

# Opportunities for Sustainable Rural Development through Native Hardwood Silviculture - Realising Quality Wood from Ireland's Native Woodlands

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## ABSTRACT

With the introduction of the Native Woodland Scheme by the Forest Service in November 2001, considerable interest has developed in the appropriate management of semi-natural woodlands. In the past, many woodland owners managed their woodlands for wood production, and this has been a factor in ensuring the survival of these woodlands to the present day. Currently, there are a significant number of woodland owners that are enthusiastic about managing their woodlands with economic sustainability as an important criterion. Although management of most native woodlands ceased decades ago, the Native Woodland Scheme provides an opportunity to reverse the trend of neglect. This would secure at least the short and medium term future of these valuable habitats, many of which are Special Areas of Conservation or Natural Heritage Areas. The development of these guidelines is in response to queries on how to manage these woodlands in a way which protects and enhances their ecological condition while at the same time realising sustainable wood production. The study focused on wood production within the context of the Native Woodland Scheme.

The principal outcome of this project is that quality wood can be produced from all of the six native species examined, i.e. pedunculate and sessile oak, birch, alder, ash and hazel, without compromising the ecological integrity of the woodland. Silvicultural approaches adopted can be described generally as being 'close-to-nature', whereby individual or small groups of trees are removed, enabling recruitment from the remaining

trees and shrubs. The financial appraisal carried out included a land value in all Net Discounted Revenue (NDR) models for each of the species assessed. Furthermore, assuming that moderate volumes of high quality wood will fetch premium prices, the financial projections indicate that woodlands managed within the context of the Native Woodland Scheme will, in most cases, provide modest returns on par with or even exceeding returns from woodlands managed on a purely commercial basis. This is due at least in part to the continuous Native Woodland Premium of €120/ha/year, which is a unique feature of the Native Woodland Scheme.

The species managed on short rotations, i.e. alder, ash and birch, show considerable potential, with projected returns of c.9% for all three. At the other end of the spectrum, long rotation woodlands with some mature quality wood, such as pedunculate oak woodland, will yield lower revenues due to the necessarily long transformation periods. Transformation in neglected woodlands is required to optimise volumes of quality wood, to enhance biodiversity and to attain uneven aged structure. By adopting transformation over a long timeframe, ecological integrity is maintained, particularly by facilitating slow colonising species, especially in epiphytic communities.

Projected returns for pedunculate and sessile oak are both c.5%, with transformation periods of 36 years for pedunculate oak and 70 years for sessile oak. It is also important to note that woodlands vary from place to place. Therefore, the models and silvicultural prescriptions described are site-specific, and cannot automatically be applied

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to sites elsewhere. However, general guidelines applicable to native woodlands managed under the Native Woodland Scheme, as well as for the individual species assessed are presented.

Although there are a number of uncertainties inherent in the appraisal (such as performance of untested provenances and future wood prices), this project clearly demonstrates that, within the context of the Native Woodland Scheme, there is considerable potential for quality wood production and revenue generation. Realising this potential does require a strong commitment on the part of the forest sector, particularly through continual financial support to land owners, the provision of silvicultural training and native tree research focused on quality wood production. It also requires a substantial commitment on the part of woodland owners to the application of sensitive silvicultural practices and regular intervention. However, making these commitments will result in a woodland resource that contributes to rural communities while also providing a rich and vibrant habitat for Ireland's native woodland species.

Keywords: Native Woodland Scheme, woodland conservation, wood production.

## INTRODUCTION

The Native Woodland Scheme (NWS) is primarily nature conservation-oriented aimed at restoring existing– and creating new native woodlands. Hence, the maintenance of biodiversity and the floral and faunal communities associated with native woodlands are paramount. There are other objectives associated with the Scheme, particularly the protection of freshwater ecosystems, wood production and recreation.

At the outset it was recognised that there is a considerable challenge in attaining wood production objectives whilst at the same time ensuring that nature conservation objectives are not unduly compromised. Though very useful guidelines for the production of a wide range of hardwoods are available for Ireland – including most of our native trees - (Horgan, et. al., 2003; Joyce, et. al., 1998), these were not developed

within the context of the NWS and do not account for the ecological constraints inherent in the new Scheme. Specific guidelines on how to achieve wood production objectives in the context of nature conservation management are urgently required, as many potential Scheme applicants are interested in generating revenue from their woodlands. In addition, many woodlands were previously 'working woodlands' and subsequent abandonment and neglect has, to some extent, compromised nature conservation values, especially in woodlands that were managed on a coppice cycle.

In the spring of 2002, Woodlands of Ireland established a Silvicultural sub-group comprising foresters and woodland ecologists, to address this challenge and specifically, to ascertain if the inputs required to realise good quality wood in sufficient quantities was achievable and worthwhile given the constraints that biodiversity objectives impose on wood production. It was decided to approach the issue by drawing up a management plan for each of the main native species that have potential to produce wood under the NWS. Management plans were devised for the following species using the NWS framework: sessile oak, pedunculate oak, ash, birch, alder and hazel. In order to bring an outside perspective and international expertise to the process, Professor Juergen Huss, (Director of Silviculture, University of Freiburg, Germany), and Dr George Peterken (UK Woodland Ecological Consultant) toured most of the sites with the Silvicultural sub-group in 2002. They provided critical analyses of the approach adopted which is contained in the published report (Little & Cross, 2005).

The purpose of this exercise is to demonstrate - from a selection and assessment of Case Studies - how quality wood can be produced within the context of the NWS. The financial implications of adopting alternative management regimes are presented. As the Case Studies are site specific, it cannot be assumed that the same management prescriptions and financial models can be directly applied to similar woodlands elsewhere. However, a number of general management principles and guidelines can be applied more widely and these are outlined for each of the species examined.

## METHODOLOGY

### Conservation principles

Prior to assessing native wood-producing species on a case-by-case basis it was imperative that the issues relevant to the overriding woodland conservation objective inherent in the NWS were outlined in detail. To this end, Dr John Cross, Senior Conservation Scientist, National Parks and Wildlife Service of the Department of Environment, Heritage and Local Government set out the primary issues of woodland conservation in Ireland in the opening two chapters of the study (Little & Cross, 2005). These are detailed under the headings; The Management of Native Woodlands for Conservation – (1) Ecological background, and (2) Basic nature conservation principles and objectives. Topics such as the definition of native woodlands, classification, elements of the woodland ecosystem, conservation of species, economic value, past management impacts, management of exotic species, seed sources and provenances, woodland management and genetic integrity, and seed guidelines are elucidated in the context of encouraging best management practise.

### Site evaluations

The sites chosen in this study are typical of the sites that are encountered in the NWS, especially in relation to ecological and wood production attributes. The NWS framework document, which is the blueprint of management planning in the NWS, was used in this project for each Case Study. After each site was surveyed by a suitably qualified forester and woodland ecologist – and subsequent to consultation with the owner - a management plan was developed. The survey describes the site, particularly its ecological attributes, and outlines the principal management requirements. It schedules the operations required to attain the short, medium and long term objectives laid out in the Framework Document (Anon., 2005). The classification system utilised in all the plans and in the following text was devised by Cross (2002) (cross reference to the woodland classification system outlined in Fossitt (2000) is also provided). The plans for the six species are available on an accompanying CD-ROM in the published report (Little & Cross, 2005).

### Financial appraisals

Numerous financial models may be applied to ascertain the costs and revenues associated with forestry investments. For the purposes of this exercise, the management plan was supplemented by monetary analyses projected over the financial rotation of each stand type using Net Discounted Revenue (NDR) models (Anon., 1990). This approach is commonly applied in commercial forestry in Ireland. The guiding principles in the financial appraisals were as follows;

- A discount rate of 5% is typically used in NDR models for forestry to reflect a minimum hurdle rate for investment in anticipation of subsequent commercial returns. In this appraisal 5% was also considered to be the minimum rate for investment. However, where the 5% discount rate did not coincide with the internal rate of return (IRR), the discount rate closest to the IRR was calculated for each species.
- The data in these models are an approximate estimation of costs and revenue streams, and projections should not be considered as absolutely accurate. NDR is applied on a species-specific basis. Since woodlands vary from place to place, these models are site-specific and cannot automatically be applied to sites elsewhere.
- NDR models were applied to the rotation of the species under scrutiny. In some cases, i.e. pedunculate and sessile oak, the model was applied over a ‘transformation’ period as opposed to a full rotation. The transformation period refers to the time taken to convert an even-aged, uniform stand to an uneven-aged woodland diverse in both species and structure.
- In the case of ash, birch, alder, pedunculate and sessile oak the NWS model was compared to a purely commercial financial approach where revenue from wood production is maximised. This was done to assess the effects of the ecological constraints inherent in the NWS on revenue streams derived from wood production.
- A land and residual land value was applied at the beginning and end of the rotation/transformation period, respectively. In the case of designated woodland, i.e. Special

Areas of Conservation/National Heritage Areas (SAC/NHA), the value was set at €2,500/ha as the constraints imposed by designation reduces the sale potential. A value of €5,000/ha was applied to greenfield (NWS Element 2 site - alder) and undesignated woodland sites, i.e. hazel, which are not covered by the 1946 Forestry Act.

## RESULTS

The following is a synopsis of each species assessment. Particular emphasis is placed on the wood production objective and hence economic criteria though the overriding conservation objective was observed. Alternate options are considered, one of which assesses the financial implications of management under the NWS. Full site details are outlined in the final report (Little & Cross, 2005).

### Site 1: Sessile oak

The site chosen is typical of sessile oak woodlands countrywide. Wood quality is typically moderate to poor. Ecologically it falls into the woodland classification category type A. 'Oak-birch-holly woodland', using the NWS classification system (Cross, 2002). The total area of the woodland is 16.3ha.

### Option 1: To apply for grant aid under the NWS for the whole site, i.e. 16.3ha

Using a NDR rate of 5%, and excluding revenue from wood production (i.e. the only source of revenue taken into account is the NWS Native Woodland Premium), this option produced a revenue stream of €29/ha/yr. Where management included wood production and incorporated a land value at the outset, an Internal Rate of Return (IRR) of 5.5% was projected. One advantage of Option 1 is the constant stream of revenue from the Native Woodland Premium. Another major advantage is that management toward ensuring the retention and maintenance of the woodland's ecological integrity would be ensured. This included deer fencing and the control of sycamore. It also allowed for the

retention of 'reserve' areas where no wood production would be pursued and where conservation objectives would dominate entirely. The primary disadvantage is that, unlike Option 2, most of the potential revenue cannot be derived in the short to medium term. In addition, wood revenue from the most productive areas will be lower, due to ecological considerations, i.e. small coupe size and retention of standards. However, revenue from wood production is supplemented by the Native Woodland Premium, which offsets the losses due to reduced wood revenue.

### Option 2: The management of the entire woodland purely for wood production without any grant aid.

The entire woodland does not have the potential to be treated as a commercial entity as one third of the area adjacent the summit of the wood has very poor, unproductive and shallow acid soils (podzols). In addition, the woodland is a proposed NHA and this would almost certainly require the owner to adopt conservation management objectives, at least in a portion of the wood. There is c.10ha where commercial management can be expected to produce quality wood. This option produced a revenue stream of €28.9/ha/annum using a NDR rate of 5%, with the advantage that a high proportion of revenue is realised in the short to medium term. However, an IRR of 3% was projected when an initial land value was included in the NDR model. Apart from the constraints imposed by good silvicultural practices, there were no restrictions applied to the most productive areas in the woodland.

Under Option 2, the woodland is not subjected to the structure and 'discipline' the NWS-based approach provides in terms of managing woodland in a way which best balances long-term ecology and production/revenue. There is no obligation to control deer damage or the regeneration of non-native species, both of which constitute a serious threat to ecological integrity in the medium to long term. In short, the owner is not obliged to have a long-term commitment to the maintenance of the ecological or wood quality attributes of the woodland. This option is the least favoured from the economic and ecological perspectives and is

not compatible where such woodlands are designated as SACs/NHAs.

### Observations from the site visit by the Silvicultural Subgroup

The Silvicultural Subgroup was in broad agreement with the management approach suggested in the NWS Ecological Survey/Management Plan (ES/MP). There were sufficient quality oak standards to support a policy of wood production. It was also agreed that sufficient consideration had been given to the ecological attributes by setting aside reserve areas, diversifying the age and species mix, increasing the deadwood component and retaining veterans. The key issues discussed on this site were whether or not wood production would compromise the ecological integrity, and if the silvicultural systems proposed in the ES/MP would yield the desired results in due course. All were of the opinion that silvicultural treatment, especially thinning, would be very desirable. The woodland is a dense, closed stand of sessile oak which was formerly treated as coppice, with an underwood of dense holly. In some areas, the oak almost represented a monoculture, while in other areas, there is a substantial birch component. On balance, the advantage for conservation appears to lie clearly with an active approach to management. The need to proceed with thinning as soon as possible, in order to transform the woodland into a more uneven-aged, diverse ecosystem, while at the same time optimising wood production potential was advocated. The benefits of accepting a policy of management to grow and harvest oak would be as follows:

- The stand would become more diverse, especially if thinning were irregular. More birch would enter the woodland.
- Larger, more valuable, trees would be produced faster than through non-intervention. Large trees are currently sparse, and only a small number of older (veteran), high-pollarded oaks are present.
- The holly underwood would be disrupted, thus allowing epiphytic assemblages to develop on the lower oak trunks.
- Some regeneration would develop, particularly in small coupes. This would help to bridge the

period when the existing, even-aged stand is harvested.

- Sycamore can be controlled as part of thinning operations.

Improving wood quality could be achieved by selecting and retaining the best quality oak stems, thinning out competing stems, and by identifying groups for coppice. The opening of small coupes should also be considered, particularly as a way to address the even-aged structure, although there is a danger of encouraging bramble due to increased light levels. Thinning operations would disrupt the holly underwood, but they would give the better oaks room to grow and form larger timber faster. There is some commercial risk in thinning, which will almost certainly stimulate epicormics and thereby reduce timber values. However, the quality of the present stand will never make veneer or top furniture grade, and the impact of epicormic growth is therefore less of an issue in this case.

Although thinning would impact on the holly understorey, this was not considered as a negative outcome since species diversity of the understorey may be increased by a reduction in holly, which is locally very dominant. The group noted the modest revenue generated through management under the NWS (i.e. the Native Woodland Premium), and that, as many similar woodlands are designated as SACs and/or NHAs, the NWS is a strongly recommended and an entirely appropriate route to take.

In conclusion, the consensus was that the ES/MP proposed was appropriate, and that even more intervention might be considered to improve species and structural diversity, and to further open up the rather dense holly understorey. Hence, a stronger intervention policy through thinning should be adopted to enhance wood production and biodiversity.

### Site 2: Pedunculate oak

This site was selected as it represents many similar pedunculate oak woodlands that are likely to be considered for the NWS. However, unlike most other pedunculate oak-dominated woodlands in Ireland, the site includes a reasonable amount of valuable standing wood, particularly within the

furniture quality grade. The woodland area is 15ha in total.

**Option 1: The management of the entire woodland under the NWS: 5ha purely for wood production and 10ha for conservation management.**

This option focuses particularly on the maintenance of biodiversity, and only transforms one third of the woodland over a 36-year period. It envisages transforming another 5ha over a further 35-year period. However, the value of the standing crop will fall, due to overmaturity. It is envisaged that all operational costs, such as deer fencing and the removal of cherry laurel, would be covered by grant aid. An IRR of just under 5% was calculated for this option.

**Option 2: Management without any grant aid: 11ha purely for wood production and 4ha for conservation management.**

This option has the advantage of realising the maximum revenue from wood within a relatively short timeframe, i.e. 36 years, while maintaining a minimum area for conservation purposes as the site is a proposed NHA. The disadvantages are that the woodland transformation rate is almost certainly too fast to maintain ecological integrity, and all operations would have to be funded by wood revenue as the woodland would not be subject to grant aid. An IRR of just over 9% was calculated for this option, even allowing for the land value being accounted for (also included in Option 1).

Though it is clear that it is financially more attractive to treat this woodland purely as a commercial entity there are many compelling reasons to recommend Option 1. The site is a proposed NHA and is also a seed stand for oak in the National Register of Basic Material. In addition, although this woodland category is not an annexed habitat, it is very limited in extent in Ireland and should be regarded as being of conservation importance (Fossitt, 2000). Although realising greater revenue compared to Option 1, the ecological integrity of this woodland is not likely to

be maintained using a purely commercial approach. Furthermore, the study area is unusual in that very few oak stands in Ireland have appreciable quantities of valuable standing wood. Therefore, it is probable that most pedunculate oak woodlands would realise similar revenue in the medium to long term whether they are managed under the NWS or if treated on a purely commercial basis.

**Observations from the site visit by the Silvicultural Subgroup**

This site created considerable debate due to, on one hand, the pressure to realise the revenue from wood production before quality declines because of overmaturity, and, on the other, concerns that ecological attributes may be lost if felling/transformation occurs in too short a timeframe for ecological components to adjust and stabilise. In simple terms, if the woodland is transformed and rejuvenated too quickly by removing mature, even-aged coupes over a 40 year timeframe, certain species, particularly lichens, bryophytes, fungi and possibly invertebrates, may not be able to adapt to open canopy conditions. Even allowing for refuge areas, it is not known if they are large enough to support a viable population of these vulnerable flora and fauna. Furthermore, the colonisation of some species, particularly lichens, from mature woodland to newly transformed woodland areas can be very slow, and hence, such species may be lost. It was generally agreed that the silvicultural approach suggested in the ES/MP would work, and would yield sufficient regeneration by seeding and supplementary planting of local stock.

However, a potential negative ecological impact of transforming the woodland too quickly may occur. From the nature conservation standpoint, there should be, in principle, no difficulty with felling, extraction and rejuvenating the wood as an oak-dominated stand. However, the rate of change proposed is fast (i.e. 25-40 years) after a long period with little activity. Clearly, it would have been better to have started 30 years earlier, in which case the whole process would have been less disruptive, and the wood would have had a succession of age classes. Starting now, the best

course would be to retain, for as long as possible, mature oaks that have some further growth potential, and to retain a proportion indefinitely. The present non-intervention refuge area (and the group of veteran oaks) will provide some buffer against change, but in the long term it would be better to 'trade in' some of the timber sacrifice this represents for a greater retention of oaks within the rest of the wood, especially if the ground flora is seen to be resilient in the face of the current silvicultural operations.

On foot of this advice and due to the concerns, particularly amongst the ecologists in the Silvicultural Subgroup, the ES/MP was altered to reduce the total transformation area from 11ha over c.40 years to 5ha over 36 years, with coupe fellings every 15 years. In the short term, i.e. during the first 5 years, only 1ha would be transformed in coupes of 0.25ha scattered throughout the woodland. Along with non-intervention reserve areas, this would provide more time for slow colonising species to adapt to woodland transformation.

### Site 3: Ash

Of all the native species examined, common ash, from a wood production perspective, is likely to generate most interest in Ireland. It is much sought after for hurley and furniture production. The area chosen, i.e. 4.2ha, is located within an ancient woodland with a number of old and veteran pedunculate oak.

#### **Option 1: To apply for grant-aid under the NWS for the whole site and to apply appropriate silviculture to realise wood production on 3.6 ha of the site.**

This option has the advantages of addressing the maintenance and enhancement of the existing woodland type while also combating the principal threats of overgrazing and invasive species. It involves the setting aside of c.0.6ha for conservation only, leaving c.3.6ha for wood production. Coupled with retaining edge trees around felling coupes of c.0.33ha, the overall loss of yield/ha is estimated at 35%. This option also

uses a staggered rotation silvicultural system to produce 180 final crop trees/ha. Specifically, an uneven aged group shelterwood system is employed, where a 3-phase felling programme is practised at years 50, 60 and 70. Other advantages of this option include the creation of age and species diversity, the establishment of refuge areas, and eligibility for the NWS Native Woodland Premium of €120/ha/yr. This option supports the creation of coupe based, uneven aged systems of management which satisfy both conservation and production objectives.

The disadvantages are that the management system applied is more complex than that in Option 2, and that, due to the need to enhance structural diversity, a portion of wood is harvested before (at year 50) and after (at year 70) the optimum time from a productive perspective, with a knock-on impact of revenue. Although there may be a temptation to fell more of the woodland area prematurely in order to realise revenue, this approach should not be advocated generally, but only in combination with staggered felling elsewhere. Nonetheless, it is interesting to note that the IRR is similar to Option 2, at just under 9%. The reasons for this are due to (i) the payment of the Native Woodland Premium, and (ii) the limited premature felling set out under Option 1.

#### **Option 2: The management of the entire site (4.2ha) purely for wood production**

Using this approach, it is envisaged that ash is produced over a 60-year rotation using a straightforward thinning and clearfell programme. It is envisaged that grant aid would be provided under the Woodland Improvement Scheme (WIS), and that the stand would be subjected to a total of six thinning cycles. The advantages include the lack of any additional ecological constraints in maximising revenue from wood, beyond standard constraints set out in the Forest Service Environmental Guidelines, Felling Licence, etc. The disadvantages of Option 2 are that: (i) the maintenance and enhancement of the inherent woodland type is not addressed; (ii) clearfell will lead to the creation of conditions conducive to briar colonisation; and (iii) the non-eligibility of the

woodland for premium payments, as the Native Woodland Premium is not available under the WIS. The IRR calculated for this option is just over 9%.

### **Observations from the site visit by the Silvicultural Subgroup**

The management system advocated for this site created considerable debate. All agreed that the management approach adopted under Option 1 maintained and almost certainly enhanced the biodiversity of the woodland. An alternative to coupes advocated in the ES/MP was suggested, i.e. continuous cover could be adopted by selecting single plus trees and final crop trees, which are then released by repeatedly thinning out competing stems. This approach would reduce operational costs while also staggering the age structure of the stand. It would also reduce operational impacts, especially the incidence of light to the forest floor and the desiccation of the existing moss community that might otherwise result from the opening up of the canopy during the creation of coupes.

Regarding nature conservation, it was suggested that the precise thinning regime is not a major issue, though heavy thinning would almost certainly result in bramble thicket. Instead, the eventual treatment of the ash at harvest, and the fate of the existing mature oaks, was deemed to be of paramount importance. Old oaks (and other mature natives such as ash) should be retained and there should be no crown competition from younger trees. Furthermore, successors should be in place to replace veterans as they die. It was important to retain some mature ash at harvest, and to allow other natives, particularly oak, the space to develop in the subsequent rotation. Eventually, it should be possible to treat the area as a 60 year rotation, with an ash-dominated stand within which there is a permanent shelterwood of retained oak, mature ash and veteran trees. Subsequently, there would be no 'non-intervention' or 'refuge areas', but rather mature habitats scattered irregularly throughout the area. It was also noted that ash may not regenerate as profusely next time around but an array of native shrubs and bramble may colonise, which may be desirable in terms of biodiversity but would be silviculturally challenging. In light of

this, the suggestion to select single stems throughout the crop would almost certainly offset future ash and bramble regeneration problems. If this system is adopted, it would be important to retain all other native tree and shrub species that become established, particularly hawthorn, spindle and hazel.

### **Site 4: Birch**

In recent years, birch has attracted attention due to demand for furniture and other products, and also due to its fast-growing characteristics. It is, however, difficult to locate Irish provenances that demonstrate good form, and fluting coupled with crooked stem form is very common. The area assessed is 3ha and lies within an old woodland of 30.5ha.

### **Option 1: To apply for grant aid and manage the site under the NWS**

The financial implications of the proposed management prescriptions contrast strongly. There is not a major difference between Option 1 and Option 2 in terms of the silvicultural approach. However, under Option 1, one third of the area will be managed solely for conservation (refuge areas). Also, the retention of 100 stems/ha of birch, and the retention of any other native species that regenerate during the rotation, will also be observed. At 2003 values, total revenue at the end of the rotation derived solely from wood production was calculated at €8,130/ha. This assumes a final crop stocking of 300 stems, with a clean bole of 4.5 m and a DBH of 34 cm. The added revenue generated by drawing down grant aid and premiums under the NWS yielded an IRR of just over 9%. The NWS grant aid and premiums more than offset the losses due to the reduced production area.

### **Option 2: To manage the site on a purely commercial basis without grant aid**

A similar silvicultural approach is adopted under Option 2, i.e. selection and re-spacing. Revenue generated from wood production is similar to

Option 1, due to the presence of unproductive, waterlogged areas. Without any grant aid, an IRR of less than 5% was calculated. Therefore, there is no advantage in applying a purely commercial approach.

### **Observations from the site visit by the Silvicultural Subgroup**

The main issue discussed at this site was whether it was ecologically appropriate to perpetually maintain the woodland as a birch-dominated ecosystem, i.e. pioneer woodland phase, or to encourage the development of a more advanced successional phase of woodland development, i.e. oak-birch-holly woodland. Even though other native species in the stand will be retained into the next rotation, with the likelihood that their numbers will increase over time, birch will nonetheless be the primary focus in relation to wood production in future rotations. The consensus was that this was entirely appropriate, especially given the context and stand location, i.e. a small birch stand within a large old woodland area dominated mainly by mature oak-birch-holly woodland. From an ecological perspective it was stated that the proposed management approach was entirely acceptable in nature conservation terms, and that the main requirements should be the retention of the few veteran oaks and the development of successors. It was also recommended that it was equally important to retain the open areas (i.e. rides and glades) as open habitats, as these will greatly diversify the woodland as a whole.

As the birch stand is part of a much larger woodland area, this factor also led foresters and ecologists to conclude that there was less of a need to set aside one third of the site as refuge, non-intervention area. There is ample opportunity for native flora and fauna to migrate into the birch, and hence, the wood production element could be pursued to an even greater extent. Some of the refuge area is retained scrub comprising a mixture of hazel, willow and birch on wet soils. Some revenue from wood would be generated with minimal effort by freeing the crowns of the best of the birch, along with the occasional ash present.

In terms of nature conservation, a view was

expressed that it would be more valuable to treat this scrub as coppice-with-birch standards, thereby introducing a distinct structure into the mosaic, although light thinning would also be acceptable. Thinning was not seen as a negative operation, given that self-thinning will naturally occur over time. In addition, the continuous cover objective was seen as conducive to biodiversity enhancement, as was the staggering of age classes by retaining mature birch and oak into subsequent rotations.

### **Site 5: Alder**

Alder is a tree that has received very little attention from a silvicultural perspective in both Ireland and Britain. It is interesting to note that alder is not even considered on its own merits as a timber producing tree in the Forest Management Tables (Anon., 1971). Nevertheless, alder historically was highly valued for its wood, due to its durable and aesthetic properties. It was for these very reasons that the tree was commonly referred to in the past as 'Irish mahogany'. Today, alder wood is now much sought after, particularly for fitted kitchens and other furniture. An alder woodland of 1.3ha within a mixed woodland of c.15ha established on a greenfield site in 1991 was assessed.

### **Option 1: To apply for grant-aid and manage the site under the NWS**

The financial analysis using an NDR model was projected over a 40-year rotation on 1.3ha. As the biodiversity objectives were not considered to confer significant constraints on the wood production objectives (as both are very compatible in this case), the main difference between applying a purely commercial approach versus management under the NWS was the capital grant and premiums that are available under the NWS. In other words, a purely commercial approach would yield the same revenue from wood production minus the NWS grant and premiums. The results demonstrated that the added revenue generated from the combination of the Afforestation Premium and subsequent Native Woodland Premium, as available under Element 2 of the NWS (i.e. €442/ha/yr for 20 years, and €120/ha/yr thereafter) added to the

appreciable returns from wood production that can be derived from appropriately managed native alder on suitable sites.

Even allowing for a land value of €5,000/ha at the outset, an IRR return of just under 9% was calculated, and this was ascribed not only to the premiums payable, but also to low initial establishment and subsequent maintenance costs. In relation to lower establishment costs, mounding is deemed not only unnecessary (due to the rapid growth rates of alder in the early years and its ability to thrive in very wet soils), but almost certainly counterproductive, as it appears – from observation of the Case Study site – to cause root ball destabilisation and subsequent heave on very heavy textured, wet soils. Vegetation control is only necessary in the initial 4 years, and since alder appears to be less palatable to grazing animals, ‘filling in’ may also be less likely than for other broadleaf species. Assuming that projected wood volumes are achieved, it would therefore seem that a relatively attractive financial return can be achieved with alder within the context of the NWS.

### **Option 2: To manage the site solely for wood production under the Broadleaf Afforestation Scheme**

The silvicultural management of the site under the general Broadleaf Afforestation Scheme would be almost identical as that under the NWS. It is envisaged that similar volumes of wood would be realised in the first rotation, but somewhat more in subsequent rotations, due to the increased species diversification under Option 1. However, it is financially more attractive to apply for the NWS grant than to enter the general Broadleaf Afforestation Scheme, due to the availability of the Native Woodland Premium amounting to €120/ha/yr, which becomes available under Element 2 after the Afforestation Premium payments cease (after 15 or 20 years, depending on applicant status). This Native Woodland Premium is unique to the NWS, and is not available under the general Afforestation Scheme.

### **Financial implications of alternate management options**

Although the Silvicultural Subgroup did not visit the site, their views on the management and financial implications of the management options were sought. It was concluded that there is no reason why the NWS should not be pursued in an attempt to realise quality wood while maintaining and enhancing biodiversity. Hence the higher revenue inherent in the NWS relative to the Broadleaf Afforestation Scheme is recommended for greenfield sites (i.e. NWS Element 2) where alder is envisaged. For comparative purposes, a mature alder site was assessed in the same region to ascertain how similar greenfield sites treated as described might develop in future. The DBH and wood volumes data gathered in the mature stand confirmed the projected values for the immature plantation in the study site, and are therefore considered realistic in terms of potential revenue from alder stands managed to produce quality wood.

### **Site 6: Hazel**

In Ireland, hazel was managed for centuries, primarily as coppice underwood. Though management of hazel declined markedly in recent centuries, it is often an important component of close-to-nature silvicultural systems in Europe today, particularly where continuous cover is being practised. In addition, there is currently considerable interest in the management of hazel and the development of downstream products in Ireland. The area of the study site is c.7ha, of which 0.5ha was financially assessed with respect to coppice management.

### **Financial implications of alternate management options**

As hazel has never been established and/or managed in a commercial forestry context in Ireland during the 20th century, and as it is ineligible for grant aid under other Forest Service schemes, the financial analysis was assessed only in the context of the NWS. Although the site was not visited by the Silvicultural Subgroup, the group saw no reason to modify the ES/MP presented.

The financial appraisal on hazel covered a 52 year period, which included a restoration cut followed by seven harvesting cuts using a coupe system (i.e. 3 coupes of 0.15ha each in area) on a 7-year cycle. The NWS grant covered all management planning, operational and labour costs (including the restoration cut at €2500/ha) and the NWS Native Woodland Premium of €120/ha/yr was inputted from year 1. A firewood value of €20/m<sup>3</sup> is given for the bulk of the initial harvested material arising from the restoration cut. At 2003 values, the standing crop of hazel at the end of a seven year cycle as a result of coppice management was valued at €650/ha, which is somewhat lower than what is obtained currently in the UK, i.e. c.€800/ha. A land value of €5,000/ha was also included in the NDR analysis. The IRR worked out at just under 4% within the context of the NWS, which is considered less than a modest return for this labour intensive silvicultural system. However, without the NWS grant and associated premium, the projected returns are very poor, with an IIR estimated at under 2%.

## CONCLUSIONS

The assessment of six native species managed within the NWS for wood production concludes that it is possible to make modest financial returns in most cases whilst maintaining and enhancing biodiversity. The final report includes a discussion in the concluding section on the management for conservation and wood production, and the financial implications of the NWS for landowners. It also outlines general silvicultural guidelines and guidelines for the individual species assessed (Little & Cross, 2005).

It is important to point out that these Case Studies may be used as general models to inform landowners, foresters and ecologists involved in projects under the NWS where a wood production objective is being pursued co-incident with conservation. Each Case Study considers the ecological and wood production objectives as fully as possible and integrates both into a coherent long-term plan. However, outside these Case Studies, every site will have its own unique characteristics, and will require its own specific silvicultural prescription. Operational costs will

vary from site to site, as will the financial projections. For these reasons, the Ecological Survey/Management Plans set out for each individual species will almost certainly require adjustment when applied in other locations elsewhere in Ireland.

Some of the financial projections included in this study assume specific revenue rates for wood and sawlog harvested from these woodlands, with hardwood value estimates based on current prices. However, it is impossible to predict precisely how much revenue harvested wood will generate. It is also of note that although there appears to be considerable demand for some of the species assessed, i.e. high quality birch and alder, markets generally have not been developed in Ireland to absorb hardwood supplies if and when they become available.

It is also of interest that even though the value of designated land (e.g. SACs, NHAs, etc.) is lower than agricultural land, modest returns are still possible under the NWS. At the very least, it should be possible for woodland owners of designated sites to cover the management costs, which would ensure that such woodlands are appropriately managed in the context of nature conservation.

In addition, it is also important to put in context the general situation regarding quality wood production of native tree species in Ireland. There are serious threats to the production of most broadleaves from expanding deer and grey squirrel populations. Also, the potential loss of productivity due to other biological factors has not been quantified in Ireland, e.g. bacterial canker in ash stands.

It is universally accepted that the use of good genetic material is a central factor when growing high quality trees (Savill, 2003). However, other than oak, there is little or no seed available from certified sources with respect to wood quality. Most stock derived from native sources is untested in terms of form and vigour, and future quality from newly planted woodlands and/or woodlands restored with such material is unknown. Some testing is ongoing in relation to oak and birch, but considerably more research is required to address this deficit (Anon., 2004; Thompson & Lally, 2000; O'Dowd, 1998). It is encouraging to note that a

number of native species are also the focus of genetic improvement under the British and Irish Hardwood Improvement Programme (BIHIP). However, all woodlands created or restored under the NWS in the short and medium term are effectively future trials in terms of hardwood quality. A complete set of results for each species will not be available until the end of their respective rotations.

There also appears to be limited experience in the management of broadleaves in Ireland, particularly in the implementation of close-to-nature silvicultural systems. This area is currently receiving attention under the auspices of ProSylva, which is a welcome development. In addition, the NWS has provided considerable momentum to the application of close-to-nature and continuous cover forestry in Ireland, by creating a platform for its implementation. However, if quality hardwood is to be realised in future, silvicultural training will be required for management planners (ecologists and foresters) and woodland contractors.

Notwithstanding the current shortcomings and unknowns outlined above, it is concluded that there is considerable future potential for rural communities, initially through the management of native woodlands currently in a state of neglect and subsequently, in the production of quality native hardwoods in existing woodlands and in newly created native woodlands on greenfield sites. Thereafter, downstream value-added produce such as furniture, has the potential to create locally-based employment thereby helping to sustain rural communities. Realising this potential is dependant on a clear commitment to this resource by the relevant forest authorities through grant aid for woodland management, research and training.

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