

The Farm Forest Resource and its Potential Contribution to Rural Development in Ireland

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ABSTRACT

A critical mass of private forestry and farm forestry is now developing in Ireland with over 210,000 hectares planted since 1980, with 180,000 hectares of this planted since 1990 (Kyoto article 3.3 forests). Many of these plantations are now reaching a stage where further management is necessary in order that these forests to maximise revenue potential. Currently 90,000 ha of private forests are over 10 years of age with 30,000 hectares over 15 years of age. 84% of private forest owners are farmers. The potential of the farm forest resource for rural development in Ireland is enormous. This is not currently being realised. Currently an estimated 876,000 m³ of timber is currently available from forests through removals from thinning operations from plantations that are at or have passed first thinning age. A forecast of timber production indicates that, the cumulative volume output from thinning could be as high as 1.9 million m³ by 2010 increasing to 5.9 million m³ by 2015. The financial benefit to the local and rural economy is massive and when combined with downstream processing of forest products, indications are that the farm forest resource has a big role to play in the wellbeing of rural locations. However there are many issues that are hindering the development of the farm forestry sector in Ireland. These include finding new markets for produce, economies of scale, cost of harvesting, stability of forests and lack of forestry knowledge among farmers. This paper takes a look at the potential of the farm forest resource in Ireland and highlights some issues that need to be addressed in order that this full potential of farm forestry is realised. It also suggests key issues that need to be

addressed in the sector. Many of the issues highlighted in the paper are currently the subject of research by Teagasc, in Athenry, Co. Galway.

Keywords: farm forestry, grant aided forests, thinning and harvesting, production forecast, economic potential, rural development.

1. INTRODUCTION

Farmers/private owners began involvement in forestry in Ireland in the early 1980's. Since 1980, 211,357 hectares of forest have been planted (Forest Service, 2005). The majority of these forests have received grant assistance from EU/Government under a variety of schemes, such as the Western Package, Compensatory Allowance and the afforestation Forest Grant and Premium Schemes. Planting reached a peak in the year 1995 with almost 17,500 hectares being planted in the country; today the average annual planting rate is about 12,000 ha per annum. The age distribution of these forests indicates that a sizeable proportion of the area is rapidly approaching or has past first thinning age. Over 41,000 hectares or 20% of these forests have now passed 15 years of age (figure 1).

2. FOREST OWNERSHIP

There are 19,616 private forest owners in Ireland. Of these 16,460 (84%) are classed as farmers. The definition of farmer in this context is a person who derives 25% or more of their annual incomes from agricultural enterprises. The remainder of forests owners (3,216) are composed of private landowners and investors either individuals or companies. The ownership of the resource by area

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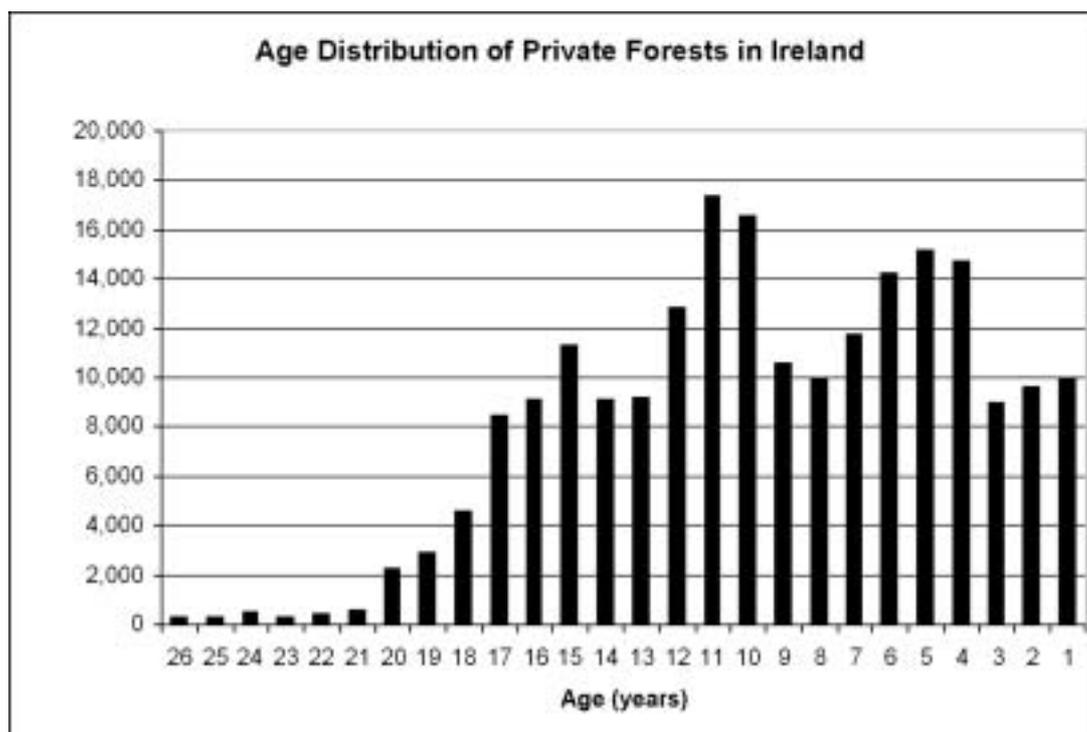


Figure 1: The age profile of private forest plantations in Ireland

planted is broadly similar with 83% of the forests (149,078 ha) owned by farmers. The balance of 16% of the area is owned by non farmers. A further subdivision of farmers into “full” or “part time” is based on whether farmers are actively engaged full time or part time in farming practice. Full details are displayed in table 1.

3. PRODUCTION FORECAST

Scenario modelling suggests that if 50% of these plantations were suitable for thinning, then an estimated 876,000 m³ of timber is currently available from these forests through removals from thinning operations in 2006¹. Many of these plantations are overdue a thinning or need to be thinned urgently. A forecast of timber production indicates that, the cumulative volume output from thinning will be 1.9 million m³ by 2010 increasing to 5.9 million m³ by 2015². If all the areas greater

than 15 years of age were harvested in the period 2007 – 2015, then the annual production from first thinning could potentially rise from 194,000 m³ in 2007 to a potential 368,589 m³ by 2010 and 302,000 m³ by 2013 (table 2). When combined with outputs from second thinning the average output from thinning could reach an estimated 500,000 m³ over the period 2012 – 2015.

4. MONETARY VALUE

Translated to monetary terms the value of first thinning is equivalent to a €16 million injection into the local economy in standing timber sales over the period 2006 – 2015³. The value of second thinning is estimated to be worth €40 million over the same period⁴. A total injection of 56 million directly into grower’s pockets will make private and farm forestry a significant industry if the potential is realised. The resulting down stream

Table 1: The number of full and part time farmers and non farmers and the area planted by county for the period 1990 – 2004.

	Full time farmers		Part time farmers		Non farmers		Total	
	Number	Hectares	Number	Hectares	Number	Hectares	Number	Hectares
Total	12995	117,327	3465	31,751	3216	31,464	19676	180,542

Table 2: The potential output from thinning from private forests based on 50% of stands being thinned over the period 2006 - 2015

First Thinning Age	Area (ha)	Prod Area (ha)	First Thinning Volume (m ³)	Second thinning Age	Prod Area (ha)	Second Thinning Volume (m ³)	Cumulative Volume Output (m ³)
2006	41,224	17520	876,010*				876,010
2007	9,134	3882	194,098				1,070,108
2008	9,171	3898	194,884				1,264,991
2009	12,837	5456	272,786				1,537,778
2010	17,343	7371	368,539				1,906,316
2011	16,555	7036	351,794	2011	17520*	1,226,414	3,484,524
2012	10,583	4498	224,889	2012	3882	271,737	3,981,149
2013	10,002	4251	212,543	2013	3898	272,837	4,466,529
2014	11,777	5005	250,261	2014	5456	381,901	5,098,691
2015	14,231	6048	302,409	2015	7371	515,954	5,917,054
Total	152,857	64,964	3,248,211	10,065	38,126	2,668,843	

*The analysis assumes that this volume is removed from forests currently aged 15 – 26 in 2006 and 2011.

value of processed forest material from thinning from farm forests on the open market is considerably more⁵. This coupled with the stimulation of rural employment and the associated economic benefits of the resource to the local economy indicates the potential of this resource and small scale forestry has to the rural economy in Ireland.

5. KEY ISSUES TO ADDRESS FOR FARM FORESTRY IN IRELAND

In order that the full potential of the afforestation programme in Ireland is realised, there are many obstacles that need to be overcome. These obstacles will be examined further and include:

1. New markets for produce
2. Economies of scale and size of forest
3. Cost of harvesting
4. Location of forest from potential markets
5. Access
6. Stability
7. Timing of operations and financial consequences
8. Lack of forestry knowledge among farmers and willingness/ability to conduct operations
9. Promotion of good thinning and harvesting practice

5.1 New Markets for Produce

It is urgent that forest owners identify potential markets for thinning produce. Most plantations in Ireland are currently unthinned. This is due to a multitude of issues such as those outlined above and these will be explained further, but there is no doubt that if markets were readily available and the demand for produce was high then these forests would be thinned. Currently most of the demand for round wood is satisfied by Coillte, the state forestry company. If processing facilities such as sawmills and board mills are to handle this extra volume of round wood then it is clear that they need a process where they can be informed about the additional volume expectations from the private sector. This would allow processors to build in extra capacity in their facilities in order to handle additional production. This extra capacity would in turn create the market necessary for round wood in the private sector.

It is probable that all the products from private forests may not be fully utilised even if the capacity to handle more round wood was addressed. It is expected that 30% of the thinning produce would be suitable for pulp, this indicates that 1.7 million m³ will be available as pulpwood over the 2006 – 2015 time period. In addition many small saw millers exist who could play a key role in the

development of markets for farm forests. However they need to be encouraged into the industry if they are to play a key role.

A recent study in County Clare indicated that in order to sell pulpwood, the distances from plantation to processing plant should be no greater than 30 miles to make it economically justifiable⁶. It is crucial that alternative markets for this produce are found in order to maximise the contribution of private forests to social, rural and economic development in the country. One such market that is currently showing growing potential is the wood energy market. There may be sufficient volume to justify an additional board mill in Ireland.

The key issues for private growers and the development of markets are as follows:

- The development of a management inventory with forecasting potential at a local level.
- Gearing up of the sawmilling sector for additional round wood production
- Encouragement of small saw millers into the marketplace
- The investigation of the potential for additional board mill capacity
- Development of new wood markets, the wood energy market shows good potential.

5.2 Economies of scale and size of forest properties

The average size of holding is an important consideration in terms of the management of private forests in Ireland. This is so that the forests areas are large enough to justify the cost of harvesting and extraction of timber and reach economies of scale. Large plantations are easier to market to prospective buyers and forestry contractors as they provide large volumes of timber from one location, weeks of continuous employment and facilitate the planning of logistics such as timber extraction and transport to the mill.

Smaller plantations are less attractive to prospective contractors or buyers because they provide small volumes of timber and are relatively short jobs of work. In some cases the cost of transportation of forest machinery may be prohibitively expensive to justify harvesting smaller areas. As a result there is a danger that the smaller plantations will be more difficult to market

and sell. The average size of plantation in the private forest estate in Ireland is 9.2 ha with the average size of farmer owned plantations at 9.1 ha and non farmer plantations slightly larger at 9.7 ha (table 2). In terms of carrying out first thinning from these plantations the average volume to be removed would be in the region of 400 m³. Recent studies have indicated that this is the minimum amount of volume that a contractor or buyer will purchase. For areas smaller than the average plantation size it may be harder to get thinning operations carried out. Farmers who are located closer to potential buyers or markets may be able to overcome these issues but plantations located further from the markets may have difficulty selling their produce.

One such solution to overcome the problems of economies of scale is the idea of marketing a number of prospective farm forests together in one sale lot. This would increase the area to be harvested, would contain relatively large volumes of material and would satisfy forestry contractors need for larger job lots.

The key issues for private growers and economies of scale are as follows:

- The development of methods to group forestry operations together
- The development of methods to market forest products from many farms combined into one sale lot based on clustering of private forests together
- Research into the minimum area required to achieve profitability in first thinning

5.3 Cost of harvesting

One of the main obstacles to harvesting farm forest plantations is the cost of harvesting. Many forestry operations in Ireland are based on mechanical felling and processing and extraction to roadside by specialised forestry machinery. The cost of

Table 3: The average plantation size of farmers and non farmers for forests planted 1990 – 2004.

	All farmers	Non farmers	Total
	(ha)	(ha)	(ha)
Total	9.1	9.8	9.2

harvesting these forests in first thinning can be as high as €21 to €23 per m³. For farmers who wish to harvest their plantations the costs associated can be prohibitively high. This is no to mention that the total amount of volume may be too low to justify interest in the purchase of the material. It is clear that information regarding possible alternatives to conventional harvesting needs to be conducted in order that farm forest plantations can be managed effectively. In addition the grouping of harvesting operations in neighbouring location may help alleviate some of these issues.

The key issues for private growers and cost of harvesting are as follows:

- Room for alternative technologies
- Scheduling of harvesting to coincide with adjacent harvesting in similar locations
- The adoption of Agricultural style contractors to carry out harvest operations

5.4 Location of forests to potential markets

One of the main obstacles to harvesting is the location of the forest from potential markets. This is especially the case for thinning. There are five major board mills and 80 sawmills in Ireland (figure 2). These vary in size from large sawmills with kiln drying facilities to much smaller sawmills with low capacity. Never the less an analysis using GIS techniques concluded that 82% of private forests were within 20 miles of a sawmill (figure 3). This is good news for private growers and any efforts to help stimulate the smaller sawmills to gear up for harvest produce from the private processing sector would be of great benefit to the private growers.

5.5 Access

Many plantations on farms have access problems. Traditionally forests were planted on farms on land which was at “the back of the farm”. As a result there are poor roading structures in place. It is crucial that roads are put in place before harvesting operations take place. The Forest Service provides roading grants to plantation owners prior to the commencement of harvesting operations and a recent COFORD publication on forest roads (Ryan



Figure 2: The location of Board mills and sawmills in Ireland in relation to the distribution of private forests

et al, 2004) has greatly added to the knowledge about road construction for small plantation owners. However there may be plantations which are not adequately covered by the roading grants or where issues with local authorities exist about access to public roads and these issues that need to be addressed. In these cases it may be more suitable to consider a no thin policy or additional methods of timber extraction as appropriate for plantations with poor access.

The key issues for private growers and Access are as follows:

- Increased grants for forest roading
- Structures put in place with local authorities regarding access to public roads
- Consideration of alternative harvesting technologies, small scale extraction machinery



Figure 3: The area covered within a radius of 20 miles of sawmills in Ireland

- Consideration of a no thin policy in these types of areas

5.6 Stability

The main threat to forests in Ireland is damage caused by wind. This is influenced by soil type, altitude, height of the trees and altitude. A model of windthrow risk has been developed which predicts the like hood of a stand suffering windblow based on soil type, altitude, height of the trees and windiness (Ni Dhubhain et al, 2004).

An example of windthrow risk for a plantation with an altitude of 100 m in windzone C or D was chosen for a well drained soil and a poorly drained soil based on a top height of 20 m is provided in table 3 below. Two scenarios were chosen a no thin and thin policy. It is clear for the model that thinning greatly increases the risk of windblow, which is as high as 80% probability in the poorly

drained soils and lower at 33% in the well drained soil. Well drained soils are Brown Earths, brown Podzolics and Grey Brown Podzolic soils, while poorly drained soils are gleys, and peats. For soils with a high probability of windblow, it may be more apt to choose a no thinning policy where the risk of windthrow is decreased. In the case of the poorly drained soils, the risk of windblow is

Table 4: The probability of windblow in percent in stands of certain soil types, based on top height of 20 m and based on a no thin and thinning policy.

Soil Type	Windthrow Probability% - No thinning	Windthrow Probability% - Thinning
Well Drained Soils	11	33
Poorly Drained Soils	50	80

decreased from 80% to 50% by adopting a no thin policy.

It is clear that windthrow is a massive problem in Irish forestry, scenario modelling suggests that a high proportion of private stands have a high probability of windblow if thinned, this risk can be reduced to a 50% chance if the stand is left unthinned. Stands with drier soils have a 1 in 3 chance of windblow if thinned, this can be reduced to a 1 in ten chance if left unthinned.

The key issues for private growers and stability are as follows:

- Work out the windthrow risk of plantations
- No thinning may be a safer policy where windthrow risk is high
- Loss in revenue associated with wind damaged stands
- If considering thinning, where there may be a risk thin early or thin conservatively.

5.7 Timing of operations and financial consequences

Two scenarios have been conducted in order to find the value of a farm forestry enterprise based on thinning and not thinning. An example is based on real data taken from a farm forest site in Ballygar, Co. Galway. The plantation is a 7.8 ha plantation of *Picea sitchensis* with the following crop details:

- Age 18,
- Yield Class 24+ m³/ha/annum
- mean dbh – 17.8 cm
- Stocking – 2188 stems/ha

- Mean top height- 15 m
- Mean Basal Area.025 m²
- Basal Area/Hectare – 54.5 m²/ha
- Volume/Hectare – 344 m³/ha
- Productive Area - 85%

5.7.1 No thinning Scenario

For the no thinning scenario the volume assortments and the total value of the crop were based on modelling of growth output of the stand using the Irish Dynamic Yield Models (COFORD, 2005) are shown at various ages (table 4). The maximum Net Present Value (NPV) of the crop value is at age 35 (figure 4). For this crop a maximum NPV of €12,983 per hectare can be expected at age 35 with no thinning. A comparison of volume assortments at different ages are provided in figure 5.

5.7.2 Thinning Scenario

For the thinning scenario the crop received a 1st thinning at age 17 to remove a basal area of 18 m²/Hectare, it then received 3 subsequent thinnings to remove a volume of 80m³/Hectare. This is based on thinning to Marginal thinning Intensity at 5 year cycles (Edwards, P.N. and Christie, J.M, 1981). An analysis of the value of the crop at age 35 indicates that the value of the crop is €232,237 compared to the value of €243,717 for the unthinned crop. However the net present value of the thinned crop is 109,538 compared with a value of €101,269 for the unthinned crop. The benefit of the thinning for

Table 5: The Volume assortments, total volume, total value, total net present value, and net present value per hectare for an unthinned plantation at various ages in Co. Galway.

Age	Volume Assortments			Total Volume	Total value €	NPV €	NPV €/HA
	7-13 cm	14 - 20 cm	>20 cm				
27	94.52	220.58	399	714	132,650.00	81,435.59	10440
30	94.52	220.58	399	714	177,392.00	94,074.77	12061
32	78.87	188.73	602	870	200,279.00	96,337.62	12351
34	72.59	172.74	679	924	231,852.00	101,156.26	12969
35	69.4	164.36	715	949	243,717.00	101,269.45	12983
36	66.28	155.82	751	973	249,683.00	98,808.04	12668
37	63.11	147.16	716	926	259,497.00	97,801.69	12539
40	53.65	121.02	881	1056	270,206.00	87,971.32	11278

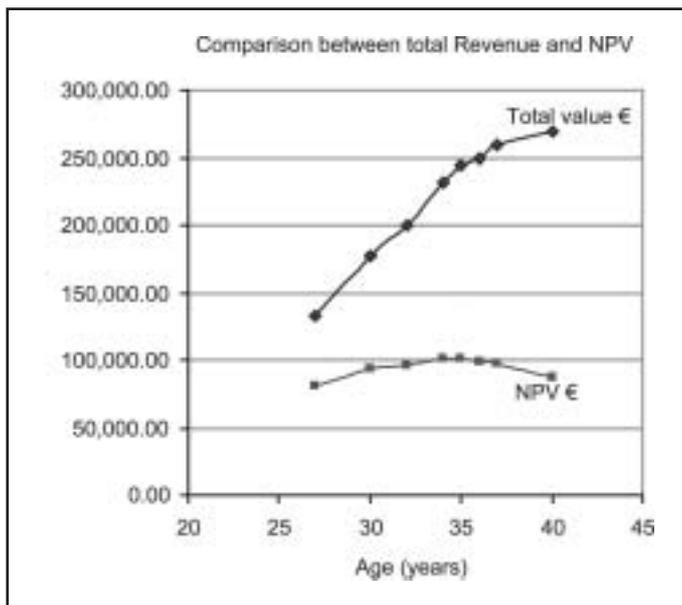


Figure 4: The total value and the Net present value of a farm forest plantation in Ballygar, Co. Galway based on a no thin policy

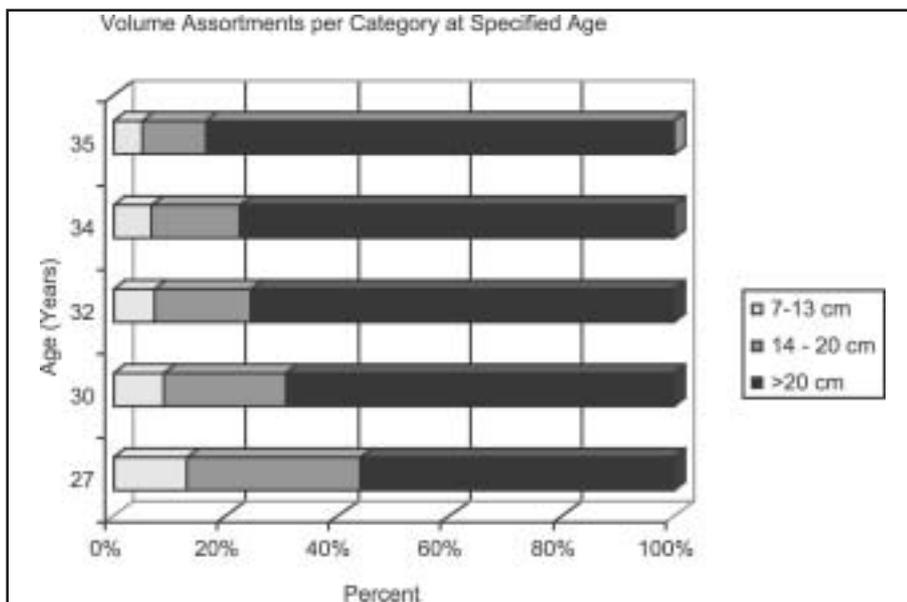


Figure 5: Volume assortments based on a no thin policy on a farm forest site in Ballygar, Co. Galway

revenue is an increase of €8,314 on the NOV value. This is attributable to the fact that revenue is generated at an earlier age in the thinned crop due

to the sale of thinnings at an earlier stage that the sale of the timber from the unthinned scenario.

Table 6: The Volume assortments, total volume, total value, and total net present value, net present value per hectare for a thinned plantation at ages 35 in Co. Galway.

At age 35				
Assortments	Volume (m ³)	Percent	Total Value €	NPV €
7-13 cm	11.42	2%		
14 - 20 cm	41.82	6%		
>20 cm	632	92%		
Total Volume at Clearfell	685	100%		
Total Volume including Thinnings	1031			
Total value			232237	109,538

5.8 Lack of Forestry Knowledge among farmers and willingness/ability to conduct operations

One of the main problems associated with farm forestry in Ireland is the lack of knowledge among farmers about forestry and forestry operations. Farmers are sometimes unaware that their plantations need to be thinned and if they do know then they are unaware of how much volume or who will carry out the operation. In recent years, Teagasc, the Agricultural and Food Development Authority have initiated a series of demonstration days and briefing sessions with farmers. The purpose of the information sessions is to transfer knowledge about forestry from professional foresters to farmers in a plain and non technical manner. A number of demonstration and monitor forests have been established by Teagasc and are used as demonstration sites to teach and train farmers the basic principles of forestry. It is important that this role is expanded and that is aided by new research so that all farmers are made aware of the options for management for their farm forest into the future. In many cases the age profile of farmers is high, and the willingness or ability to conduct harvesting operations is low. For these types of situations the only answer is to educate farmers about the benefits of management of their plantations, so that they have all the information when they are deciding what course of action to take.

The key issues for private growers and Knowledge are as follows:

- Farmers are made aware that plantations may need to be thinned
- Publicity campaign to support management of private forests
- Encourages a culture of good forest practice
- Educate farmers about basic principles of forestry

5.9 Promotion of good thinning and harvesting practice

An issue that is of concern for private forest growers is that adequate care is taken when their plantations are being thinned. It is crucial that plantations are not over thinned for two main

reasons. The removal of too much volume from thinning operation can result in a loss of revenue due to the final crop not achieving the desired volume production. It also opens up the forest canopy to the potential of windblow. If windblow takes place at a relatively young age then the anticipated return on investment may not be realised.

The key issues for private growers and good Thinning and Harvesting Practice to insure peace of mind for farmers are as follows:

- Farmers are made aware of the consequences of over thinning
- Adequate thinning control needs to be performed
- Contractors are adequately trained in the practice of thinning

6. CONCLUSION

Much progress has been made in Ireland regarding the promotion of the afforestation of land to date with an average annual planting programme of 12,000 hectares. A significant proportion of private forestry and farm forestry is now at or past first thinning (41,000 ha). Over the coming years the massive bulk of farm forests planted during the peak afforestation periods of the 1990's will be coming up to first thinning age. The potential of this resource to rural Ireland is enormous. Scenario modelling suggests that if even 50% of all private forest plantations were managed and thinned, then an estimated 5 million cubic metres of timber could be harvested from these forests by 2015. The value to the economy is great with farm forestry having the potential to contribute €56 million over the period directly into grower's pockets. Despite the massive programme for afforestation, there seems to be little in the way of ideas for the management of this resource. There are a number of issues that need to be addressed in order that growers have the chance to reach this potential. It is clear that new markets need to be created and that existing markets may need to be expanded. This includes the sawmilling, and board milling sectors. In order for companies to increase capacity, they need to be reassured that the potential from farm forests is realisable. This could be achieved by a local level forest management planning using inventories of

farm forest plantations to generate forecasts of production. These management plans can then be used to group farm forest plantations together to achieve economies of scale in order to market and sell their produce. They would also be useful for the scheduling of forest operations by moving forward or backward forest thinning operations in order that they synchronise with other local operations that may be taking place.

The potential of the wood energy market offer a great avenue for farm forest produce especially the low value products such as pulp, but more work and resources needs to be put into this area so that it can be more actively encouraged. Other issues such as location of plantations, access and the cost of harvesting operations are the subject of current research work by Teagasc in Athenry and will be elaborated at a later stage. The main issue forest growers have in relation to their individual plantations is the problem of windthrow. It is clear that forests on poorly drained soils have a high windthrow risk. In many cases it may be decided that plantations will remain unthinned where the risk of windthrow is too great. Further research to look into the effects of thinning early or respacing on crop development and stability needs to be conducted, in order to give sound recommendations regarding this practice. The consequences of not thinning are illustrated in the text and indicate the potential loss in revenue associated with not thinning the forest. This is due to the fact that there is a longer wait until payment for the produce is received. The example indicates that the difference in the NPV of the thinned example is in excess of €1,000 greater than the unthinned stand at €14,043 per hectare compared with 12,983 respectively. This however may not be the principal consideration in the choice of thinning operations as the potential for windblow may mitigate against any perceived benefits associated with thinning. It is also clear that farmers need additional information in order to understand about the management of their forests. This is currently being addressed by Teagasc and other organisations. In addition a protocol for thinning control would be welcomed in order to protect grower's interests.

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Notes to accompany the text:

1. Based on average thinning removal of 50 m³ per hectare on a productive area of 17,500 hectares.
2. These figures are based on first thinnings from the period 2006 – 2010 and include first and second thinnings over the period 2006 – 2015.
3. Based on an expected stand sale of first thinnings of €5 per m³ for first thinnings.
4. Based on an expected stand sale of first thinnings of €15 per m³ for second thinnings.
5. The value of processed wood products, such as stake wood, sawlog and wood chips.
6. A study of the Clare farm Forestry Market, Rural Resource Development, Co. Clare.