3280 (€552) in Suomussalmi.

He also stated that imports have taken over a significant share of the domestic market. He states that rapidly falling prices from increased competition in the international markets are a threat to viability.

Scotland

In 2002 there were five companies involved in wild mushrooms. One of the five companies had a turnover of approximately £250,000 arising from wild fungi. All companies have expanded and the combined turnover is now estimated to be in the region of £1m. In addition there may be an equivalent amount harvested in the black economy. In recent times one of the companies was able to provide sufficient quantities to supply a contract with Sainsburys supermarkets.

Market sources estimate the value of the UK market for wild mushrooms to be in the region of €6m. This is in the context of a population of close to 60 million people with long established upmarket restaurants and gourmet cooks.

A Welsh gourmet mushroom company has estimated that a small woodland area of five ha could produce income of €30,000 within three years of establishment (Wicklow Uplands Council 2002).

The two factors influencing this sector identified by Dyke and Primrose (2002) in a survey of buyers were:

1. The growing demand for organic produce;
2. The influence that celebrity and television chefs have on the sector.

US

A few studies have attempted to estimate the gross wages from wild edible mushroom harvesters. The average wage for a mushroom picker in the mid-eighties was $830 seasonally, with a few people earning a maximum of $4,000. In an assessment of American Matsutake in the Nass Valley in British Columbia, Meyer Resources (1995) found that pickers earned an estimated $4,500 per season in the early 1990s. Love, Jones and Liegel (1998) estimated wages for commercial mushroom harvesters in the Olympic Peninsula in Washington at about $30 per day. Obst and Brown (2000) reported an average wage of $15 per hour for morel harvesters in the Northwest Territories of Canada. Other authors (Kangas 2001) have found that while experienced pickers earn $547 per season, the majority of mushroom harvesters earn far less ($167) and many, particularly those with little or no experience, lose money.

Mushroom picking is a seasonal and supplemental source of income. The wild mushroom business is unpredictable; changes in soil moisture and temperature drastically affect the location, quantity and quality of mushroom harvest. Pickers and buyers who are prepared to move around the US can make a year long living. Otherwise they typically engage in occupations such as farming, construction work, and logging or millwork to produce a year–round income (Jones *et al*. 2002).

8.6 PRODUCTION FEASIBILITY

Mushrooms

The technology and the know-how exist to produce exotic mushrooms in Ireland. Appendix H elaborates on the feasibility of production of mushrooms in the forests. The cost of accessing the substrate from abroad is in the region of €500 per tonne. Alternatively it could be produced in Ireland but the costs of setting up a laboratory to produce a substrate would be in the region of €1m. Added to the cost of the substrate is the cost of labour. These costs would have to compete with mushrooms that grow wild in countries like China that have the added advantage of low labour costs. Since the current value of the Irish market is estimated to be in the region of €300,000 the Irish product would have to be competitive on the export markets in order to generate an adequate volume of sales.

The market is supplied through imports, and exotic and wild mushrooms are currently sold through Tesco, Superquinn and Dunnes Stores.

Mr Tom Kent from Waterford Institute of Technology has initiated a demonstration of forest mushroom production. The mushroom species being demonstrated are:

1. Shiitake (*Lentinus edodes*);
2. Enoki (*Flammulina velutipes*);
3. Chicken-of-the-Woods (*Polyporus sulphurous*);
4. Pearl oyster (*Pleurotus ostreatus*);
5. Fir oyster (*Pleurotus pulmonarius*);
6. Yorkshire oyster (*Pleurotus ostreatus*);
7. Tarregon oyster (*Pleurotus euosmus*).

Thinnings from ash and sycamore were crosscut to approximately 1 m lengths for ease of handling and then drilled so that birch dowels inoculated with the respective mushroom species could be inserted in the logs. The end of the dowels were covered with a malleable wax to help prevent infection of the logs by unwanted fungi. The logs were then stacked in the forest and covered to help maintain a moist, shady environment. This whole production process can be carried out in the forest. The first crop of mushrooms is expected in the autumn of 2004.

Truffles

The Truffle UK company concentrates on producing the Perigold black truffle (*Tuber melanosporum*) and the Burgandy or summer truffle (*T. uncinatum*), hoping to generate £22,750 per acre of oak and hazel trees. The trees are grown from seed in special conditions. The company believes that chalk and limestone areas are the most promising for truffle production and recommend that truffle sites

should be at least 75 m away from any existing woodland so that there is no competition for space and nutrients from other fungi. Production is expected after four years. Truffle UK intends to use trained dogs to aid in their harvest (Anon. 2002). The season for fresh truffles is from October/November February. One ounce of black truffles sells for around £12-£25, while the white truffle sells for £50-£100.

8.7 NUTS

Hazelnut – *Corylus* spp.

Hazel grows as an understorey in oak and ash woodlands or as pure hazel woods. Hazel scrub woodland covers extensive areas of limestone, particularly in the Burren generally on limestone soils (Coillte 2000).

Annual world hazelnut production is approximately 844,000 tonnes. Turkey is the largest producer accounting for approximately 75% of total production. It accounts for 80 percent of world hazelnut trade and largely determines world export prices. About 70% of Turkey's hazelnut exports comprise raw kernels with the remaining 30% being processed kernels, including roasted, sliced, chopped, paste, meal and flour.

Hazelnut production is one of the most important economic activities in the country, employing an estimated 385,000 growers. Most grow hazelnuts to supplement their income and own about 1 to 2.5 ha. Only a few large growers rely solely on hazelnut production as their primary income. There are approximately 536,000 ha in production.

Levant type hazel nuts, which are an estimated 70–80% of the total production, receive support prices. There is no price support mechanism for tree nuts in the EU. Due to the cheap price of the Turkish product and aggressive competition from Turkey, Italy (Europe's largest hazelnut producer) has lost market share in Germany, France and Switzerland.

Chestnut – *Castanea* spp.

Chestnut trees tend to bear fruit at a younger age than most other nut trees. In British Columbia (BC) if the trees are managed properly, they will provide a light nut crop within three to six years. Mature production (14 -22 kg per tree) can be expected by years 11-14 (Forest Renewal BC 2001). Most harvesting is still done by hand in Europe and Asia and is considered a viable option for one person on an area of 4 ha or less (maximum of 1,000 trees). Another option is mechanical harvesting. This involves mechanical shaking of the tree but it is likely to reduce the commercial life of the tree to 35-50 years. Chestnuts add half their weight during the last two weeks on the tree. Therefore, if mechanical harvesting is used, it is important that it only be done after the nuts reach maturity but before they fall naturally from the tree.

The US chestnut market is worth about $40m (*circa* 20,500 tonnes) per year. Approximately 20% of this is imported to the US. The primary exporter to the US is Italy followed by China, Spain and Korea.

The most traditional use of chestnuts is roasted whole with the shell and peel.

8.8 HONEY

Bee foraging is an important part of the biology of both young and established forests. Worker bees show species fidelity. That is, they specialise in foraging on a single plant species at one time, which makes the flavour of honeys from different tree species unique (Hill and Webster 1994). In parts of Europe such as the Black Forest there is a traditional market and a distinctive honey associated with forests.

Market

The Irish market for honey is estimated to be in the region of 1,000 tonnes per annum. Approximately 300 tonnes are produced in Ireland and the remainder is imported. Boyne Valley have captured 73% of the market share in Ireland and 86% of this is imported. The wholesale value of 1 kg of honey is approximately €5.50 so the total value of the

Irish market for honey is €5.5m. Market research in Ireland (Teagasc 2000) shows that honey produced at farmhouse level is not distinctly different from its industrial equivalent in terms of sensory aspects. However, some consumers value other attributes such as small-scale production. This research also found that honey is price sensitive.

The large multiples in the UK have introduced specific honeys including forest honey.

Most of the honey producers in Ireland do so on a hobby basis. There are only six commercial honey producers (with 350 to 500 hives) in Ireland.

World trade in natural honey is of the order of 300,000 tonnes, valued at US$300m (FAO 1998). Former USSR, China, USA, Mexico and Turkey are the major producing countries. Germany, USA, UK and Japan are the major world markets.

Production Feasibility

The honeybee (*Apis mellifera*) is one of 20,000 species of bee documented worldwide. A healthy beehive contains 80,000-100,000 bees and is capable of producing 23–45 kg honey per hive per year, depending on availability of forage, hive health, and weather conditions during the foraging season (Hill and Webster 1994).

Honeybees are particularly attracted to leguminous species, whether they are tree species or ground cover (Hill and Webster 1994). The briars, holly, ivy and fir bush often found near and in forested areas are valuable sources of nectar and pollen. Broadleaf trees such as sycamore and horse chestnut are very valuable sources of nectar but conifer forests have little value. Because of the predominance of conifer forests in Ireland there is very little opportunity to develop a distinctive forest honey.

In the event that there is a substantial growth in broadleaf forests in Ireland then there is greater likelihood of the development of forest honey. Bees will travel 3 to 4 miles collecting nectar so the area surrounding the beehives needs to be predominantly wooded.

8.9 ISSUES HINDERING DEVELOPMENT

The erratic nature of the Irish climate is not conducive to ensuring consistent supply of honey. There is a very short window (3 weeks) of opportunity in Ireland to have a successful honey production season.

Beehives kept in an exposed, windy location do not do well. Evergreen trees, such as pines, spruces, firs and junipers make especially effective windbreaks for hive protection.

It is unlikely that Ireland would be cost competitive with the low cost countries that are now the major producers and exporters of wild honey.

8.10 CONCLUSIONS

There is limited potential for profitable production of berries because of lack of competitiveness with countries that have more favourable weather conditions and cheaper labour. Furthermore the opportunity is not attractive because of the low level of returns from harvesting wild berries.

There may be a niche opportunity for a small number of producers to harvest wild mushrooms and produce mushroom outdoors in a forest environment. The technology exists to produce exotic mushrooms that are to be found in the wild in countries like China but the economics of doing so requires further research to establish if it would be cost competitive.

The dominance of Turkey of world hazel nut production combined with its aggressive marketing in light of overproduction suggests that it would be very unlikely for Ireland to develop a competitive industry for this product.

Ireland's erratic climate, preponderance of conifer forests and lack of labour cost competitiveness combine to constrain any potential for the production of honey from afforested areas.

8.11 RESEARCH PROGRAMME

There is need for ongoing market intelligence regarding trends in wild food products.

The research and development needs of edible NWFP have been identified as follows:

- A national survey of wild food (berries mushrooms and honey) producers in Ireland leading to the preparation of a database of all producers in Ireland;
- A wild food inventory indigenous to Ireland that identifies comparative advantages of particular areas of the country;
- Research on the production techniques of growing wild mushrooms outdoors;
- Examine the feasibility of setting up a laboratory in Ireland to produce substrate for wild mushroom production;
- Market intelligence regarding trends in wild food products and
- Knowledge of the resilience of many NWFPs to harvesting pressures and on the full implications of the ecological roles played by these products.

Other Recommendations

Leaflets and point of sale material need to be developed to educate the consumers about wild food.

There is need for ongoing education and training of pickers of wild berries in relation to market requirements and ways and means of improving quality.

9. Forest Grazing

9.1 INTRODUCTION

Forest grazing has had a long history in Europe, and not least in the UK. Grazing on wood-pasture commons was mentioned in several Anglo-Saxon charters and Rackham (1995) found the term 'wood-pasture' in a document that dates from 953 AD.

Coniferous plantations in Ireland have a stocking of around 2,500 per ha at establishment. Species with dense foliage (e.g. Sitka spruce, Norway spruce and Douglas fir) are not conducive with the growth of fodder.

Trials to stimulate fodder production in similar plantations in the UK (Adams 1984) and France (Lemoine *et al*. 1993, Rapey *et al.* 1994) often include a reduction in stem density to below 600 stems per ha, a selection and pruning of 200 stems per ha, and an over sowing of grasses in alleys between tree lines. Dupraz and Newman (1997) note that the removal of thinning and pruning debris is a practical limitation to this system and that the economics of such systems is unclear. Consequently, most research efforts nowadays are concentrated on creating new agroforests from pastures or clearfell areas.

Current policies do not allow for livestock grazing within a farm-forest plantation if the owner of the forest receives the forest premium payments. This practice is seen as double-funding, i.e. premiums are paid to the owner for the forest and grants are also paid for the livestock.

Notwithstanding the aforementioned constraints on forest grazing a number of trails and cases throughout the world are worthy of note.

9.2 NEW ZEALAND

Silvopastoral agroforestry developed in New Zealand in the early 1970s as a result of a marketing study undertaken to identify new and profitable export markets for timber (Sutton 1975). As a result of the study, it was decided to focus on one market segment in particular, that of finishing timber. The initiative was forestry led and not farmer led. Sawmillers were consulted on the ideal log dimensions, from which silviculturalists designed the 'direct saw log' regime. The regime involves the planting of high quality clonal stock of *Pinus radiata* at wider than normal spacing. The trees would be thinned once and pruned to a height of 6 m. The resultant open canopy provided by this system led to the rapid growth of grasses and weeds in the under-storey, resulting in the decline in tree growth due to competition. Animals were brought into the system to control the under-storey vegetation as an afterthought. The introduction of the animals to the system was found to improve tree growth, partly due to the resultant reduced competition but also due to improved nutrient cycling. The system was also more economical due to improved access for pruning, which made the operation easier and the labour more productive (Thomas and Willis 1998).

9.3 BRITISH COLUMBIA

Forest grazing is a system that is relatively common in British Colombia. Approximately 80% of the area is forested, much of which has silvopastoral systems in place. Ranchers own valley bottom properties where they grow winter feed and calve out their herds. In the spring the herds move up onto the grasslands and open forests and then into the coniferous forests in the summer. In the autumn the cattle return to the open forests and grassland and then to the farms for the winter. Most of the forest grazing occurs on Crown land. About 260,000 cows from 2,000 ranches have grazing tenures with the Ministry of Forests. The tenures account for about 1,000 Animal Unit Months (AUM) of grazing on about 10 million ha of land (Drinkwater pers. comm.). Every area and system is different but the example below is close to typical.

The area is the Trout Creek Range Unit. After clearfelling, the native vegetation that releases is not great forage. Therefore the blocks are lightly seeded (4–6 kg ha^{-1}) with agronomic species that usually include orchard grass (*Dactylis glomerata*) and a legume. This results in a mixture of native vegetation and a scattering of agronomic species. The agronomic species improve the quantity and quality of the forage and also draw the cattle into the blocks, thus giving a more uniform distribution and an increased use of native species by the cattle. Grazing is prescribed on a rotational basis to a level that maintains a healthy near-ground flora at the same time as providing some brushing and weeding for the planted conifers. Blocks can usually be grazed for 25–30 years before the canopy precludes it.

9.4 ISSUES

Newman and Powell (1997) report on an experiment to assess the affect of cattle trampling and browsing on lodgepole pine. They found that, on average, only 2% of lodgepole pine seedlings were browsed and that most of the browsing is accidental. However, high levels of browsing can occur when forage species become scarce. When the available forage was reduced to less than 100 kg ha^{-1} at moderate cattle stocking, browsing damage increased dramatically.

Unlike browsing damage, trampling damage commonly occurs. The intensity of damage varies, depending on the number of cattle and the size of the trees. It is highest in the first two to three years after planting and drops to well below 10% by the fourth year due to the greater visibility of the trees. Cattle will seldom step on trees if they are large enough to be a physical hindrance. Blocks that were seeded with agronomic species were found to have 20–30% more trampling damage in the first two years than unseeded blocks. Trampling damage can also increase if the cattle are allowed to concentrate in particular areas. Newman and Powell (1997) also found that not all trampled seedlings died. About 27% of two-year old trees that were trampled subsequently died. By age six, only 5% of trampled seedlings died.

Soil compaction can occur following cattle use in a forest. Newman *et al*. (1999) state that pastures grazed for one month each year for eight years had a 6% higher soil bulk density than ungrazed exclosures. One month of grazing at an average cattle stocking rate of 0.69 AUM/ha was not sufficient to produce significant changes in soil bulk density. The soil bulk densities obtained in the grazed pastures during the study were well below the root limiting critical range of 1.4 t/ha (Newman *et al.* 1999).

Further analysis and breakdown of the impact of different types of stock on sites is shown in Appendix I.

9.5 CONSIDERATIONS

In summary therefore management of forest grazing requires attention to the following:

1. Need to ensure a continuous supply of grazing;
2. Need to provide water;
3. Cattle trampling can be kept down by excluding cattle from plantations with trees less than one metre after which there is little or no trampling;
4. Cattle tend to head for the younger plantations, even if there is good forage in plantations over 20 years of age. This can be avoided by providing mineral licks and/or fertilising the forage in the older plantation to draw the cattle in.

9.6 CONCLUSIONS

While current policies in Ireland do not allow grazing of land afforested with EU aid the experience from other countries shows that forest grazing is feasible in certain circumstances.

The opportunity to graze in forestry is confined to the period before the canopy closes and also to times of the year when the trees are less sensitive such as in the autumn. Grazing in spring time during periods of new growth is likely to cause the greatest damage.

Damage to the trees arising from trampling and grazing can be reduced by keeping stocking

rates low (approximately five ewes per ha).

The system is feasible where a farmer who can regularly monitor the effect and impact of the grazing sheep and change the animals if there is insufficient grass.

Grazing with some breeds of sheep (Shropshire) among certain species (Noble fir and Norway spruce) is feasible and practised on a very limited scale in Ireland, but these are usually in Christmas tree farms; grazing by heavier livestock will cause too much damage to the roots, bark and foliage.

Forest grazing is not suitable for pregnant ewes, other sheep may require mineral supplements.

10. Organisation Issues

NWFPs transcend a wide range of products, sectors and industries. Because of this there is no single organisation with a mission for the promotion and development of NWFP. Farmers with forests who wish to develop NWFP would deal with a range of specialists across a number of organisations.

Research into the subject area showed that there are very few individuals or organisations in Ireland with the skills and knowledge in relation to the subject matter.

The formal education, training and advisory services do not have the capacity at present to make a significant input to the development of NWFP. A similar situation existed in the organic sector and much of the courses they provide have been informal and provided on a voluntary basis by existing organic producers. Such a situation is not sustainable and will not contribute to the organised and planned development of the industry.

Teagasc has a remit for the development of agriculture and food industries. Recently it has employed a small number of foresters to support farm forestry. Previous research by Collier *et al*. (2002) has shown that there is need for enhanced co-ordination and co-operation between the agriculture and forestry services within Teagasc. The development of NWFP as part of farm forests presents a new challenge for Teagasc to develop their own capacity and to co-operate and co-ordinate with other specialists in food, horticulture and tourism etc. This development is necessary if the NWFP entrepreneur is to receive the broad based support required.

The NWFP sector in Ireland is at a very low base and consequently is not politically organised or represented. This is a very significant constraint on the development of the area. Inevitably there may be conflicts between the production of NWFP and the use of forests for wood production. In the circumstances it is desirable that a representative organisation for the sector should be established.

10.1 SOLUTIONS TO HORIZONTAL ISSUES

While the previous issues are very real and significant they are by no means insurmountable. Local development groups through Leader Companies, Area Partnership Companies and Community Groups present an opportunity to initiate a response to the challenges outlined and pilot the development of support services. The results of this pilot study could then be mainstreamed within the main development organisations such as Teagasc.

The Western Development Commission has already invested heavily in establishing the opportunities and development needs surrounding the organic industry. Many of the challenges facing the organic industry in terms of knowledge, training and advisory services, linkages between the producer and the markets, virtual marts are the same for the NWFP sector. Furthermore, the level of afforestation in the western region facilitates aspects of production feasibility. The lessons and solutions to the issues affecting the organic food sector may be transferred to NWFP.

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APPENDICES

APPENDIX A: LIST OF CONSULTEES

CONSULTEES	ORGANISATION
Farming	
Jim Reidy	Teagasc, Athenry
Ignatz Graf Westerholt	Wicklow Sheep Farmer
Pat Lehane	IFA
Food	
Una Fitzgibbon	Bord Bia
Bridin McIntyre	Teagasc, Food Centre
Maeve Henchion	Teagasc, Food Centre
Michael MacGiolla Coda	Federation of Irish Beekeepers
Patsy Bennett	Teagasc, Clonroche
Gerhardt Gallagher	Wicklow Uplands Council
Liam Staunton	Teagasc
Ciaran O'Keefe	Duchas
Mark O'Connor	Gourmet mushroom company
Foliage	
Jim Costello	Forest Produce Ltd.
Liam Quinn	Coillte Foliage
Paddy O Kelly	Coillte
Barry Nyhan	Emerald Foliage
Felim O'Raghallaigh	Setanta Foliage
Andrew Pockrandt	Green Foliage Ireland Ltd.
Gary Graham	Bord Glas
Jim Kelly	Consultant
John Mc Loughlin	Tree Council of Ireland
Tourism	
Dr Sheila Flanagan	DIT Tourism Centre
Liz Kennedy	DIT Tourism Research centre
Bill Murphy	Coillte
Brian Maher	Bord Failte
Des Croston	National Association of Regional Game Councils
Oils and Oleoresins	
John Black	Aroma Trading
David Kelly	Atlantic Aromatics
Roisin Carroll	Celtic Tree Oils Ltd
Ann Prendergast	President of Aromatherapy of Ireland and Europe

APPENDIX B:
EU IMPORTS OF CUT FLOWERS AND FOLIAGE, 1997 – 1999

	1997		1998		1999		
	VALUE US$	VOLUME (t)	VALUE US$	VOLUME (t)	VALUE US$	VALUE €	VOLUME (t)
Total	2,910,437	607,580	3,070,493	687,597	2,783,845	2,626,269	660,916
Extra EU	630,572	144,772	667,118	151,660	616,397	581,507	177,762
Germany	1,057,669	237,497	1,090,253	243,273	812,430	766,443	190,531
United Kingdom	489,040	89,730	540,446	105,134	534,603	504,342	123,797
France	383,384	73,304	422,872	79,335	426,138	402,017	96,823
The Netherlands	389,208	104,956	416,821	105,564	402,837	380,035	131,912
Italy	134,043	20,905	143,361	22,443	151,829	143,235	26,739
Belgium	na	na	na	Na	106,303	100,286	26,566
Austria	107,230	15,204	101,014	13,937	101,740	95,981	14,936
Denmark	67,346	8,617	65,977	8,995	66,742	62,964	9,410
Sweden	63,004	7,241	53,224	6,404	47,112	44,445	16,255
Spain	33,256	6,500	41,526	7,457	41,496	39,147	8,973
Ireland	22,242	3,287	23,822	60,465	29,221	27,567	5,107
Greece	24,446	3,813	23,455	3,898	24,522	23,134	4,529
Portugal	12,324	1,637	13,815	1,913	16,469	15,537	2,491
Finland	20,517	2,475	18,170	2,077	16,110	15,198	2,215
Luxembourg	na	na	na	na	6,281	5,925	632
Belgium & Luxembourg	106,721	32,414	115,737	26,702	-	-	-

APPENDIX C:
PRODUCT PROFILE: LEATHERLEAF FERN

PRODUCT PROFILE: LEATHERLEAF FERN	
1. Product information:	Common name: Leatherleaf Fern Botanical name: *Rumohra adiantiformis* (Dryopteris fern family) Fronds (i.e., fern 'leaves') are triangular, coarsely toothed, 3-4 pinnate at base, 10-24 inches long. Sori are located on the dorsal (bottom) side of the fronds. Stipes (i.e., fern petioles or 'stems') are somewhat woody. Availability: year round Decorative life: 7-21 days
2. Market requirements:	European quality standards: Minimum labelling: - Identification (name and address) of the exporter and/or packer - Nature of the produce (if not visible from outside) - Name of the variety - Origin of the produce - Commercial classification: class, size, minimum and maximum lengths, number or net weight Packaging: - Special packaging requirements on request of buyer or auction. Waxed or plastic coated cartons are not accepted. Import regulation: Refer to Section 9.1.
3. Market structure:	Consumption calendar: - All year round - Peaks in the flower sales during public holidays Average prices: - Price per stem is € 0.05 Market trends: Leatherleaf ferns have been a leader for over ten years. It is the archetypal foliage, especially for supermarkets. The market for foliage is increasingly demanding quality. Foliage requires a minimum level of quality equivalent to that of cut flowers and especially a standardisation of products and careful packing. The main criterion is vase life.
4. Main suppliers:	The leading suppliers are Costa Rica, Israel, Guatemala, South Africa and USA.
5. Quality:	Harvesting: Leatherleaf ferns should be matured and hardened. Most leatherleaf is dipped after harvest in various mixtures of water, mineral oil and surfactant to both clean and, hopefully, extend subsequent vase life. Packaging: Measures to protect the product during transport. Storage: High relative humidity lasts up till 6 weeks if packed. Temperature between 2°C to 4°C is advised. Re-cut stems frequently. Transport: Preferred shipping without transfer. In general: Experience, practical and theoretical knowledge are the most important factors to improve the quality.

APPENDIX D: CASE STUDIES OF FOREST TOURISM ENTERPRISES

Centre Parcs UK was one of five award winners at the TOURFOR* Award Ceremony in January 2000, which demonstrated progress towards the implementation of an Environmental Management System for forest recreation and tourism.

Two others were UK based (Kelling Heath Holiday Park & Wilderness Wood) and one each in Finland (Humari Holiday Centre) and Portugal (Tapada Nacional de Mafra) respectively.

There follows a description of each of the five case studies.

UK

Centre Parc originated in Holland in 1967 when Dutchman Piet Derksen identified the idea of a 'villa in a forest' where city dwellers could escape from the stresses of everyday life by enjoying close contact with nature with all its restful and restorative qualities. Today there are 13 villages across Europe: five in Holland, two in Belgium, two in France, one in Germany and three in the UK.

Centre Parcs opened its first UK village in Sherwood Forest, Nottinghamshire in 1987, (approximately 60 miles from Manchester and Birmingham) followed closely by a second at Elveden Forest near Newmarket (approximately 60 miles north of London), Suffolk. A third village opened at Longleat Forest in Wiltshire (approximately 60 miles west of London) in the summer of 1994.

Product Description

Each village is set in some 400 acres of what was originally mainly coniferous forest. The forests today are very different following the introduction of extensive indigenous deciduous species and a network of streams, lakes, woodland glades and rides. The approach is to create a myriad of 'natural' habitats. The diverse forest structures that characterise the village landscape attract a wide variety of birds, plants and animal life. The status of diversity within these habitats is monitored and management activities are targeted at enhancing and maintaining the wide spectrum of species, which, have been attracted or developed naturally.

Accommodation is in self-contained villas rather than rows of huts. The main feature of the centre is a tropical water complex under a space-age dome in the middle of the site. A lot of importance is attached to quality, which is reflected in the accommodation units, the facilities, the equipment used, right down to the crockery and linen etc.

Its location in relation to significant population centres is extremely important to ensure that the villages are accessible for the short stay periods, which comprise its main business.

Kelling Heath Holiday Park is situated on the North Norfolk coast between Sheringham and Holt and extends to approximately 100 ha of woodland, lowland heath and maintained grass areas. One natural spring fed pond is present together with a conservation pond that was created approximately 10 years ago. The Park is a commercial venture owned by a Great Yarmouth company called Timewell Properties Ltd. The site contains 380 static Holiday Home pitches and its touring fields can accommodate just over 300 touring units. It also hires out just over 38 company owned holiday homes. The site receives 30,000 visitors per annum. Facilities at the park include a swimming pool, restaurant, bar, general store, toilet and shower blocks, take-away restaurants, two tennis courts, mountain bike circuit, woodland assault course and a small sports field. The majority of the Kelling Heath Holiday Park lies upon a feature known as the Cromer Ridge. The ridge is an area of dissected upland 5 – 92 m above sea level, largely sands and gravel deposited by

* TOURFOR is an award scheme to encourage sustainable co-development of tourism and forestry. The project ran from 1997 to January 2000.

the southern edge of a glacier during the ice age. The park falls within the North Norfolk Area of Outstanding Natural Beauty and is bordered by Kelling Heath itself – an extensive tract of lowland heath. Arable fields and two Forestry Commission woodlands complete the surrounding area.

Wilderness Wood is a 23 ha family-run working woodland in the hills of the Sussex High Weald Area of Outstanding Natural Beauty, about 65 km south of London. It has been owned and managed since 1980 by Chris and Anne Yarrow, who run it as a small business, with income from on-site sales of wood and wood products, and from visitors. The wood is managed with the aims of maintaining a financially sound business; making best use of all woodland produce, and adding value by making it into items such as garden furniture; maintaining and enhancing the resource base; giving people the opportunity to enjoy and learn about the wood; and providing worthwhile rural employment.

Site Description

Wilderness Wood is an ancient semi-natural wood, which has been woodland for over two centuries, and has probably never been cleared. Until the 18th century it produced charcoal for the local iron industry. Today nearly two-thirds of its area are coppices of mainly sweet chestnut, which are cut in the traditional way, on a cycle of approximately fifteen years. The remaining areas are larger chestnut trees, and plantations of pine, beech and fir, all intended for timber. A 0.5 ha Christmas tree plantation is very popular for 'dig-your-own' trees. The wood is open all the year round to visitors, who enjoy the experience of productive working woodland that is also a beautiful place with attractive wildlife. About 14,500 paying visitors come each year, as well as local villagers who use the wood free. The owners have built a traditional timber barn which houses an exhibition about Wilderness Wood and growing and using wood, a shop, and a tearoom selling local cakes and ice creams. There is a 1.2 km self-guided woodland trail with children's discovery sheet; a 0.45 km 'easy-access' path with trail leaflet; seasonal spotter sheets for children; picnic places and a wooden adventure playground; and barbeques for hire. All activities and events are based on the resources of the woods, and include a spring bluebell walk, autumn fungus hunts, and children's activities such as bug hunts, teddy bears' picnics, and campfires. About 65 school groups visit the wood each year and there are three teachers' packs for different levels.

Finland

Humari Holiday Centre is located by Lake Hoytiainen in a beautiful hilly landscape. The customers are accommodated in hotel standard cottages. A restaurant, meeting facilities and a swimming pool are located in the main building. There are some 60,000 customers who overnight or use the restaurant services each year. Humari Holiday Centre can accommodate 300 guests, the restaurant has 350 seats and modern meeting facilities have 500 seats. The main products offered by Humari are holiday packages for families, short break holidays and conference services. Most of the holiday packages are combined with outdoor activities such as trekking, fishing and sight seeing. In winter time the customers can fish on ice, take part in skiing tours or even rent a snowmobile. Tennis, volleyball and mini-golf are also offered at Humari. Humari Holiday Centre aims to provide moderate priced holiday service for Finnish customers but at the same time giving consideration to the environment.

Portugal

The Tapada Nacional de Mafra is a unique natural environment located just 35 km from Lisbon, Portugal. Its 819 ha of Mediterranean forest are surrounded by an 18th century wall, which has made the site relatively isolated and contributed to its protection. The motives for creating the Tapada in 1747 were to supply the nearby monastery with food but also to provide the Monarchy with a leisure and hunting park, therefore wildlife is abundant. Fallow deer, red deer and wild boar run freely and can easily be

seen during a visit, and birdwatchers admire the many species that can be found.

Recreation and tourism provision

Nowadays, the Tapada is open to the public as a leisure park. Visitors can choose to tour the Tapada by several different means: walking, riding and cycling are an option, but most people choose the two-hour mini-train drive. There is a network of pathways designed to accommodate visitors and reduce impacts on the habitat. There is also a small country hotel, a nineteenth century building was adapted to become an event pavilion to host social and corporate meetings. Visitors can engage in bird watching tours, fallow deer and wild boar hunting activities, and there is a range field for archery. Environmental education is a priority in the Tapada and schools represent two-thirds of the visitors. The hotel and the event pavilion were recently restored, as part of the new management plan, in which tourism and recreation are the main source of income. Another source of income is forest management, though its contribution is not as significant.

APPENDIX E: CLAIMED ACTIVITY OF SELECTED TOP-SELLING HERBAL MEDICINES

PRODUCT	PLANT PART	ACTIVITY
Siberian ginseng	Root	Defuses nervous tension and fights fatigue
Kava kava	Root	Combats anxiety and stress
Green tea	Leaves	A powerful anti-oxidant and cholesterol reducer
St. John's wort	Herb	Anti-depressant
Saw palmeto	Seeds	Treats prostrate problems
Liquorice	Root	Treats ulcers and stomach disorders
Wild yarn	Roots	Alleviates PMS and menopausal symptoms
Aloe	Leaves	Treats wounds and skin problems
Garlic	Bulb	Boosts the immune system; lowers cholesterol
Calendula	Flowers	Soothes skin; fights bacterial; viral and fungal infections
Ginger	Roots	Treats nausea and inflamed joints

Source: Centre for Promotion of Imports from Developing Countries (2001).

APPENDIX F: PRODUCTION FEASIBILITY OF HERBS AND TREES

The production feasibility of some main herbs and trees that have uses in alternative medicines are outlined below.

HERBS AND SHRUBS

The following herbs and shrubs, identified as tolerant of moist shade, may have the potential to be grown under the forest canopy of a mature stand.

However, further research is necessary to establish their applicability.

St. John's wort (*Hypericum perforatum*)

St. John's wort is an erect glabrous perennial that reaches up to 1 m in height. It has yellow five petaled flowers, ovate, linear pale to dark green leaves with translucent oil glands on surface and black dots on lower leaves in some cases.

St. John's wort is native to Europe. It can be found growing wild on roadsides, and in dry pastures and meadows.

It is a hardy perennial that can be grown in moist soil in full sun (Das *et al*. 2001a).

▲ St. John's wort.

TABLE F.1: Scientific and common names of herbs and shrubs that tolerate moist shade.

SCIENTIFIC NAME	COMMON ENGLISH NAME
Angelica archangelica	Angelica
Anthriscus cerefolium	Chervil
Allium schoenoprasum	Chives
Sambucus nigra *Sambucus* 'Aurea' *Sambucus* 'Marginata'	Elder
Tanacetum 'Arthenium' *Tanacetum* 'Aureum'	Feverfew
Melissa officinalis	Lemon balm All gold Aurea Variegata
Levisticum officinale	Lovage
Mentha	Mints
Petroselinum crispum	Parsley
Rumex acetosa	Sorrel
Myrrhis odorata	Sweet cicely
Tanacetum vulgare	Tansy
Asperula odorata, syn, Galium odoratum	Woodruff

Source: Brickell (1994).

American ginseng (*Panax quinquefolium*)

American ginseng is a perrenial herb with characteristic branched roots extending from the middle of the main root. The stem is erect and not branched with 3-6 terminal leaflets 4-15 cm long and 2-6.5 cm wide; a new leaflet grows each year until maturity (4-6 years). Flowers are pink and the fruit is berry shaped and red when ripe. The main mature root is cylindrical 2.5-20 cm long by 0.5-3.0 cm in diameter.

In the wild, American ginseng grows in deep shade (minimum 70%) of mature deciduous hardwood forests (Forest Renewal BC 2001). In the northern part of its range, it is most often associated with sugar maple (*Acer sacchharum*); in the American mid-west it is associated with several hardwood species, including oak (*Quercus* spp.); and in the southeastern US, it can be seen growing under black walnut (*Juglans nigra*) or tulip poplar.

American ginseng generally does not grow in an exclusively coniferous forest (Forest Renewal BC 2001). However, preliminary research from West Virginia suggests that as long as favourable soil and environmental conditions are met, ginseng can grow quite successfully under white pine (*Pinus alba*) shade (Das *et al*. 2001b). Wild harvesting of American ginseng is strictly controlled in North America through a system of permits. The main collection areas in the USA are the forest regions of Kentucky, Tennessee and West Virginia, which together produce over 750 tonnes, more than 70% of the US total. Ontario is the main collection centre in Canada.

▲ Ginseng roots.

It grows best in well-drained, porous soils with topsoil rich in humus formed from hardwood and other leaf litter (Das *et al*. 2001b). Natural populations tolerate a wide range of pH, and grow in soils that vary greatly in level of other soil nutrients. Indications are that the species prefers a pH range of 5-6 (Das *et al*. 2001b) and soils that are calcium rich (Forest Renewal BC 2001).

American ginseng can be field grown (using artificial shade) or grown under a forest canopy. There are now several hundred acres of American ginseng under cultivation, especially in Wisconsin, Ontario and Vancouver. Winconsin produces more than 5,000 tonnes of cultivated ginseng while more than 1,200 ha are planted to ginseng in Ontario and more than 800 ha in British Columbia, Canada.

There are two methods of growing ginseng under the forest canopy:

1. Forest-cultivated ginseng
2. Wild-simulated ginseng.

Forest-cultivated ginseng

This involves growing ginseng under the shade of a forest canopy and cultivating the soil to a depth of 10-15 cm. The first harvest of roots takes place after 6-9 years after planting (Forest Renewal BC 2001). Beds which are 1.8 m wide are elevated 15-20 cm with a low walkway between them for maximum water runoff. Beds should also slope gently downhill so that roots never stand in water. Beds should not be elevated on steeper slopes (erosion). Seeds or seedlings are planted no more that 15 cm apart (2.5 or 5 cm apart when simulating field-grown conditions) in rows 15-30 cm apart at a depth of 1 cm. Beds are than covered with 2.5 or 5 cm of leaf mulch or clean straw. Fresh or stratified seeds should be planted in the fall.

Wild-simulated ginseng

This involves growing ginseng under the forest canopy but without cultivating the soil (Forest Renewal BC 2001). The first harvest occurs 9-12 years after planting. The resultant ginseng

roots look most like true wild ginseng and, therefore, receive a premium price on the market relative to field grown or forest-cultivated ginseng roots (Forest Renewal BC 2001). Thinning of the plants is also required to achieve a final density of one plant per square foot. Weeding is less intensive in this practice, and is normally only carried out for the first two seasons. After two years, the plants are essentially left alone unless pest control is required (Forest Renewal BC 2001).

Very sandy or clayey soils should be avoided. The addition of lime to raise pH to 5-6 may be desirable. Anecdotal evidence suggests that calcium is equally as critical as pH (Das *et al*. 2001b). Forest Renewal BC (2001) recommends that ginseng beds should be tested for available calcium every two to three years. In the case of wild-simulated ginseng, little fertiliser should be applied excepting calcium as needed. Fertilisers enhance plant growth but the more they are used, the more the plants resemble the lower valued field-grown ginseng (Forest Renewal BC 2001).

In the autumn, the ginseng beds should be covered with leaf mulch or clean straw (Forest Renewal BC 2001).

Roots are harvested in late summer or early autumn using a potato digger or manually (Das *et al*. 2001b). Harvesting manually allows for more care to be taken to avoid damaging the root or the fibres of the taproot (Forest Renewal BC 2001). Once harvested, the roots should be washed but never scrubbed. Scrubbing may result in the roots taking on an undesirable shine to the skin. Fresh roots can be kept in an open plastic bag in a refrigerator for several months. Placing roots on screens or cardboard so that they do not touch each other in a well-ventilated shed or dryer allows the roots to dry. The temperature should not exceed 37ºC. Dried roots lose two-thirds of their fresh weight (Forest Renewal BC 2001).

Black cohosh (*Cimicifuga racemosa*)

Black cohosh is a deciduous perennial that grows to a height of 3 m. The aerial portions of the plant die back in the autumn (Forest Renewal BC 2001). Freshly dug roots are dark reddish brown externally and white internally. The root, which is actually a rhizome with small wiry rootlets, is quite large and has knobbly bumps.

Black cohosh is native to hardwood forests from southern Ontario to Georgia and west to Arkansas and Wisconsin. It can be found in open woods and at the edges of denser woods. Black cohosh generally grows in moist, rich, well-drained soils (Forest Renewal BC 2001).

Black cohosh is considered easier to cultivate than American ginseng (Forest Renewal BC 2001). It grows best in rich, moist, well-drained soil and under partial shade. Provided ample water is available, black cohosh will tolerate considerable amounts of sun although some shade is required in BC. A harvestable size of root is reached after three to four years and is harvested in the autumn. Rhizome pieces that have buds can be replanted to produce more harvestable roots in three years. Roots should be thoroughly washed before being sold and dried whole in a warm, airy location, out of sunlight (Forest Renewal BC 2001).

Goldenseal (*Hydrastis canadensis*)

Goldenseal is a herbaceous perennial that can grow to 35 cm tall. The rhizomes, with which Goldenseal spreads have a horizontal profile, are bright yellow, 2-3 cm thick and are covered in fibrous roots (Forest Renewal BC 2001).

Goldenseal grows in the shade of mature mixed hardwood forests in the wild and prefer cool, moist sites with well-drained, deep loamy soils and a good supply of organic matter. It does not grow well under conifers whose shallow root systems compete for nutrients and moisture. In the wild, goldenseal is associated with, amongst other, black cohosh (Forest Renewal BC 2001).

Goldenseal will tolerate slightly more sun and slightly wetter soils than ginseng. It grows best on rich, moist, well-aerated, loamy soils, with good drainage. A site with mixed, deeply rooting, hardwoods is ideal. Some growers mix their goldenseal and ginseng because

goldenseal is believed to 'clean' the soil. Soils should be tested for fertility and nematode infestation. If goldenseal is mulched in wet areas, care should be used to prevent the occurrence of crown rot.

Roots are ready for harvest in three to five years. Harvesting occurs in the late summer or early autumn when the tops die down. The largest roots should be kept aside to use for replanting as goldenseal seeds are notoriously difficult to germinate. Once harvested, roots should be thoroughly washed but not soaked or scrubbed. To dry, the roots should be placed on screens in the shade where there is good air movement (Forest Renewal BC 2001).

Goldenseal may be grown in the same areas as American ginseng.

Ginkgo (*Ginkgo biloba*)

Ginkgo prefers deep, well-drained soils and has good frost tolerance. It will tolerate at least light shade but exact shade tolerance is unknown (Forest Renewal BC 2001). Generally, ginkgo is slow growing. However, there is current research being carried out that is hoping to produce trees with more rapid growth.

The leaves of ginkgo are valued for their medicinal properties. They should be harvested in the autumn, just as they begin to change colour. The fresh to dry yield for the leaves is 4:1. The trees are usually pruned to maintain a height of approximately 2 m to allow for easier harvesting.

TREES

The medicinal properties based on tradition of a number of Ireland's native trees are reviewed below.

Common alder – Fearnog (*Alnus glutinosa*)

One of Ireland's most traditional and widely distributed trees, alder may be found in damp areas, beside freshwater lakes and along river banks. Alder will grow in most soils and likes wet sites.

The bark and leaves of alder have been used since at least the time of the Anglo-Saxons in Britain. It was used in a decoction to treat burns and inflammations and also to stop bleeding because of its astringent properties, and to stop gangrene. The bark, made into a decoction, was used to stop diarrhoea and as a toning for lax muscles. It can also be used as a gargle for sore throats, a lotion for cuts and grazes, burns and scalds, boils and abscesses, and varicose veins. It was also recommended for getting rid of fleas (Miles 1999).

In ancient Ireland sections of alder trunks were used as round shields. Later it was used for making clogs and also in the furniture trade where is known as 'Irish mahogany'. As it is resistant to decay when submerged in water, alder is used to make sluice gates and other structures along streams, rivers and canals.

Alder leaves 'gathered while the morning dew is on them, and brought to the chamber troubled with fleas, will gather them there-unto, which being suddenly cast out, will rid the chamber of those troublesome bedfellows' (Culpeper 1653).

▲ Leaves and cones of the common alder.

Ash – Fuinseog (*Fraxinus excelsior*)

Ash is the commonest tree in Irish hedgerows, and is also a traditional woodland species.

The flowers are very dark, almost black, and may be seen before the leaves develop – ash is one of the last trees to come into leaf and is one of the first to lose its leaves in autumn (Coillte 2000). The seeds are clumps of winged keys.

The pale dense timber makes good firewood and is also used for hurley sticks, snooker cues

▲ Leaves and cones of the ash.

and furniture. Leaves, collected in spring or early summer, and the seeds, plucked when young and green, are today considered beneficial for their diuretic and laxative effects (Miles 1999). They help cleanse the body of toxins by relieving fluid retention and sluggish bowels. They are used specifically for treating gout and rheumatism. The bark, removed in spring from three- or four-year-old branches, acts as a bitter tonic, stimulating the flow of bile from the liver and aiding digestion. It also has valued astringent properties for the treatment of diarrhoea and dysentery and in stemming bleeding. It is a diaphoretic, reduces fevers, and has often been used as a substitute for quinine to treat intermittent fevers and malaria.

Aspen – Crann creathach (*Populus tremula*)

Aspen is a native poplar. It grows into a full sized tree. The leaves make a distinctive sound as they rattle gently in the wind and have a sweet smell in the spring (Coillte 2000).

▲ Leaves of the aspen.

Poplars produce seeds on catkins, but also spread vegetatively by suckers, i.e. new shoots growing up from the roots.

There is a long history of the use of aspen flower buds, leaves and bark for medicinal benefits, mainly to enhance digestion and absorption and to stimulate the appetite. They can be taken for a range of digestive problems including indigestion, wind, acidity, colic, diarrhoea and liver problems (Miles 1999).

Aspen contains salicin, which has properties similar to aspirin. Therefore aspen is a worthy remedy for headaches, pain and fevers. Its anti-inflammatory and diuretic action helps to relieve urinary problems such as cystitis, irritable bladder and fluid retention. It is often prescribed for painful inflamed joints. Externally it tones the skin and makes a good styptic for cuts and grazes, an anti-inflammatory for eczema and ulcers and an astringent for excessive perspiration (Miles 1999).

Birch – Beith (*Betula pubescens* and *B. pendula*)

There are two types of birch in Ireland, downy and silver. The most usual is the downy birch, which, like silver birch, is a delicate tree with fine branches and small leaves. The springtime flowers are catkins, which stay on the tree and contain the mature seed by autumn (Coillte 2000).

Birch will grow in poor soils but likes a sunny position. Downy birch is tolerant of wet sites, but silver birch needs good drainage.

▲ Leaves of the birch.

Tapped birch sap has long been used medicinally. It was used as a popular remedy for urinary infections due to its antiseptic action and affinity for the kidneys and bladder. During the time of Napoleon, the sap was regarded as a universal panacea with a special efficacy for treating skin infections, rheumatism, gout and bladder problems. In Germany a tisane made from birch has long been popular for treating skin problems. The oil from the buds and bark contains methylsalicylate, which explains its use as a liniment for arthritis and rheumatism. It has also been used successfully to treat psoriasis and eczema and as a disinfectant for cuts and wounds (Miles 1999).

Cherry – Crann silin fiain (*Prunus* spp)

Wild cherry can be found in hedgerows and also in mixed deciduous woodland. It produces white or very pale pink flowers in spring followed by hanging cherries.

The fruits and stalks of the cherry have been valued for centuries. They are a diuretic. They have been used for rheumatism, arthritis and urinary infections, and cherry stalk tea is famous for lowering uric acid levels and receiving gout. The stalks have an astringent action, helping to protect the lining of the digestive tract from irritation and infection, and to treat diarrhoea, while the fruits have a more laxative effect and make a good remedy for constipation. Culpeper recommended the gum that exuded from the bark of the tree for colds, coughs, hoarseness, kidney stones and gravel and wind, as well as to sharpen eyesight and provoke appetite (Miles 1999).

Cherries are nutritious: they are rich in vitamin C and a good source of beta carotene, calcium, magnesium, iron, phosphorus, potassium and zinc. They contain a wealth of assimilable sugar, laevulose, which is safe for diabetics. They also help the body to combat infection and are easily digested, making them a good food for people who are run down or recovering from illness (Miles 1999).

The bark of the American wild cherry (*Prunus serotina*) is used today in herbal medicine. It has a sedative effect on the nervous system and particularly on the cough reflex, making it an excellent remedy for hard, irritating or paroxysmal coughs such as whooping cough and croup. It has also been used for nervous palpitations and digestive problems but should only be used on the advice of a qualified medical herbalist as the bark contains prussic acid (Miles 1999).

Elder – Ruis (*Sambucus nigra*)

Elder offers a range of dyes: black from the bark, green from the leaves and a variety of blues and purples from the berries (Miles 1999).

All parts of the elder tree have been used as a medicine for thousands of years and it has so many different healing properties that it has been called ‘the medicine chest of the country people’. John Evelyn writing in 1664, said: ‘If the medicinal properties of its leaves, bark and berries were fully known, I cannot tell what our countryman would ail for which he might not fetch a remedy from every hedge, either for sickness or wounds.’

Elder flowers can be used to treat colds, sore throats, fevers and flu when taken as a hot

▲ Leaves and fruit of wild cherry.

▲ Leaves and fruit of elder.

infusion. They are excellent at binging out the rash of measles and chickenpox and speeding recovery. They also have a decongestant action. Elderflowers have long been used to treat rheumatism, gout and arthritis. They can also release tension, allay anxiety and lift depression. Externally, they can be used in lotions and creams for cuts, haemorrhoids, burns, sunburn and skin problems. The root and bark of elder are powerful laxatives when taken internally. Externally they can be made into ointments for skin problems and a decoction can be used to gargle for sore throats (Miles 1999).

Yew – Iodha (*Taxus* spp.)

The yew is an evergreen conifer with dark foliage and red berries encasing a single seed. The yew is more often seen in artificial surroundings of estates or churchyards.

Yew trees need a well-drained site and one not too exposed to wind or frost. A well-known NWFP derived from yew is taxol. Taxol is a plant-derived anti cancer drug and was first isolated from the bark of the Pacific yew (*Taxus brevifolia*). It is also found in the bark and needles of related species of *Taxus* throughout the world (FAO 1998). Harvesting of yew bark is done by stripping the bark from live or freshly felled trees. The bark is stripped from the main stem and all the boughs with a diameter greater than 2.5 cm. It can be harvested as soon as the sap begins to flow in the spring when the bark contains its maximum amount of taxol and is easier to strip. However, due to the slow-growing nature of yew and concerns of sustainability of yew bark harvesting, an alternative has been found (USDA Forest Service *et al*. 1993). A promising alternative to taxol is taxotere, a related compound that is produced chemically by altering a compound extracted from the needles of the yew.

▲ Leaves and fruit of yew.

APPENDIX G:
GROWING CHARACTERISTICS OF FOREST FRUITS

Strawberries- *Fragaria* x *ananassa*

Summer fruiting strawberries produce nearly all their fruit during a 2 or 3 week period in mid-summer. Some cultivars also give a smaller autumn crop.

Perpetual fruiting strawberries crop briefly in summer, cease for about 2 months, and then produce a succession of fruits in autumn. They grow best in regions with mild, frost-free autumn weather.

Strawberries are best grown where new plantings may be made regularly on fresh ground, since cropping, fruit size, and plant health deteriorate if the same ground and plants are used after the third year.

Sunny, warm sites give the best flavoured fruit. Sandy soils produce the earliest crops, loams and well drained clays the heaviest and most finely flavoured; chalky soils do not produce good results. Slightly acidic conditions with a pH of 6-6.5 are ideal. Good drainage is vital to prevent soil-borne diseases.

Choose warm, sheltered site for earliest crops, sunny open ground for the main crop, and a less sunny site for late-ripening fruits.

Planting time depends on geographical location. In cool, temperate regions, late summer – early autumn is best and ensures the heaviest crops the following summer.

Clear all weeds and apply generous amounts of well-rotted farmyard manure (FYM).

Space strawberries at 45 cm within the slightly raised rows and 75 cm between rows. On wet sites, plant in raised beds.

Blackberries and Hybrid Berries - *Rubus fruticosus* and *Rubus* hybrids

Wild blackberries grow on brambles that are tough colonising plants and have rapidly growing stems. When the tips of the bramble touch the ground it can grow new roots and start a new plant.

Blackberries grow best on deep, well-drained soil, with ample amounts of water. It has fairly low nutrient requirements, and nitrogen in low applications is the only nutrient generally applied (Forest Renewal BC 2001). However, in a horticultural context, Brickell (1994) recommends that before planting, the ground should be well prepared and fertilised as for raspberries. Thornless cultivars are usually less vigorous than prickly ones.

Blackberries and hybrid berries need a sunny or partially shaded position. Do not plant them in exposed sites. Provide the plants with support (posts and wire/canes).

TABLE G.1: Recommended varieties of strawberries.

SUMMER FRUITING			PERPETUAL FRUITING
Early	**Mid-season**	**Late**	
Cambridge Rival	Cambridge Favourite	Bogota	Aromel
Cambridge Vigour	Elsanta	Cambridge Late Pine	Gento
Elvira	Hapil	Domanil	Ostara
Gorella	Pandora		Rabunda
Hedley	Providence		Rapella
Honeoye	Red Gauntlet		
Pantagruella	Royal Sovreign		
	Tamella		
	Tenira		
	Totem		

Source: Brickell (1994).

TABLE G.2: Recommended varieties of blackberries.

BLACKBERRIES		HYBRID BERRIES
Early	**Late**	
Bedford Giant	Ashton Cross	Boysenberry
Himalaya Giant	John Innes	Kings Acre Berry
Merton Early	Oregon Thornless	Loganberry
Merton Thornless	Smoothstem	Sunberry
	Thornfree	Tayberry
		Tummelberry
		Veitchberry

Source: Brickell (1994).

Plant during winter; if the weather is severe, delay until late winter or early spring. Some hybrids may be killed in very cold areas. Space more vigorous cultivars 4-5 m apart, less vigorous ones at 2.5-3 m apart.

The plants fruit on one-year old wood.

Birds, grey mould (*Botrytis*) raspberry beetles and viruses (resistance varies between varieties) are among the main pests and diseases.

Blackberry can be used to keep animals (including people) away from stream banks or other sensitive areas. It is especially well-suited to planting along fence lines, either on its own or planted between widely spaced trees to ensure adequate light for berry production. It could also be planted as a component of windbreaks, especially on edges where adequate light is available (Forest Renewal BC 2001).

Raspberries - *Rubus idaeus*

Raspberries are a cool season crop, growing best where there is plenty of moisture. Two main types of raspberry: summer fruiting, which has a short season of heavy cropping in high summer, and autumn-fruiting, which has a protracted cropping period beginning in late summer and continuing until the start of winter frosts.

The site needs thorough preparation before planting. Do not crop well on poor soils, particularly if in competition with weeds.

They should be planted in a sheltered, sunny position and are tolerant of partial shade.

Soil should be rich in humus and moisture retentive whilst being well drained. They do not tolerate poor drainage. Sandy, chalky and poor stony soils need an annual heavy dressing of humus rich material, and regular watering. If grown on lime-rich soils, can suffer from chlorosis (manganese/iron deficiency).

Plant at 38-45 cm spacing in the row and 2 m between rows. Plant in autumn and early winter.

Blackcurrants – *Ribes nigrum*

Blackcurrants thrive only in cool temperate regions. The bushes flower early and so are prone to frost damage on exposed sites. They are host to a rust disease on white pine in the USA.

TABLE G.3: Recommended varieties of raspberries.

SUMMER FRUITING			AUTUMN FRUITING
Early	**Mid-season**	**Late**	
Delight	Glen Prosen	Augusta	Autumn Bliss
Glen Clova	Malling Jewel	Leo	Heritage
Glencoe	Orion	Malling Admiral	September
Glen Moy		Malling Joy	Zeva
Malling Promise			
Southland			
Sumner			

Source: Brickell (1994).

TABLE G.4: Recommended varieties of blackcurrants.

EARLY	MID-SEASON	LATE	VERY LATE
Boskoop Giant	Ben Lomond	Amos Black	Jet
Laxton's Giant	Ben More	Baldwin	
Tsema	Ben Nevis	Ben Sarek	
	Blackdown	Ben Tirran	
	Blacksmith		
	Seabrook's Black		
	Wellington XXX		

Source: Brickell (1994).

Before planting, remove all weeds from the site and add plenty of manure.

The best location for blackcurrants is a sunny site, sheltered from cold winds; some shade is tolerated. Protect from spring frosts if necessary. They grow in a range of soils but deep, moisture retentive soil is most suitable; avoid wet, poorly drained ground. A pH of 6.5-7 is preferable.

Planting in late autumn is preferable but is possible throughout the winter. Space them 1.2-1.5 m apart with the same distance between rows. In spring, apply a mulch as well as N and K fertilisers at 35 g/m^2 (350 kg/ha). Mulch around the base with compost or leaf mould to conserve soil moisture.

Pest and diseases

Aphids, gall mites, winter moth (*Operophtera brumata*) caterpillars, birds.

Forest Renewal BC (2001) suggests that currants may have potential in intercropping systems as they have shallow rooting systems and therefore will not compete with the more deeper rooting trees.

Red- and whitecurrants - *Ribes sativum*

Red- and whitecurrants require a cool climate. Both fruit in mid-summer and need the same growing conditions. Harvest as for blackcurrants. They are normally grown as open-centre bushes but may be trained on support wires. Fruits develop on spurs produced by pruning backside shoots.

Red- and whitecurrants need a sunny site but tolerate some shade. Protect plants from the wind to prevent stems from breaking.

Prepare the soil as for blackcurrants. Heavier, moisture retentive, but well drained, soils are preferable. Potassium deficiency may occur on sandy soils.

Plant in autumn or winter: space bushes 1.2 – 1.5 m apart.

Maintain as per blackcurrants. Maintain high potassium levels by applying potassium sulphate (muriate of potash may scorch the foliage).

Pests and diseases

Net the plants over the winter to prevent birds from damaging the buds. If the buds do get damaged, delay winter pruning until just before

TABLE G.5: Recommended varieties of red and white currants.

REDCURRANT			WHITECURRANT
Early	**Mid-season**	**Late**	**Mid-season**
Jonkheervan Tets	Red Lake	Wilson's Long Bunch	White Dutch
Laxton's No. 1	Rondom		White Grape
	Stanza		White Versailles

Source: Brickell (1994).

bud-burst and then prune to healthy buds. Aphids, sawfly larvae, grey mould (*Botrytis*) and coral spot may affect plants.

Blueberries - *Vaccinium corymbosum*

High bush blueberries are derived from the American wild blueberry. They require a cool, moist climate, needing 700-1,200 hours below 7ºC, and very acid soil (pH 4 – 5.5). For good production, organic matter content in the soil needs to be at least 3% (Forest Renewal BC 2001). High bushes grow to a height of 1.3-2 m. Rabbit-eye blueberries (*Vaccinium ashei*) tolerate less acid conditions and drier soils (Brickell 1994). At one time in British Columbia, blueberries were grown exclusively on peat soils on drained bogs. Recent years has seen a change as production moves onto mineral soils (Forest Renewal BC 2001).

Cropping in mid- to late summer is light at first but after five or six years, yields of 2.25 kg per bush can be obtained and on older bushes, considerably more (Brickell 1994). Well-maintained blueberry plantings can remain productive for fifty years or more (Forest Renewal BC 2001). Blueberry crops better when two or more cultivars are grown in close proximity.

Blueberries require a sunny location but they do tolerate some shade. The soil must be well drained (Brickell 1994) and porous; plants will not tolerate long periods of flooding in winter (Forest Renewal BC 2001). A water table 30-60 cm below the soil surface is recommended by Forest Renewal BC (2001) for blueberry production. The roots of blueberry are very shallow and can be adversely affected by extremes of soil temperature.

Brickell (1994) recommends, in a horticultural context, the blueberry should be planted from late autumn to late winter and spaced 1.5 m apart. They should also be mulched with acid compost or leaf mould to aid in weed control and maintain an acidic rhizosphere.

Again in a horticultural context, Brickell (1994) recommends the application of a dressing each spring of sulphate of ammonia at 35 g/m^2, sulphate of potash as 35 g/m^2, and bone meal at 105 g/m^2.

Pests and diseases

The fruits of blueberry may be eaten by birds (Brickell 1994). However, sound devices and scare devices have been found by BC farmers to be effective when used properly. The presence of birds of prey is also effective, even if they do not prey on the pest bird species, so Forest Renewal BC (2001) recommends the provision of nest boxes and roosts for raptors. Other pests and diseases rarely cause any trouble (Brickell 1994).

Potential agroforestry use

Blueberries may have potential on the outer edges of riparian zones provided that run-off is controlled and seasonal flooding does not occur (Forest Renewal BC 2001). Due to their shallow rooting, blueberries may also have potential in widely spaced plantations, particularly those composed of tree species with moderate to deep roots, provided that adequate light is available for fruiting. Blueberries may also be planted along fencelines, edges (particularly south facing edges) and as part of a windbreak.

TABLE G.6: Recommended varieties of blueberries.

Early	Mid-season	Late
Bluecrop	Berkeley	Coville
Bluetta	Herbert	Darrow
Earliblue	Ivanhoe	Goldtraube 71
Patriot		Jersey

Source: Brickell (1994).

APPENDIX H:
FEASIBILITY OF PRODUCING MUSHROOMS IN FORESTS

Shiitake - *Lentinus edoides*

Shiitake mushrooms can be grown on inoculated logs. Inoculation of logs with spawn usually occurs in late winter/early spring when freshly cut logs are full of rising sap. Spawn comes as either wooden plugs made from hardwood dowels or as sawdust. A new type of spawn, called 'comb spawn', has been developed in Japan but at the time of writing, Anderson and Marcouiller (n.d.) state that it is not widely available. The spawn is cultured on a type of wafer that can be inserted into a saw kerf in a log. Different strains of spawn are available for different climatic conditions (e.g. cold weather strains, warm weather strains and wide-range strains). During the first two months after inoculation, the moisture content of the logs must be maintained at 35-45%. Shiitake growth becomes poor if the moisture content falls below 35% or rises above 60% (Anderson and Marcouiller n.d.). Spawn will grow between 4º and 32ºC (40ºF and 90ºF) but the optimum is 22ºC to 26ºC (72ºF to 78ºF). For the spawn to fully occupy an inoculated log and produce fruiting bodies often takes 6-12 months, but a single log may then produce a seasonal crop for five successive years.

Over their productive lifetime, it is expected that logs will produce at least 1-1.5 kg of mushrooms for every 50 kg of log (Sabota 1993). Hill (n.d.) states that logs usually produce about 10% of their original weight over their productive life and that once Shiitake production declines, the logs can be sterilised and reinoculated with oyster mushrooms. Shiitake mushrooms grow best on logs with diameters of 7-20 cm. Shiitake mushrooms may, therefore, be a value-added product of thinnings that would otherwise likely be used/sold as firewood. Shiitake will grow on almost any species of hardwood tree, although oaks are favoured. It is possible to grow them on coniferous logs but this is not as successful (Hill n.d.).

Shiitake is not the only mushroom species that can be grown on inoculated logs: Oyster mushrooms, Lion's mane (*Hericium erinaceus*), and Maitake can also be successfully grown (Hill n.d.). The logs must come from live trees and the lengths that people use vary.

King stropharia (*Stropharia rugosoannulma*) and morels (*Morchella* spp.) do not grow on logs. They grow on the forest floor. Stropharia can be 'seeded' into wood chip beds in the forest and watered as needed until they begin to produce mushrooms (Hill n.d.).

▲ Shiitake mushroom cultivation on oak logs.

APPENDIX I: GRAZING CHARACTERISTICS AND IMPACT ON SITE BY STOCK

SPECIES	FEEDING METHOD	SELECTIVITY	DIET PREFERENCE Major/minor species	SEASONAL VARIATION	EFFECTS ON HABITAT
Cattle	Bulk grazer Tear-off long vegetation by wrapping tongue around and pulling. Grasp short vegetation between lower incisors and horny upper pad. Ruminants feeding for 60% of the day.	Low	High quality grasses, bent/fescue Low quality communities: bog-rush fen, mat grass/purple moor-grass, heather (ling).	Low Broadleaves bark stripped when forage availability low (winter), or in response to mineral deficiency (summer).	1. Uneven tussocky sward, with tall vegetation around dung patches which are avoided. High grazing pressures produce short swards. 2. Winter grazing of mat/purple moor-grass breaks-up deep litter and increases quality of spring growth. 3. Summer grazing of heather and wavy hair-grass reduces coarse and woody material, encourages herb species and improves forage.
Horses & ponies	Bulk grazer Nip herbage close to ground with upper and lower incisors. Non-ruminant. Feeds for 75-88% of the day.	High	Bent/fescue grasses. Purple moor-grass, heather, gorse and holly. Sedges/rushes and ferns. Native breeds take more coarse grasses.	High Bent/fescue grasses preferred. Purple moor-grass, sedges, rushes and ferns taken late spring and summer. Bark stripped when forage availability low.	1. Varied sward structure, patches of closely grazed and tussocky ground. 2. Native breeds are particularly useful at controlling coarse grasses and producing open, herb-rich swards.
Sheep	Selective grazer Nip herbage close to ground. Vegetation grasped between lower incisor and horny upper pad.	Very high Native and hardy breeds are less selective.	High quality grasses and forbs Heather and coarse grasses.	High Ash, holly, oak and birch browsed in summer. Fir, spruce, yew, juniper and bramble in winter. Bark stripped in severe winters.	1. Short, tight sward, except where tussocky grass is present. 2. Commercial hill breeds avoid coarse grasses. 3. Browse hardwood seedlings for a greater proportion of the year and more selectively than cattle, preventing natural regeneration. 4. Saplings browsed in winter, especially during snow cover. 5. Seek woodland shelter during inclement weather causing particularly high impact to ground flora and natural regeneration.
Goats	Selective browsers Narrow incisor width enables high selectivity.	High	High quality grasses, sedges, rushes and dwarf shrubs Mat grass, rushes, bracken, bog myrtle.	High Grasses, sedges and rushes in summer, dwarf shrubs, gorse and browse in winter. Norway and Sitka spruce browsed in winter. Winter stripping of smooth broadleaf species and conifers	1. Graze/browse tall vegetation leaving uneven, tussocky swards. 2. Hardwood seedlings browsed more than by cattle and sheep, preventing natural regeneration. 3. Brambles and other thorny species may be controlled by browsing.
Pigs	Omnivorous Take invertebrates, tubers, fungi, fruits, seeds, grasses and carrion, much of which is obtained by rootng in the leaf litter.	Low	Anything tasty	Low Fruits and seeds (particularly acorns) taken in autumn.	1. Dense ground vegetation (bracken, couch grass, brambles, roses) reduced/cleared by rooting behaviour. 2. Seed beds created for natural regeneration. 3. Seedlings, saplings and roots of larger trees may be uprooted or damaged unless pigs are ringed (4-5 rings in snout) and removed following pannage period (3-4 weeks). 4. Continual pig rooting prevents natural regeneration.

Source: Mayle (1999).