

Denmark

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Summary

In general, this report bears on the total forest area in Denmark, irrespective of ownership category and holding size. The reason is that from most points of perspective, almost all Danish forest holdings have the characteristics of small-scale forestry. Furthermore, the entire population is considered to be urban as only a small percentage is dependent on rural-type income.

By far the most important limiting factor on forest entrepreneurship in Denmark is the ownership structure in combination with the wealth of the country. There are a large and increasing number of forest holdings in the smaller size classes, where forestry as a business and livelihood is not a primary aim. Recent decreases in the prices of traditional products and hence decreases in economic performance of the primary forestry sector represent an additional limiting factor. This development has made private forestry – but also public forestry to some extent – look for opportunities for increasing income generation from non-wood products and services. A few forest owners have demonstrated great inventiveness and creativity – proving that many services can become income generating.

Society has developed some tools to remedy the potential welfare implications and support and improve the technological innovation and management processes of the sector in general. The key question and issue that research must study and private initiative deal with is how to build and develop markets for ever-increasing ‘softer’ goods and services from the forests at large.

1 Consumption

1.1 State of the art and historical development

Annual statistics on total fellings (removals) are published, based on mandatory reports from all forest holdings >50 hectares and from samples of holdings below that limit. Detailed information on foreign trade in wood and wood products is published annually. On this basis wood consumption in roundwood equivalents can be calculated more accurately than from FAO's Yearbook of forest products.

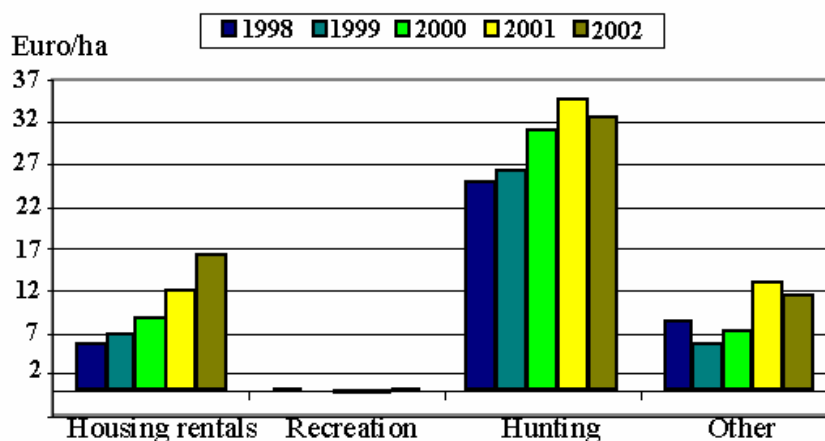
More detailed information on annual removals is available from State forestry and the more important private forest holdings, and also on other forest products and services.

Data are available on total annual exports (imports are negligible) of Christmas trees and greenery, whereas total production is not recorded.

1.2 Forest products and services consumption

Detailed calculation of Denmark's total roundwood balance has been made for 1938, 1958, 1963, 1968 (Dalgas 1970), 1971 (Moltesen 1971) and average 1970-1980 (Helles et al. 1984), and a more rough estimate for 1997 (Linddal 1997). There was an increasing trend for the entire period, from 3.0 to 7.5 million m³ or 0.8 to 1.5 m³ per capita. The share of domestic removals increased from 23 to 40%.

The annual domestic consumption of Christmas trees is estimated at about 2 million trees whereas no information is available on the consumption of greenery. However, a likely estimate is 2-3,000 tonnes. The exports of Christmas trees 1990-1999 fluctuated between 5.5 and 8.8 million trees, the exports of greenery was more stable, between 20,000 and 29,000 tonnes. (Larsen and Johannsen 2002).



Source: (Data from Danish Forest Association 2004)

Figure 1. Development of working surplus from non-wood products and services in private forestry 1998-2002, in nominal terms.

Figure 1 shows the development 1998-2002 of working surplus from non-wood products and services, i.e. those marketed, from private forestry holdings that are members of the Danish Forest Association – representing about 28% of the total forest area in private ownership. There were large variations among regions and holding sizes, but the average contribution margins per hectare amounted to:

- wood production 240 euro,
- Christmas trees and greenery 138 euro – both with decreasing trend, and
- other products and services in total 73 euro, with increasing trend (Dansk Skovforening 2003).

The total market value of hunting rentals in Danish forests is presumed to exceed 16 million euro per year (Thorsen and Strange 2003) and may be as high as 27 million euro per year.

The use of forests for recreation has been intensively investigated since the 1970s (Koch 1978, 1980, 1984; Koch and Jensen 1988; Jensen and Koch 1997; Jensen 2003). The free access to forests for recreation is legalised and is a little more extensive in public than in private forests, however, many privately owned forests <5 hectares are relatively inaccessible due to lack of proper roads and trails. The opportunities for forest visits vary rather much. If measured as the distance of 20 minutes by car, North Zealand and Mid Jutland have relatively very good supply of opportunity, and not surprisingly two thirds of all forest visits take place at the forest nearest to home. About one third of total visits are made to ten forests accounting for one tenth of the total forest area. Forest visits amount to a total of 75 million per year, 90% of Danish adults making a forest visit at least once a year, with an average duration of about one hour. The main motives for visiting the forest are to go for a walk and enjoy nature, only 1-2% doing horseback riding, hunting or fishing.

In Figure 1, 'Recreation' is close to zero but behind this total lie minor net incomes in the Islands and net expenditures in Jutland. The major items in 'Other' are letting of land (e.g. for grazing, to the armed forces), contract work, sale of seed, fishing licence, horseback-riding permits, nature kindergarten, dog training.

1.3 Market demand for forest related products and services by urban population

See Section 1.2, where this subject has been treated in total. As mentioned, by far the dominant part of the Danish population can be considered urban.

1.4 Main problems and research questions in consumption for enterprise development

The increasing importance of non-wood products and services (exclusive of Christmas trees and greenery) to Society and forest owners, see Section 4, makes it imperative that better statistics on the marketed products and services become available. To make forest owners bear the costs and risk associated with the development of new forest products in terms of, e.g. specialised recreation services or special biodiversity protection initiatives, it is imperative that owners have access to good information on market demands (a topic for marketing research) and can benefit from information on existing successful or failed attempts to develop similar products (an information and transparency issue must presumably be tackled by the sector itself).

Future general statistics will include data reflecting the emphasis on environmental goods and services in a broad sense, systematically collected through sample measurements in forests, e.g. standing volume, diameter distribution, tree species mixture, variation in stand structure, and indicators of biodiversity (cf. Section 5).

Annex A: Organisations studying forest products consumption and main publications and information sources.

Organisations:

The Forest and Nature Agency, Ministry of Environment (www.sns.dk)

Danish Centre for Forest, Landscape and Planning, KVL (www.sl.kvl.dk)

Danish Forest Association (www.skovforeningen.dk)

Statistics Denmark (www.danmarksstatistik.dk)

Publications and information sources:

Danmarks Statistik: [Agricultural Statistics] (annual, in Danish)

Danmarks Statistik: [Danish Exports and Imports] (annual, in Danish)

Dansk Skovforening: [Survey of accounts for private forest holdings] (annual, in Danish, English summary)

Larsen, P.H. and Johannsen, V. Kvist (eds) 2002: [Forests and Plantations 2000]. Danmarks Statistik, Skov & Landskab, Skov- og Naturstyrelsen, Copenhagen, 171 p. (in Danish)

2 Small-scale forestry practices

It is emphasised that in the present context all forestry in Denmark is considered small-scale forestry, irrespective of ownership category and holding size. Forestry practices are described through the development of forest policy and Forest Acts.

2.1 State of the art and historical development

The Forest Act 1805 introduced the concept of **forest reserve**, which applied to the major part of the forestland – and still does. Forest reserve could, in principle, not be converted into other land uses and management should comply with good forestry practices, primarily aimed at wood production. The Forest Act 1935 made ‘good forestry’ the official guideline for forestry practice, to be interpreted according to developments in forest science but its focus remaining on wood production. The legislative process revealed that environmental values might be considered but not at the expense of market outputs to any significant extent (Helles 1969). However, in State and other publicly owned forests, some non-market outputs were taken into consideration in keeping with the demand, e.g. recreation opportunities.

In general, wood production potentials should be fully utilised, a practice that was benefiting from great achievements in silviculture mainly since the mid 1800s. What was physically possible should be done – there was little general emphasis on profitability, even though forest economics was much discussed (Helles et al. 1997). Many plantations should never have been established, wetlands in forests were drained and afforested, and so was any glade. Since 1904, Government grants are available to small woodland owners associations for engaging a forest graduate, so that even properties < 50 hectares could be managed in a sound way – most often for the production of wood for sale and own consumption and for providing labour opportunities in slack periods in agriculture.

A need for revision of the forest policy emerged in the late 1960s. With the increasing affluence in the Danish society, outdoor life had become popular, resulting in an increasing number of visits to forests. The issue gave rise to heated political debates, and in 1969 an Amendment to the Nature Conservation Act was passed, granting public access rights to private forests, however slightly more restrictive than those granted in 1917 to publicly owned forests. This is the first instance of the multiple-use concept being deliberately applied to Danish forestry.

The 1980s were a decade of transition with regard to forest management and to the perception of the role of forests in Society. A National Forest Inventory 1976 seemed to indicate that the area of beech was declining, not only in private but also in State forestry. Beech being Denmark’s ‘national tree’, the risk of having in a few years to change one verse of the national anthem made the fate of beech a front page issue in newspapers and politicians became concerned. Stands of mainly Norway spruce in heathland plantations showed red needles, a fact that ENGOs immediately related to ‘bad forestry practice’. This perception remained even after the phenomenon was termed ‘forest die-back’ and its complexity acknowledged.

A new Forest Act was passed in 1989. It maintained production objectives similar to those of its predecessor, but nonetheless the overall objective was extended to include multiple-use forestry. The management principle 'good forestry' was changed into 'good and multiple-use forestry'. In the comments on the Bill it was claimed that Danish forests were already characterised by multiple use, a principle that was now strengthened through making it the fundamental management principle. One might have expected that politicians would ask for a thorough updating of forest management. This was what ENGOs had fought for only a few years earlier, and the forestry sector had been completely on the defensive. A possible explanation is that in 1987, two governmental offices often contending had been merged to form the Forest and Nature Agency, covering the entire multiple-use spectrum. Almost all interested parties welcomed the Act drafted by this Agency because even if immaterial outputs were emphasised, a new grant scheme for the establishment of broadleaved stands was also introduced and other support to forestry increased. In line with a general trend, the new Forest Act was very much based on the 'carrot method' contrary to the 'stick method' that had dominated the previous Acts.

In Denmark, the 1990s might be called a 'decade of forest policy'. The Government was very active in the follow-up to international policies or strategies. In a statement 1994 the major forest policy issues were listed:

- Forests must be preserved, and within one rotation (80-100 years) the country's forest area should be doubled through State afforestation and financial support to private afforestation.
- The area of deciduous forest should be increased through financial incentives.
- A public forestry and a profitable private forestry shall be maintained.
- All forests must be managed according to 'good and multiple-use forestry', implying that economic outputs as well as non-market values are considered.
- Public forestry has a particular obligation to consider values of landscape amenity, nature, cultural heritage and recreation.
- Support to forest improvement in private forestry will be provided with regard to economic outputs and to furthering 'near-natural' management.
- For biodiversity reasons a certain area of State and private forest will be turned into 'non-intervention forest'.
- The property structure should not deteriorate by splitting-up of forests into small, non-sustainable management units.

These issues are included in the Forest Act 1996 which retains the objectives of its predecessor but changes the fundamental principle of 'good and multiple-use forestry' from an intention into an obligation for all forest reserves. All essential Government grant schemes in forestry were incorporated in the Act:

- Establishment of broadleaved stands, management planning, specific management practices, and recreation facilities.
- Conversion of stands into 'non-intervention forest'.
- Private afforestation of farmland.
- Development of more profitable or environmental friendly production processes.
- Professional assistance to small woodland owners associations.

Private forestry made substantial use of the grant for establishing broadleaved stands, not only when converting coniferous stands but also in cases where the grant did not obviously lead to a net increase of the area of broadleaves. Conversion of stands into 'non-intervention forest' or old management regimes has predominantly taken place in State forest. Afforestation of farmland has not yet reached the stipulated average of 5,000 ha per year, but when grants were made more advantageous in 1996 they became more in demand. Private afforestation without grants has been relatively more widespread, presumably because a precondition for the grant is that the area becomes a forest reserve and, furthermore, should preferably be in pre-assigned zones where afforestation is particularly welcomed. State afforestation tended to be concentrated at urban centres without previous easy access to nearby forest for recreational activities.

2.2 Small-scale forest holding

Tables 4 and 5 in Section 5.3 show the forest area's distribution to ownership categories and holding size classes. The characteristics of ownership categories are outlined below:

Personal private holdings account for 46% of the total forest area and in all size groups the majority of holdings are owned jointly with agriculture. Until fairly recently, if the forest was larger than about 250 hectares it played an important role in equalising the total holding annual income and formerly also as a job opportunity in slack seasons in agriculture.

Since 1904, the Government has through financial support encouraged small woodland owners to form associations aiming at improving the economic output, mainly from wood production. A network of forest extension firms organised under the Danish Forest Extension services has emerged, each owned by the associated forest owners on a co-operative basis and run by a board of owners. For many years, support was given only to holdings ≤ 50 hectares but the limit was later increased to 250 hectares. This support led to great improvements of silviculture, and sales incomes were raised through correct timing and assortment of fellings as well as coordination of sales from several holdings. Such associations still exist, each having a professional staff. Owners have never been heavily dependent on income from the forest. In this category, the pleasure from ownership as such has always been a very important factor, together with hunting possibilities – let out or not.

Until about 1970, holdings larger than 250 hectares usually had their own professional staff – either a graduate forester and/or one or more forest rangers – and permanent forest workers. However, costs – in particular wages and salaries – then started to rise at a pace that could not be counterbalanced through mechanisation. For example, in the period 1965-1980 the average annual surplus per hectare in the old forest regions fell by 70% when deflated by the wage rate (Helles et al. 1984: 77). Most forest owners reacted by dismissing staff and workers and relying on part-time professional assistance and contractors. At the moment only one private holding has its own permanent forest graduate – by far the largest holding.

Juridical private holdings (societies, private companies and partnerships) account for 19% of the forest area. All size classes are represented. The most important category is plantations established between 1870 and 1930 by groups of individuals, usually locals,

wanting to contribute to a 'national issue' of the time: the afforestation of heathland (Helles 1984). Many such plantations are members of a small woodland owners association or rely ad hoc on similar professional assistance from the Land Reclamation Service (formerly The Danish Heath Society). Mainly since about 1970, some personal private forest holdings have been turned into juridical ownership, e.g. for taxation reasons.

Foundations, private or public, account for 6% of the forest area and are dominated by the size group 500->1000 hectares. Some were founded a few hundred years ago and as the demand for surplus is often small compared to personal holdings of similar size, they have been more able to maintain own professional staff. Some foundations of recent origin aim at improving amenity values and perhaps realising the resulting property value increase through sale and then investing in other forest holding.

State forests under the National Forest and Nature Agency cover 23% of the forest area. They are administratively allocated to forest districts, most of which are large for Danish conditions – the average size being 4300 hectares. There are forests previously belonging to the Crown for hundreds of years, there are plantations established mainly in the late 1700s and the 1800s on sand dunes and heathlands, some forests have for various reasons become in state ownership, and recently afforestation of farmland has taken place. Forests on former sand dunes have predominantly soil protection objectives and recent afforestations are mainly made for ground water protection and recreation opportunities at urban centres. Apart from that, State forests have until recently been managed for business, albeit with – increasing – emphasis on protection of landscape amenity, nature values and cultural heritage, and promotion of recreation. Attention has been paid to not competing with private forestry business, e.g. in production of Christmas trees etc. and letting out of hunting. State forestry has professional staff and workers, machinery, nurseries, etc.

Forests belonging to municipalities and counties comprise 4% of the forest area. Some holdings are small, but others fall in the largest size class. In general, the primary objective is to supply recreation opportunities.

2.3 Small-scale forestry practices

Changes in general conditions have over the last few years led to changes in forestry practices towards less intensive management and this trend will presumably continue in the foreseeable future. Less intensive management has become legal through changes of the Forest Act.

General provisions of the Forest Act 2004

a. Objectives: As discussed in Section 2.1, the previous general management principle 'good and multiple-use forestry' has been modernised into 'sustainable forestry', however without the concept being properly defined and with predominant emphasis on biological and social aspects.

b. The concept of ‘forest’: There has never been an explicit definition of what is meant by a ‘forest’, but a practice has developed (Wulff 1998):

- Generally, the area must be minimum 0.5 hectare and 20 m wide,
- the stand must be of forest tree species,
- the species must be able to develop into closed high forest,
- a stand may be established for non-forestry purposes without this preventing it from being regarded as forest, e.g. willow for energy or conifers for Christmas trees,
- it does not matter whether or not a stand is managed according to rational forestry principles, e.g. near-urban recreation forests fall under the Act.

c. Forest Reserve: The forest reservation clause (see below) implies a permanent binding of areas for forestry, i.e. they must ‘in perpetuity’ be used for such purpose. In the comments on the Forest Act 1996 the binding was justified by the increasing pressure for converting forest reserve areas into other uses, e.g. building land. However, the Act holds provisions for removing the clause, so it is just a restriction of disposal rights similar to the general non-compensated regulation of ownership found, e.g. in agriculture. But a conflict over a particular area should in principle be solved for the benefit of forestry. (Wulff 1998).

d. Regulation of holding structure: Here the Forest Act 2004 introduces a major change. Previously, coherent forest reserves could not be split up into smaller holdings, the administrative practice being that forests with a distance between them of up to 0.8-1.2 km were considered coherent. The reason for this strict policy was that business economic potentials would suffer from holdings becoming smaller. This restriction now applies to physically coherent forests only. The rationale is that business economic aspects are no longer that important, whereas an owner should have the option to sell part of his holding to improve his finances. The reason for not permitting that physically coherent forests be split up is that this would be to the disadvantage of recreation. Apparently it is no more a policy objective to unite woodlands into fewer holdings – and there has never been efficient ways to do this.

e. The use of forest reserve land: Forest reserve land must be kept under such tree cover that forms – or will within reasonable time form – a closed high forest. This has been a central provision of the forest reservation clause since the Forest Act 1805. Areas under tree cover must be managed according to forestry principles, but some previous standards of ‘good forestry’ no longer apply. For example,

- an owner may choose not to manage the forest at all, or part of it,
- exemption is no longer needed for managing the forest for creating or preserving biological diversity, and
- management may aim at furthering landscape amenity, nature values and cultural heritage, environmental protection and recreation – even at the expense of wood production.

Apart from thinning, felling must not be made until the stand or the individual tree has reached maturity (age or dimension). This provision was previously motivated by economic reasons only, but now amenity considerations have been added. It is also new that the owner is free to fell before maturity if the aim is to create open areas for nature

amenity. A new guideline is that clear-cutting should for environmental reasons be omitted if possible.

No later than ten years after felling a mature stand, the area must be sufficiently regenerated to form closed high forest (cf. above), irrespective of how the new stand is established. Previous practice was a time limit of 3-4 years. It is emphasised that due to weeds, undue delay of regeneration may become too costly. If the regeneration does not meet usual forestry demands, the area must be planted or seeded – however, a new possibility is to include the area in that kept open for amenity reasons (see below).

Irrespective of the above, the forest owner is free to turn 10% of the area into coppice or rangeland. Previously, exemption for such uses might be granted, and the change is primarily meant to further the ‘variation’ of forest management. Production of Christmas trees and greenery in short rotation is still permitted on maximum 10% of each topographic forest unit, i.e. the limit does not relate to the holding area.

Another new exemption from the general rule of forest cover is that maximum 10% of the area may be kept open to the furtherance of nature and landscape amenity values, cultural heritage or biological diversity, e.g. forest meadows, protected nature types, natural re-growth, areas not reforested within the 10 years time-limit. Exemption from the area limit may be granted. Together with the permission for Christmas tree and greenery, a total of 20% of the forest area may now be more or less permanently maintained without typical forest cover.

Buildings, constructions and modifications of terrain are only permitted on forestland if necessary for management. It is now permitted to build workmen's sheds and cottages for scouts or nature kindergartens. A suggestion that weekend cottages and hunting lodges also be permitted was immediately suppressed by all actors in the legislative process – somewhat surprisingly as this might have improved private owners' incomes.

Subsidies

Possibilities for obtaining Government grants have changed somewhat, but are still primarily open to private owners (individuals as well as juridical persons).

a. Furthering of sustainable management in existing forests: The substitution of ‘sustainable’ for ‘good and multiple-use’ management implies some changes. Elements of sustainable management that are not immediately economically advantageous to the forest owner are eligible for support, in particular activities considering biological diversity. Emphasis will also be put on support to the conversion into more sustainable management, of forests rather than individual stands. Support may still be granted for conversion into non-intervention forest. There are more activities eligible for support, all of them aiming at environmental improvements and nature protection. The corresponding grants in the previous Act were more specific, e.g. regeneration with beech, oak and other ‘valuable’ broadleaves; on poor soils regeneration with stable conifers; establishment of forest edges of broadleaves.

b. Afforestation of farmland, tending of plantings, and income compensation: More emphasis will be put on afforestation in regions designated for such undertaking, and also projects for the protection of ground water resources will be prioritised.

c. Products development: Subsidies may be granted for the development of products from forestry and the wood processing industry. In forestry, eligible projects must aim at the development of products and production processes, new and more environmental friendly or profitable production methods, and new products that are suitable for forestry. The scheme is a continuation of the Forest Act 1996.

d. Support to small woodland owners associations: Until further notice, the grant scheme is continued (cf. Section 2.2).

A major shift has taken place in the **State forestry paradigm**. Non-production goods and services have for almost one century been taken particularly into account but nonetheless forestry has basically been considered a business. Now the central objective has become to provide public access to nature, and traditional forestry is scaled down accordingly (Skov- og Naturstyrelsen 2002, 2003a), implying a general conversion into near-natural forestry, with a time-horizon of 100-300 years (Skov- og Naturstyrelsen 2003b). This conversion has no doubt been fuelled by heavy budget reductions since 2002, low investments in reforestation and tending being justified by conversion into a management practice that is often held obviously economically advantageous – which is certainly not always the case, neither from a business nor from a Society point of view (Thorsen and Strange 2003).

Management practice is also changing in **private forestry**. Some important trends are:

- There may be room for further relying on administration through entrepreneurs, but at least for some categories of holdings and owners this development has perhaps gone too far – some income opportunities may not be utilised.
- Owners may be tempted to minimise reforestation and tending costs, as such short-term consideration has become legal. The aim should of course be to develop a good multi-purpose production potential – at low costs. The more and more widespread justification of low investments by conversion into near-natural forestry is not always well founded – it tends to be neglected that, e.g. the transition phase may prove very costly. Furthermore, lower levels of investment may correlate with fewer future production options, which would have proven beneficial in face of a future where only change and variation are certain features (Abildtrup 1999; Jacobsen 2004).
- Many owners are already succeeding in developing marketable environmental goods in a broad sense (see Section 4.1). However, this is not very easy as it must be goods that are not already supplied without charge.

From a Society point of view the changes towards more emphasis on non-wood products is immediately advantageous. However, the possibility to supply high quality wood products may prove forgone if – or when – sales prices rise again to profitable levels.

2.4 Policy framework and production conditions

In 2002, the Forest and Nature Agency published a national programme on forests with six major goals, four of which were:

- **Nature and environment:** Conversion of present even-aged mono-species forestry into near-natural forestry and preservation of nature amenities in forests.
- **Economy:** Maintenance of forestry as a trade through the provision of sustainable framework conditions.
- **Social considerations:** Securing and developing forests as suppliers of welfare through providing possibilities for recreation and nature experiences.
- **More forest and nature:** In the effort to double the forest area, emphasis is put on promoting nature amenities and furthering public participation in decision-making.

At the same time, a revision of the 1996 Forest Act was initiated, leading to a new Act in 2004. There are several reasons why a revision was held necessary after so few years:

- Profitability of forestry had decreased so much that many private owners had difficulties in covering the costs demanded by 'good forestry'. Therefore, private forestry wanted more freedom in the choice of management practice.
- ENGOs held that Society needed more environmental services than could be supplied within the framework of 'good and multiple-use forestry'.
- The Government felt a strong need to comply with the demands of the EU Directive on habitat protection (i.e. Natura 2000).

It is seen that the above is in keeping with three of the major goals cited from the National Programme on Forests, whereas it is a moot point whether the goal on economy is considered.

One of the objectives of the Forest Act 2004 corresponds to previous forest policy, viz. to preserve and protect the forests and increase the forest area. But the management principle 'good and multiple-use forestry' has been replaced by 'sustainability', aiming at:

- Furthering the establishment of stable forests.
- Securing the wood production.
- Preserving and furthering the biological diversity in forests.
- Securing that landscape amenity, natural history, cultural heritage, environmental protection and recreation are properly considered.

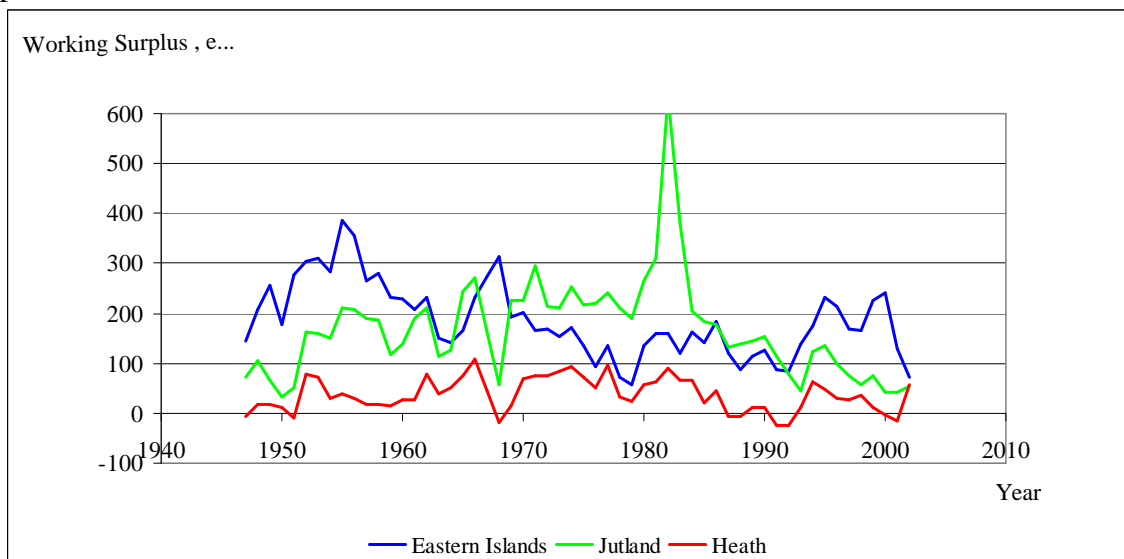
'Stable forests' refers to resistance against windthrow and climate change, and the aim is supposed to be met through conversion into near-natural forestry. It is not evident that wood production will be secured, whereas emphasis is put on biological diversity. The last aim is a continuation of the two previous Forest Acts.

The **profitability of forestry** has deteriorated since the mid 1970s, leading to changes in management practices in both private and State forestry. The production conditions are outlined below whereas the management changes were dealt with in Section 2.3.

Figure 2 shows the development of working surplus in private forestry 1947-2001 (Thorsen 2003a, b). It is seen that by 2000 the surplus was at a historically very low level, in particular for holdings in the old forest regions of Jutland (Jylland) but also in the Heathland (Heden) region. During the period 1995-2001, exceptionally high prices on beech logs for Asian markets supported the surplus of the Islands region (Øerne). In the surplus shown are included marketed 'minor' products, e.g. hunting rentals, but the development reflects to a considerable degree the downward trend in sales prices of the more important products: roundwood of beech and Norway spruce, and Christmas trees of nordmann fir.

Roundwood prices vary considerably over time, and trends – upward as well as downward – may be sticky. Therefore prices are likely to start rising again and maintain the upward trend but nobody can tell when. Except for Norway spruce, prices have sometimes been just as low or even lower, so the real problem is that rising production costs – in particular wages and salaries – have not been made up for by rise in productivity. Prices of Christmas trees will no doubt also start to rise, but presumably only as a response to decreasing supply – many owners currently stop such production due to financial loss.

Concurrently with the decreasing working surplus and roundwood prices it has apparently become more popular to be a forest owner. This has impacted on the development of forest property (taxation) values, and they do more or less reflect property market values. The average real property value has more than trebled in the period 1947-2001.



Sources: Dansk Skovforening 2003 and earlier account surveys.

Figure 2. The development of working surplus in private forestry 1947-2001 in real 2000 prices

The implication is of course that the return on property value decreases, in the last 5-10 years between 0 and 3.5% compared to 2.4-4% for the entire period, see Table 1. However, when the capital gain from increasing property values is included, the real return is for the period 6.3-8.1% – a reasonable level in comparison to many other long-

term investments, and even more so because the return seems to be positively correlated with inflation and negatively with the return on a number of more sensitive assets. The level was lower in the last 5-10 years of the period but with an upward tendency.

Table 1. The annual return rates in Danish Forestry over different periods. Based on data from Dansk Skovforening (2003) and earlier account surveys.

Period	Capital gain		Return excl. capital gain			Return incl. capital gain			
	Øerne	Jylland	Heden	Øerne	Jylland	Heden	Øerne	Jylland	Heden
1997-2001	2.8%	1.4%	3.5%	2.9%	1.1%	0.3%	5.8%	2.5%	3.7%
1992-2001	0.9%	0.0%	1.0%	2.8%	1.4%	0.4%	3.7%	1.4%	1.4%
1947-2001	2.4%	2.8%	4.0%	5.7%	5.7%	2.3%	8.1%	8.6%	6.3%

Even if the business economy of forestry is currently strenuous, there is nothing seriously wrong with forestry's aggregate long-term profitability – as an investment asset. One reason is that the increasing property values seem to reflect buyers' appreciation of functions, products and services that are not included in the accounts. However, this does not lift the economic pressure felt by the majority of owners and managers of private forests for whom the forest is an important source of income and who want to keep the property. An investigation has shown that 60% of all owners hope to be able to descend the property to family, whereas only 10% expect to sell it (Boon 2003).

Boon (2003) also shows that there are many more owners finding landscape and nature amenities etc. very important to their ownership, as compared to owners who put emphasis on the forest as an investment asset. It seems as if many owners are motivated by the pleasure and other values derived from ownership as such. Owners apparently balance worries about income against other outputs also obtained – many of them being immaterial. This has every appearance of being rational and is supported by the upward trend in property value. It does, however, imply that forest ownership relies more on the perception of forests and forest ownership as a private consumption good, and less on the perception of forests as classical production capital.

2.5 Conclusions: Supporting and limiting factors for enterprise development in small-scale forestry and barriers to entrepreneurship

By far the most important limiting factor on forest entrepreneurship in Denmark is the ownership structure in combination with the wealth of the country. There are a large and increasing number of forest holdings in the smaller size classes, where forestry as a business and livelihood is not a primary aim. Each of these holdings are much too small and have too small cash flows and balances for investing any significant effort in R&D activities, including the development and marketing of new technologies, products and services within the sector as well as to the outside world.

Recent decreases in many product prices and hence decreases in economic performance of the primary forestry sector represents an additional limiting factor, which nevertheless may be of a more temporary nature.

This is not a new feature of Danish forestry, in fact similar structural problems were earlier also true for the agricultural sector. In recognition of this Society has developed

tools to remedy the potential welfare implications and support and improve the technological innovation and management processes of the sector in general.

These include in particular, as described in section 2.2, financial support to encourage small woodland owners to form associations aiming at improving the economic output, mainly from wood production, but in recent years also from Christmas trees and greenery as well as other products and services. A network of forest extension firms organised under the Danish Forest Extension service exists and each unit is on a co-operative basis owned by the associated forest owners. There is no doubt that this supporting infrastructure has increased the ability to undertake small-scale technology development and in particular furthered the spread of innovations in the forest sector.

Another and more recent feature is the establishment of a public R&D fund aimed at the forest sector and the (primary) wood-processing industries. Some activities spurred by this initiative are further described below (Section 5.4).

Finally, State forestry has historically taken on the responsibility of testing and introducing new (often Swedish/Finnish) technologies to the Danish forest sector. Owning and running around 30% of the Danish forest area, State forestry has a size that makes it worthwhile to engage in R&D activities, even if profit concerns have in general also been given substantial weight in State forestry practice.

Annex B: Organisations studying small-scale forestry and main publications and information sources.

We refer to Annex A with the addition of another organisation:
Danish Forest Extension (www.skovdyrkerforeningen.dk)

3. Wood-processing industries

No information available, apart from some comments in Section 5.4.

4 Non-wood forest products and services

4.1 State of the art and historical development

As explained in Sections 1.2 and 2.4, non-wood products and services have become more and more important in Danish forestry. The main reason is the development into an increasingly affluent Society with a corresponding rise in leisure time and environmental concern and awareness, but the development has in recent years been fuelled by the dramatic decline in roundwood sales prices, forcing private forestry into searching for alternative income-generating activities and State forestry into giving wood production an inferior status.

An attempt has been made to estimate the recreational benefits from the entire forest area (Dubgaard 1998). A CV survey of WTP for an annual pass to Danish forests yielded an estimated (lower-bound) social net benefit from recreation of about 62 million euro or about 135 euro per hectare annually – as compared to a gross factor income in the forestry sector of about 148 million euro. There is reason to believe that the ratio of social benefits to marketed benefits has increased since the mid 1990s.

The problem for private forestry – and public to a less extent – is how to capitalise on the huge interest in recreation benefits. It goes without saying that goods and services that are now free cannot suddenly be charged. New products must be made and some private forest owners demonstrate creativity, for example:

- Facilities for nature kindergartens. Here the Forest Act 2004 has provided the opportunity to build simple houses.
- The same applies to scouting and other youth activities, but it may prove more difficult to demand payment.
- It was suggested that the new Forest Act should permit the building of hunting lodges but this failed because of protests from NGOs (Rasmussen and Skyum 2004). It is difficult to say how much such opportunity might have increased hunting rentals, but nonetheless the hard opposition demonstrated how little understanding NGOs have of private owners' economic difficulties.
- A suggestion that weekend cottages and a house for absentee owners be permitted in forests was immediately suppressed, and this might have proven a better income-generating activity than the one above. The argument was adduced that in State forestry many houses formerly used for residence (workers and staff) are now let out, did not convince the opposition (Rasmussen and Skyum 2004), but this is more intelligible as such activity is also found on private holdings, see Figure 1.
- It has for some years been discussed whether forest owners should charge organised recreation activities, e.g. orienteering, company outings. Some owners prefer not to charge and keep the possibility to refuse applications, whereas others do make an income from such activities. A recent income source that will no doubt gain importance is guided nature walks. Here is room for much creativity in many forests, e.g. general and specialised tours at different times of the day and year, and with extra service in the form of leaflets and refreshments. It may also be feasible to charge for permitting, e.g. motoring and mountain biking. Administration costs must of course be considered and it will hardly be feasible to charge for facilities to further the ordinary forest recreation, e.g. parking places and toilets.

- Horseback riding becomes more and more popular, and in both State and private forests permits are usually required and charged.
- The same applies to fishing licences.
- In private forestry, hunting rentals is an important source of income (cf. Figure 1). In State forestry, hunting rights lie with the Crown, however, in some regions they are let out at market price. Unlike in many other countries, hunting rights belong to the landowner and are often transferred to a leaseholder through rental contracts covering a well-defined period and a well-defined area. However, little is known about the dynamics and characteristics of the market for hunting rentals in Denmark. An improved understanding of this market and the welfare economic value of hunting are becoming increasingly important, as forest management practice is about to shift towards a stronger reliance on natural regeneration and less extensive investment phases, cf. Section 2.3. These management measures may be sensitive to the presence of large game populations that may inflict significant damages on regeneration (Thorsen and Strange 2003). On the other hand, large game populations presumably influence the value of hunting rights positively. Thus, Society and forest owners face a welfare economic dilemma with a potential scale of billions of DKK. Research has been initiated (Helles et al. 2002) to develop theoretical and empirical models for the valuation of hunting leases, including a proper assessment of the cost side of game management for hunting, in particular costs inflicted on forest management. This is needed to provide a well-informed basis for arbitration between the management of forests and the management of game and hunting.

These new activities may bring about new and profitable business for private forestry, quite different from traditional roundwood production. This has in fact happened before in the Danish forest sector, the prime example being the rise of prosperous activities in Christmas tree and greenery production. This production developed only slowly through the 1960s and early 1970s, but gained an incredible momentum during the 1980s, and in parts of Jutland it became the dominant income-generating activity in forestry. The fall of the Iron Curtain made available large amounts of seeds and plants from quality provenances in the Caucasus. This in combination with annual return rates well above 10% led to massive investments and increases in the Christmas tree production area, in turn causing increased supply and decreased prices during the last 6-7 years. Nevertheless, we will choose this particular field as the prime example of successful entrepreneurship and innovation and discuss the marketing efforts making Denmark the dominant exporter of Christmas trees in Europe. However, two case studies are added to demonstrate the ongoing efforts in private forestry to develop income sources alternative to wood and Christmas trees.

4.2 Case studies of successful marketing strategies

Christmas trees and greenery

The Danish producers of Christmas trees and greenery are as diverse in size and other characteristics as are the forest owners. While considerable technological innovation and entrepreneurship has taken place in the business, the need for massive marketing abroad quite early spurred co-ordinated initiatives across producers and wholesalers.

In 1990 the first effort was made to establish the ‘Domus Silva’ trademark, but the initiative soon lost the support from central players – possibly due to free-rider

incentives – and was aborted. During the period 1994-1999, the growers association arranged a number of marketing campaigns aiming at, in particular, the French and German markets and increasingly focusing on nordmann fir Christmas trees.

To support the continuous innovation and improvement in the Christmas tree business, a R&D fund was established in 1997, which depends in part (50%) on a per hectare tax on private Christmas and greenery production areas and on a matching (50%) Government contribution. This has supported the development of the current ‘Original Nordmann’ trademark, which has been marketed with a fair amount of success since 1999. While the growers association runs the current initiative, regular communication takes place with the exporters and wholesalers. Through market surveys the impact of this trade campaign is regularly evaluated.

The fact that the campaign depends partly on the general support from growers and partly on Government funding – always at stake in annual budget negotiations – points to potential problems and threats to the initiative. With decreasing profitability in recent years, the area of Christmas trees – and hence the R&D fund – has begun to shrink simultaneously.

A forest district with good growing conditions¹

The forest district comprises 430 hectares under tree cover and 250 hectares of bare land (meadows, fields, grassland, moor). Moreover, there are 450 hectares of farmland. The management objective is to maintain the present family ownership and preserve the rich natural amenities and cultural values.

Two houses are let on a yearly basis for use as kindergartens. One of them is for 30 children, and inclusive of some extra access to the forest and other areas the rental is € 21,000 – equivalent to a little less than 1 euro per child and day. However, the kindergartens imply some reduction of hunting rights rental, an income source that is so important that in management decisions wildlife is often given precedence over timber production. Another problem is how to combine a rich wildlife with low-cost natural regeneration.

It is difficult to charge for guided tours in the forest because the county and State Forestry offer similar tours without charge. However, the estate’s website lists many different nature experiences offered and in total the annual income from such experience – inclusive of the above – amounts to 175 euro per hectare (cf. Figures 1 and 2).

A forest district with poor growing conditions²

The forest district comprises 470 hectares of woodland, lakes and beach that is the setting for comprehensive and non-traditional activities at a course centre – a rather small rustic building inside the forest. Courses are offered on team building and on executive and personal training, and nature excursions and instruction are arranged – or just a funny and ‘meaningful’ staff or birthday outing. Focus is on ‘action, suspense, healthiness, and mental well-being’.

¹ Based on Simonsen and Bak (2003).

² Based on Emmedsbo Skov (2004).

The wildlife is very rich and hunting is rented out on a selective and individual basis, e.g. shooting fallow buck, red deer and wild boar. For shooting a wild boar (fenced in), under professional guidance, of up to 40 kg the price is 335 euro plus VAT but inclusive of the meat, for a red deer with premium antlers must be paid 2,700-4,000 euro – plus VAT and for the trophy only. Venison is for sale, e.g. 1 kg of red deer at 15 euro plus 500 euro for the slaughtering.

A team-building day may comprise, e.g. the following activities: archery or axe throwing, Segway Human Transporter-driving, safari on ATV-motor-cross bike, teamwork training, climbing, canoeing and firewalking – the last activity, though, not included in the 270 euro per person plus VAT but including the use of a 65-persons tipi.

Guided nature and forest walks are arranged for groups of minimum 12 persons, two hours for 25 euro per participant. Special walks are arranged for school classes, youth clubs etc., with many activities, e.g. felling a tree – same duration, minimum group size and price (however, no charge for the leader).

4.3 Conclusions: Supporting and limiting factors for enterprise development in non-wood forest products and services production and barriers to entrepreneurship

Many of the conclusions in Section 2.5 are also valid for non-wood forest products and services. Society's demand for such products and services is increasing, contrary to the demand for timber and the traditional non-wood products Christmas trees and greenery.

Decreasing prices of traditional products has made private forestry – but also public forestry to some extent – look for opportunities for increasing income generation from non-wood products and services. To some extent the Forest Act 2004 facilitates such development because it puts less emphasis on traditional production forestry, but its emphasis on 'nature' also implies barriers to the development of new services.

However, the major barrier is that most forest owners are not prepared for developing new activities or charging for activities that have so far been supplied for free. A few forest owners have demonstrated great inventiveness and creativity – proving that many services can become income generating. There are potentials for intensifying well-known services, e.g. hunting lease, and developing new services, some of which are considered odd or even 'unworthy' of forestry, e.g. organised paint-ball fighting or 'survival' tours. An example of services that Society may be willing to pay for is protection of ground water resources under private forests. The imaginative forest owners will of course benefit from the pressure of demand for new non-wood forest products and services. There must be an upper limit to the demand, but it is far from reached – and moreover, the demand is dynamic.

5 Forests and ownership

5.1 State of the art and historical development

Since 1881, general forest statistics have been published every 10-15 years, based on information that forest owners are liable to supply through filling in a questionnaire. However, data on removals are collected every year and for forest properties <50 hectares only for a sample. Since 1990, the Forest Act has made general statistics mandatory every ten years, the most recent and comprehensive relating to year 2000 (Larsen and Johannsen 2002).

Definitions and classifications have changed over the period, but the two latest general statistics – 1990 (Miljøministeriet et al. 1993) and 2000 – are safely compared.

5.2 Forest resources

The total forest area 2000 is 486,000 hectares (11.3% of the country's area), of which 35.8% is under broadleaves, 60.5% under conifers, and 1% is temporarily and 2.7% permanently without tree cover.

Table 2. Development of forest area 1990-2000, 1,000 ha

	Denmark		Islands		Jutland	
	1990	2000	1990	2000	1990	2000
Total forest area	445	486	141	149	305	337
Perm. uncovered	28	13	8	4	21	9
Total under tree cover	417	473	133	145	284	328
Broadleaves	143	174	81	90	63	85
Beech	72	80	43	44	29	36
Oak	30	43	15	19	15	24
Other	41	52	23	27	18	25
Conifers	268	294	51	54	218	240
Norway spruce	135	132	30	27	105	105
Sitka spruce	35	34	4	4	31	30
Silver fir	7	12	2	3	5	9
Nordmann fir	12	28	4	10	7	18
Other	79	87	10	11	69	77
Temp. uncovered	6	5	2	1	4	4

In the period 1881-2000, the total registered forest area more than doubled due to afforestation, primarily with conifers. In the same period the share of broadleaves was reduced from three fourths to one third. The forest area increased by 41,000 ha 1990-2000, however, some was due to improved statistics and the real increment is estimated at 28,000 ha – partly a result of the Government policy of doubling the forest area (cf. Section 2.1). The area of nordmann fir more than doubled (40% as afforestation of farmland) and also the area of Silver fir (*Abies procera*) increased substantially.

Table 3. Size distribution of forest holdings, %.

	1990		2000	
	number	area	number	area
Total	20,563	100.0	26,548	100.0
0.5-1.9	35.0	1.6	32.2	1.9
2.0-4.9	30.0	4.1	31.5	5.2
5.0-9.9	15.9	5.0	17.6	6.6
10.0-19.9	9.5	5.9	9.6	7.3
20.0-49.9	5.2	7.2	5.4	9.1
50.0-99.9	1.8	5.8	1.5	5.7
100.0-249.9	1.4	10.2	1.2	10.6
250.0-499.9	0.6	10.1	0.5	9.2
500.0-999.9	0.4	11.5	0.3	10.8
>1,000.0	0.3	38.6	0.2	33.6

As shown in Table 3, Denmark has many small and few large forest holdings (in fact units – holdings may include two or more units). For example, 17,000 holdings <5 hectares account for only 35,000 hectares, whereas 200 holdings of 500 - >1,000 hectares cover in total 216,000 hectares. Apart from the smallest category, the relative number and area of holdings <50 hectares has increased 1990-2000, whereas the opposite trend is dominating for holdings >50 hectares.

In general, the largest holdings have higher yield classes than the smallest, a combined effect of forest climate, forest structure and proper administration. The total average annual increment in broadleaves 1990-1999 was 1,135,000 m³ and is forecasted at 1,334,000 m³ for 2000-2009; the corresponding figures for conifers are 3,417,000 and 3,843,000 m³.

The average annual felling (removals) 1991-1999 was 1,830,000 m³, beech accounting for 26% and conifers for 63%. The average share of timber was 59% (54% in broadleaves and 77% in conifers). In absolute terms the amount of timber was decreasing, fuelwood was stable and woodchips increasing.

In the period 1990-1999, 72% of total felling took place on holdings \geq 250 hectares while holdings <50 hectares accounted for 12%. In the first category, average annual felling per hectare was 5 m³, in the second <2 m³, and 49 and 16% respectively was fuelwood.

It is forecasted that 1-2 million m³ will accumulate annually in the period 2000-2009.

For the period 1990-1999, the annual net sequestration in forests is estimated at 3,064 Gg C or 3,901 Gg CO₂. For comparison, the actual total emission in Denmark 2001 was 54,100 Gg CO₂. An extensive analysis of sequestration potential and marginal sequestration costs in Danish forestry is published in Anthon et al. (2003)

5.3 Forest ownership

As described in Section 2.3, the ownership structure in Danish forestry is distributed across several categories. Private (individual) forest owners are the largest owner group in terms of number (93.7%) as well as area (46.1%). Juridical private owners (foundations etc.) account for another 25.6% of the forest area, leaving State and other public ownership with 28.3 % of the forest area. However, as seen in Table 4, more than half of the forest area in individual ownership is related to holdings <50 ha and in fact more than 40% is related to holdings <20 ha.

For almost all other ownership categories, private or public, the picture is very much the opposite as more than 50% of the area owned by any of these categories is related to holdings >250 ha.

Table 4. Forest area distribution to ownership categories.

Size category	Total	0.5-19	20-49	50-99	100-249	250-499	> 500-
All, ha	486,234	101,832	44,061	27,911	51,403	44,970	216,058
Private	46.1	42.8	14.9	7.3	10.2	7.6	17.2
Foundations etc. ¹	6.3	4.3	3.2	2.3	7.1	11.8	73.3
Societies etc. ²	19.3	12.9	8.2	8.5	21.2	19.2	38.2
F&N ³	23.2	-	-	-	-	-	100.0
Other state ⁴	1.1	9.3	19.8	17.1	15.7	27.7	10.4
Counties etc. ⁵	4.0	3.1	4.9	10.5	26.5	24.9	30.0

Notes: 1. Private institutions 2. Private companies, partnerships, other associations
3. Forest and Nature Agency 4. Incl. livings 5. Municipalities

Table 5. Number of holdings and forest area in various ownership categories.

	1990		2000	
	no.	ha	no.	ha
All	20,563	445,391	26,548	486,235
Private	19,375	202,102	24,874	223,986
Foundations etc.	107	28,786	131	30,524
Societies etc.	737	74,647	1212	93,954
F & N	28	114,099	26	112,928
Other state	106	4614	118	5357
Counties etc.	210	20,543	187	19,486

Notes: Categories as in Table 4.

The number of forest holdings is increasing along with the forest area. However, while the forest area has increased with slightly less than 10%, the number of forest owners has increased with almost 30%. This indicates the increasing dispersal of forest ownerships, probably caused by the new afforestation efforts as well as the breaking up and selling of larger private holdings as well as some privatisation of publicly owned forest-land. In fact, the only two categories where the number of holdings as well as the area has decreased are public: The Forest and Nature Agency has reduced its number of districts and forestland and so have the counties, municipalities etc. The forest owner category showing the largest growth is 'Societies etc.', which includes private companies, partnerships, and other associations. This group has increased with more than 60% in number and more than 25% in area during the 1990s.

5.4 Main problems and research questions in forest resources and ownership for enterprise development in the forest sector

As pointed out in Section 2.5, the most important factor restraining forest entrepreneurship in Denmark is the ownership structure. There is a large and increasing number of forest holdings in the smaller size classes, and each of these holdings is by far too small as to area, cash flows and balances to allow any significant effort in R&D activities, including the development and marketing of new technologies, products and services within the sector as well as to the outside world.

This is not a new feature of Danish forestry, in fact similar structural problems were earlier also true for the agricultural sector. In recognition of this, Society has developed tools to remedy the potential welfare implications through supporting and improving technological innovation and management processes of the sector in general. As described in Sections 2.2 and 2.5, this includes in particular financial support to encourage small woodland owners to form associations aiming at improving the economic output. A network of forest extension firms organised under the Danish Forest Extension service exists due to this long-standing support.

Another and more recent feature is the establishment of a public R&D fund aimed at the forest sector and the (primary) wood-processing industries. Furthermore, to support the continuous innovation and improvement in the Christmas tree business, an R&D fund has been established, which depends in part (50%) on a per hectare tax on private Christmas and greenery production areas and on a matching (50%) Government contribution. Some of the results of this latter R&D fund in terms of innovation, marketing and entrepreneurship have been described in Section 4.2.

The public R&D fund aimed at the forest sector and the (primary) wood-processing industries has spurred a number of R&D partnership projects, involving public research organisations and private firms and organisations. These include:

- The Plant Fibre Laboratory – a research entity established within The Royal Veterinary and Agricultural University, Copenhagen, doing research on the use of wood fibres for a number of purposes.
- The Danish Wood Centre (www.traacentret.dk), a research and industry network, involving a number of organisations and firms and handling a growing portfolio of research projects within the field of improved and innovative use of wood.
- A number of R&D projects, focusing on improving the forest operation systems at firm, regional and national levels – in particular at the first level involving private holdings as well as research organisations.
- Significant support has recently been given to a joint initiative on improved and cost-efficient reforestation and afforestation techniques. The initiatives involve State forestry, research organisations and a number of private forest holdings and forest entrepreneur firms.

Thus, while R&D and innovative entrepreneurship do take place in the Danish forest sector, the efforts are certainly hampered by structural features. A number of tools have been developed to remedy the potential problems caused by the forest ownership structure. While these tools have been extensively used and with some impact and success, it is obvious that the innovative forces have so far not been sufficient to

counterbalance the effect of the overall developments on the (global) roundwood markets.

By any standard, Denmark is a country rather poor in forest land, e.g. there is less than 0.1 ha of forest per capita. However, turning that fact upside down, Denmark is a country with more than 10 people per ha of forestland. People who may ask the forest and hence the forest owners for an increasing amount of services in terms of experiences with and in a natural environment offering a number of health improving and environmental benefits. Thus, while a growing and increasingly more urbanised population, creating increasing wealth from other productive sources, leading to decreasing significance of the traditional forest sector's contribution to the GNI, the same dynamics seem to point towards obvious new ways of expanding the values of the Danish forests to Society.

The key question and issue that research must study and private initiative deal with is how to build and develop markets for ever-increasing 'softer' goods and services from the forests at large.

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