

# THE PRODUCTION AND MARKETING OF SCOTTISH HARDWOOD FLOORING



Cuille Beithe na Gàilheachd  
**HIGHLAND  
BIRCHWOODS**



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Photographs:

Front cover: Hardwood flooring in a visitors centre (Sweden) (*Ivor Davies*)

Insets: Creating 4 x 1 's on the Double-slabber (*Ivor Davies*), Strathspey quality pine (*Denis Torley*), Atholl Estate quality birch (*Richard Worrell*), Processing Pine (*Denis Torley*)

# INTRODUCTION

For several years there has been ongoing discussion about markets for low grade home grown hardwood timber. Overall the consensus would indicate that the most feasible volume market in Scotland is probably hardwood flooring. This report brings together the findings of three progressive studies carried out between 1997 and 2001. They comprise:

## **1. The Market for Scottish Hardwood Dimensioned Stock. Undertaken in 1998-1999**

Several industries in the UK buy large quantities of small section, short standardized lengths of hardwood timber, generally from imported sources. Producing these components in the UK is sometimes proposed as a potential volume outlet for the under utilised lower grades of British hardwoods. This study describes an assessment of the viability of such an approach in Scotland. Many of the current buyers of imported dimensioned stock contacted during the study expressed a willingness to use Scottish material providing the timber could match the quality and price of their existing supplies. There was no premium available for either high environmental standards or to Scottish origin. As a consequence of the low purchase prices identified during the study, the immediate potential for Scottish sawmills to supply significant volumes of low to mid-grade material into the existing market appears to be limited. However there appears to be scope for more import substitution of dimensioned stock at the higher timber grades and for further development of niche marketing operations such as flooring or laminated windows.

## **2. The Markets for 'Character Grade' Hardwood Flooring. Undertaken in 1997-1998.**

This study, based on an unpublished Business Development Services report to the Forestry Commission, investigated the UK market for character grade flooring and assessed the extent to which Scottish sourced material could substitute for imports. The study concluded that there is a substantial market in the UK and it is potentially open to domestic

suppliers providing that they can match the price, quality consistency and customer support of importers. Although there was no evidence of a price premium for home grown timber there was potential for market share advantage.

## **3. The Production of Scottish Hardwood Flooring. Undertaken in 2000**

This paper provides an overview of current UK practice in the manufacture of solid flooring from low-mid quality hardwoods. The paper draws upon the experience of Scottish Hardwood Timber Market Development Group members and in particular summarises the type of solid hardwood flooring factory which is most common in the UK and Scandinavia.

The minimum scale of viable hardwood flooring factory would probably require an investment of at least £110,000 for plant and working capital. Such a set up could produce at least 20,000 m<sup>2</sup> of flooring per annum, at a selling price of £12 to 28 m<sup>2</sup> (depending upon species and thickness) with an annual turnover of £300,000 to £500,000. This would utilise around 3,000 to 5,000 m<sup>3</sup> of low-mid grade hardwood logs per annum.

# 1

## The Market for Scottish Hardwood Dimensioned Stock

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### Background

The UK hardwood timber industry faces a number of inter-related marketing problems (Clegg J. & Co. 1995). The difficulties can be summarised as follows:

- \* The bulk of the resource is low-mid grade timber. The quality limitations include small diameters, lack of straightness, discolouration, knots and shake.
- \* The timber is often only available in small parcels offering few economies of scale and little continuity of supply.
- \* The markets for lower grade hardwood timber are in steady long-term decline.

These factors make it difficult to achieve profitable timber production from small broadleaf or mixed woodlands. Given the continuing growth in interest in managing such woodlands, solutions are being sought to these inter-related market problems.

One of the solutions regularly proposed is to process low-grade timber into small sections and short standardized lengths often referred to as standard dimensioned stock. This approach recovers the maximum yield of sawn timber from low-grade sawlogs and it is sometimes argued that UK hardwood sawmills could supply this material in large volumes, thereby stimulating the market for under utilised low-mid grade hardwoods. It is further argued that such an approach would be particularly relevant for cooperative production by small, often mobile, sawmills and individual woodland owners.

The principal markets for standard dimensioned stock in the UK are industries such

as upholstered furniture and high volume woodturners who manufacture large volumes of standard components. Other possible clients include furniture manufacturers who currently buy wide boards and who might be persuaded to switch to this alternative raw material.

In 1993 an investigation by Brazier into contemporary and potential markets concluded that the immediate potential to supply UK sourced hardwood-dimensioned stock was limited because:

- \* The markets were of limited size and demanded a wide range of dimensions
- \* Good quality imported timber is easily available at low prices
- \* Manufacturers require low processing costs with a minimum of wastage

Brazier identified flooring and upholstered furniture as the markets with greatest potential. This study, undertaken over 1998 and 1999, extends Brazier's work and investigates in detail the market requirements of these and other manufacturers who were already purchasing standard dimension stock from UK and imported sources.

### Methods

The study was designed to investigate the potential to substitute Scottish sourced standard dimension stock for imported material in medium (100-1,000 cubic foot per annum) to large (1,000-8,000 cubic foot per annum) volume markets. The authors contacted thirty-five businesses, and conducted in-depth interviews with twenty seven, from Scotland and England, who made regular purchases of temperate hardwood dimensioned stock.

Firms throughout the UK were interviewed although, given the Scottish focus of the study, those in or easily accessed from Scotland were given preference. They were selected on the basis of membership of relevant trade associations supplemented by the personal knowledge of members of the Scottish Hardwood Timber Market Development Group (SHTMDG). Where possible the study concentrated on medium to large volume timber users, however size of operation was not always possible to assess from published sources. The structured interviews were conducted by phone and focused upon timber consumption, quality and purchase price.

Firms expressing interest in using medium to low grade timber were supplied with samples of Scottish timber, cut and dried to their specification. A follow-up interview a few weeks later recorded the reaction to the Scottish stock and compared its performance with their normal supply. Selling medium to low grade timber is the area of greatest market failure and was the key focus of the study. The timbers covered were oak, ash, beech, birch, and sycamore, of different species depending on country of origin, as these were representative of current production in Scotland.

The potential production costs of Scottish dimensioned stock were derived from published sources (Vickers 1999) supplemented by unpublished data from members of SHTMDG. The UK hardwood processing industry is very traditional and prices are generally quoted in cubic feet. Imported timber may be quoted in either cubic feet (cu ft) or cubic metres (m<sup>3</sup>). For clarity both units are quoted in this report. All the costs quoted in this study apply to the period 1998-1999 although it is likely that these figures will be

largely unchanged for the foreseeable future.

The hardwood sawmilling costs in Scotland range from £28 to £53 m<sup>3</sup> (£0.80 to £1.50 cu ft) for cutting dimensioned stock, kiln drying costs range from £55 m<sup>3</sup> up to £130 m<sup>3</sup> (£1.50 to £3.70 cu ft). Translating these figures into a selling price is of course difficult without having much more detailed information about the particular situation. That being said it is unlikely that the selling costs for kiln dried Scottish hardwood dimension stock would be less £285 m<sup>3</sup> (£8 cu ft) for most species. Oak would tend to be higher than this with a selling cost of at least £353 m<sup>3</sup> (£10 cu ft). Good quality timber would be expected to attract a premium. These figures were taken as the base prices during the study.

Although there is a British Standard for the appearance grading of sawn hardwood timber (BS EN 975-1: 1996) this has not yet gained wide acceptance within the industry and there is a wide variation in the grading rules used by the trade. Consequently a very simple system was developed for this study based upon consultation with existing dimensioned stock suppliers in the UK (table 1). These grades are broadly similar to the American hardwood grading rules (AHEC, undated) which, due to American market domination, are widely used and accepted in the UK.

*Table 1. Appearance grades for standard dimensioned stock used during the study*

Top grade	Mid grade	Low grade
Maximum diameter of knots 10 mm. No more than three such knots per linear metre. No dead knots.	Maximum diameter of live knots 30 mm. No more than three such knot per linear metre. Maximum diameter of dead knots 15 mm. No more than three per metre.	Maximum diameter of live knots 50 mm. No more than four such knots per linear metre. Maximum diameter of dead knots 30 mm. No more than three dead knots per metre.
No insect damage or discolouration. No exposed pith, bark or wane.	No shakes or exposed pith. Minor bark and wane permitted on less than 20% of length. Colour variation permitted.	No shakes, minor pith, bark and wane accepted on less than 50% of length. Colour variation permitted.

## Results

Thirty five businesses were initially contacted by the study and twenty-seven of these were willing to be interviewed. At this stage, three actual or perceived problems with Scottish hardwood dimensioned stock were raised:

- \* poor quality
- \* erratic supply
- \* limited suppliers

Half of the firms interviewed were located in Scotland and half in England, and sixteen were interested in receiving samples of Scottish material to evaluate. Of these only six firms were interested in low to medium grade timber, were prepared to pay market prices, and were medium to high volume purchasers.

The breakdown of all contacts by the

authors, given by sector, is shown in table 2.

Of the six firms provided with samples, three were extremely negative about the material they received. The reasons given were either that the timber supplied was much lower quality than they currently buy from abroad or that the estimated price of the timber (above £8 per cu ft [£283 per m<sup>3</sup>] for mid grade kiln dried) was too high. Two firms, a joinery manufacturer and a batch furniture maker, did

Table 2. Breakdown of sample by market sector

Contact class	Contacted by letter	Interviewed	Sent samples
Turners	10	8	2
Furniture	10	11	3
Distributor	4	1	0
Joinery	11	6	1
<b>Totals</b>	<b>35</b>	<b>27</b>	<b>6</b>

Table 3. Scottish timber quality and dimensions requested for testing by interviewed firms. The prices are indicative, based on contemporary purchase patterns of the firms.

Timbers	Quoted size in mm	Grade	Moisture Content**	Price cu m*	Price cu ft
Oak	37.5 x 50 x 450	top	KD	£706	£20
	50 x 50 x 1000	top	KD	£858	£24.30
	38 x 150 x 1000	top	KD	£671	£19
Ash	37.5 x 50 x 450	top	KD	£530	£15
	50 x 50 x 1000	top	KD	£786	£22.30
	38 x 150 x 1000	top	KD	£512	£14.50
	50 x 150 x 1000	top	KD	£809	£22.86
Beech	37.5 x 50 x 450	top	KD	£424	£12
	37.5 x 37.5 x 450 - 600	top	KD	£317 - £565	£9 - £16
	50 x 50 x 475	top	KD	£459	£13
	25 x 150 x 2000	top	KD	£600	£17
	28 x 250 x 2000	mid	KD	£283	£8
	50 x 50 x 1000	top	KD	£971	£27.50
	50 x 150 x 1000	top	KD	£823	£23.30
Birch	37.5 x 37.5 x 450 - 600	top	KD	£240 - £300	£6.80 - £8.50
	25 x 100 x 1000	low	AD	£105	£3
	25 x 100 x 1000	mid	KD	£280	£8

Notes: \*These prices are based on contemporary buying in prices quoted by interviewed firms. The information from several other requests for samples was incomplete and these are not recorded, although virtually all were for top quality timber.

\*\*KD refers to Kiln Dried material at a moisture content of around 10%.

AD refers to Air Dried material with a moisture content of around 18%..



find both the quality and price acceptable and a wood turner said the quality was acceptable providing the price could be reduced to their current buying in price.

All the requests for timber are summarized in table 3, with indicative prices. Given the Scottish production costs identified above it will be apparent that many of these requests are not viable under current market conditions. This is confirmed by table 4 which shows that whilst several firms reported buying UK sourced dimension stock it is apparent that virtually all of these purchases are for medium or high quality timber where the price and timber quality can match imports. Only two purchasers of low-grade timber occur in the sample.

Table 5 shows the full range of timber types and grades identified during the study. Timber quality and price were the main factors that determined purchase decisions. Only two firms mentioned environmental issues: a low volume wood turner was 'very keen on green issues' and a large construction company stated

that 'all supplies must have Forest Friendly certificates, or equivalent'. No premium was offered for any kind of environmental certification. Similarly, no respondent offered a premium for Scottish material and in general Scottish-ness was seen, if anything, as a disincentive towards purchase. Indeed two firms declined to be interviewed because they had tried samples of Scottish hardwoods in the past and were not impressed with the quality. These findings are consistent with other recent market studies (see paper 2 in this booklet) which reported that buyers would not pay extra for Scottish timber but they would buy Scottish in preference to imports providing the local material could match imports for quality and price. As table 5 shows imports dominated the sample with the USA having the largest share. It should be noted that the use of tropical timber was not recorded in the study and this may have distorted the relative importance of each country slightly.

The average purchase costs reported in the study are summarized in table 6. These overall figures are broadly consistent with

Table 4. Details of the UK material sourced by interviewees

Origin	Timbers	Grade	Volume Cu ft	Price cu ft	Price m <sup>3</sup>
Scotland	Beech	mid	2	not given	not given
		mid	?	not given	not given
		mid	30	not given	not given
	Sycamore	low-mid	4500	£4-£5	£141 - £177
	Birch	mid	?	£8	£280
England	Oak	mid	5250	not given	not given
		mid	5	not given	not given
	Ash	top	?	£14.30	£505
		top	?	£15-£25	£530 - £883
		mid	530	not given	not given
	Beech	top	140	not given	not given
		mid	1400	not given	not given
		mid	?	£8	£283
	Beech & ash	low	1800	£4	£141
	Sycamore	top	?	£15-25	£530 - £883
		mid	2000	£12	£424
	Birch	top	70	not given	not given

Table 5. Timber purchases by interviewees during previous 12 months, analysed by country of origin, type and grade.

Country of origin	High	Mid	Low	Total for all grades	Timbers
USA	21	6		27	Oak, ash, beech, birch, sycamore
England & Wales	5	6	1	12	Sycamore, ash, beech, birch
Europe	2	6		8	Beech, ash, oak, birch, sycamore
Germany	4	2		6	Beech, birch, sycamore
Scotland	1	5		6	Beech, sycamore, oak
Canada	1		2	3	Birch
Denmark	1	1		2	Ash, beech
France	2			2	Oak
Poland	1	1		2	Beech
Finland	1	1		2	Birch
Sweden		1		1	Beech
Latvia			1	1	Birch
Russia			1	1	Birch, beech, ash
Switzerland	1			1	Oak
<b>Totals</b>	<b>40</b>	<b>29</b>	<b>5</b>	<b>74</b>	

timber prices known to members of SHTMDG and at this level appear to be a reasonable reflection of wholesale prices within the industry in Scotland during 1998-1999. That being said it should be noted that some of the individual prices collected during the study need to be treated with caution for the following reasons:

- \* Firstly, the study frequently encountered subjective quality grading definitions, and variable knowledge, or expectations of moisture content.
- \* Secondly, different firms bought their timber at different points in the supply chain and were not always able to say if their price was from an importer, a main or a secondary distributor, or direct from a sawmill.
- \* Finally, in some cases the firms either would not reveal or did not know full details of the prices or timber volumes involved.

## Discussion

This study has only investigated the extent to which the current production costs of standard dimensioned stock made from Scottish hardwoods are inline with current wholesale prices within the trade. No attempt has been made to gross up this small sample to provide any picture of the whole industry.

It would appear that under current conditions the scope for large expansion of the existing market for home produced low to mid grade hardwood dimensioned stock is limited. The key limiting factor is price and Scottish suppliers of low-mid grade hardwood dimensioned stock cannot hope to compete against imports when purely selling a commodity product under current conditions. However, on the evidence of the figures quoted in this study an efficient Scottish sawmill selling top quality oak or ash dimensioned stock can compete satisfactorily against imports and there would appear to be room for expansion in this sector. Not surprisingly these results closely mirror the actual supply situation in the Scottish hardwood industry. These results raise a number of issues.

Table 6. Analysis of timber purchases by volume & grade.

Timbers		High volume (1000 – 8000 cu ft)	Medium volume buyer (100-1000 cu ft)	Low volume buyer (<100 cu ft)	Notes
Oak	Quality	Top	Top	Top	A further 6 buyers did not provide prices. (3 small, 1 medium & 2 large)
	Price £/cu ft	£32.86	£23.72 average (range £19 - £40)	£25	
	Sample	1 at 7609 cu ft. This price is not typical for the firm	5 - average 200 cu ft	1 at 70 cu ft	
Ash	Quality	Top	Top	Top	4 further medium sized buyers did not provide prices. 3 of these wanted mid grade timber & 1 wanted top
	Price £/cu ft	£18.68 average (range £14 - £22.86)	£17.60 average (range £10 - £22.30)	£20	
	Sample	2 - average 3937 cu ft	5 - average 198 cu ft	1 at 70 cu ft	
Beech	Quality	Top; Mid; Low	Top	none	8 further firms did not supply price information, the largest of which bought 14,000 cu ft. 7 of these 8 firms wanted mid grade timber.
	Price £/cu ft	£16.35 average (range £9 -£23.57); £8; £4	£18.18 (range £12 -£27.14)		
	Sample	3 - average 3899 cu ft; 1; 1	5 - average 218 cu ft		
Birch	Quality	Low	Mid	Mid; Top	7 firms reported buying birch. Only 4 firms quoted prices.  1 distributor quoted: Baltic 'Frame grade' (i.e. low-grade) at £130 cu m (£3.68 cu ft); Finnish B grade at £150 cu m (£4.24 cu ft); Finnish A grade at £190 cu m (£5.38 cu ft). These prices assume moisture content below 18%.
	Price £/cu ft	£3	£7.65	£8 for mid; no price available for top	
	Sample	1 at 2,400 cu ft	2 - average 270 cu ft	1 at 20 cu ft; 3 average 35 cu ft,	
Sycamore	Quality	Mid; Low	Top	none	6 firms bought sycamore. Of these 2 didn't give prices and 1 (a turner) quoted £90 cu ft for 525 cu ft of top grade! This is not included in the table.
	Price £/cu ft	£12; £4 – 5	£20		
	Sample	1 at 2000 cu ft; 1 at 4000 – 5000 cu ft	1 at 140 cu ft.		

It would appear that the production of standard dimensioned stock from mid to low grade Scottish hardwoods can only be viable if the selling price can be substantially reduced. This implies a specialized double slabber type sawmill with good material handling facilities. No small or mobile sawmill can hope to achieve the low production costs required. In order to achieve adequate capital utilisation such a sawmill would need to have a large throughput of timber and this leads on to the second point. Given that in the dimensioned stock market there appears to be no market advantage in

relying solely upon Scottish hardwoods a mill targeting this market should consider using imported timber in addition to Scottish material thereby generating higher turnover, better capital utilisation and more assured continuity of raw material supply.

Under current market conditions it would appear that the most viable options for selling low-medium grade Scottish hardwood blanks are probably as follows.

- \* A sawmill could sell the material virtually at cost as a bi-product of a more profitable product line selling good quality timber.
- \* Alternatively a smaller producer should concentrate upon niche markets such as flooring or windows where small producers can add sufficient value through design, service, localness or some other distinctive selling point to overcome an inherently costly and low quality raw material.

Both of these routes are already being implemented on a small scale in Scotland and both would probably merit further development. However niche markets are by definition small and bi-products from good quality timber do not utilise much of the lower grade material.

The present study has researched the market for dimensioned stock during a period of very difficult trading conditions and it is assumed that the market for Scottish hardwoods would become more viable if the pound dropped in value. Even then however Scottish producers of dimensioned stock will have to be competitive in a world market. These conclusions emphasise once again the importance of timber quality and efficient, market driven, production as key challenges facing the UK forestry and wood processing industries.

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# 2

# THE MARKETS FOR 'CHARACTER GRADE' HARDWOOD

## Background

The Scottish Hardwood Timber Market Development Group (SHTMDG) has identified medium quality solid hardwood flooring as a potential target market for the comparatively short (minimum 1.2m) straight lengths of timber which could readily be cut from the mid to low grade hardwood logs that are currently difficult to market in Scotland.

Medium quality hardwood flooring is now increasingly being marketed as 'character grade' which can be defined as solid hardwood flooring, produced from predominantly short lengths of timber, with no serious defects on the front face and sides but with variations in colour and grain as well as small dead knots present on most of the boards. The character arising from this is often seen as advantageous in some market sectors.

The purpose of the study, undertaken in 1997, was to investigate this market and to assess the extent to which Scottish sourced hardwood flooring could substitute for imports.

## Methods

During 1997 a desk study (BDS, 1997) was made of the published data on the hardwood flooring market in the UK. In addition discussions were held with distributors and contractors operating in the market, to consider what their reaction might be to sourcing solid hardwood flooring from Scottish grown timber. Nine flooring contractors, 9 distributors/merchants/retailers and 6 importers in Scotland were interviewed. The objective was to generate information on:

- \* the overall UK market for hardwood flooring products;

- \* the product specifications and market requirements;
- \* price

The market for both solid hardwood flooring and laminated flooring were assessed. Laminated flooring consists of a number of thin layers of timber or reconstituted board glued together like plywood. Generally only the top layer is hardwood. Because of the high set-up costs this product is not specifically relevant to Scottish manufacturers who are thus restricted to solid flooring products.

## Results

### UK market size, sectors and values

In 1997 the total UK market for both solid and laminate flooring was estimated at 2,700,000 m<sup>2</sup> per annum and had been growing at or around 10% per annum since 1992. The estimated value of this market was £55 million in 1997 (BDS, 1997). There are no accurate figures available for the past three years but, in line with growth in the overall construction market, it is likely that the hardwood flooring market has continued to grow at around the same rate.

Putting this into the context of the wider floor covering market, Palmer Market Research (in BDS, 1997) estimates that timber flooring accounts for only 3-4% of the total floor coverings market. Of this, 45% goes into the domestic sector and 55% into contract flooring. The higher quality, higher value solid flooring products go into the contract market which, at a total value, in 1997, of £41 million, accounts for 75% of the value of timber flooring market. The laminate market, worth £14 million in the same period, has been largely restricted to the domestic sector. The solid

timber flooring market is currently thought to be rising at circa 10% per annum whilst the smaller value laminate flooring domestic market is rising at circa 20% per annum. There is no data available on the market share for hardwood or softwood timbers although it is believed that hardwoods have the dominant share.

In 1997 it was estimated that the volume of the UK solid timber flooring market was circa 1,500,000 m<sup>2</sup> per annum (BDS, 1997). A rough estimate, based on population, would therefore suggest a Scottish market of circa 150,000 m<sup>2</sup> at a value of £4.1 million per annum and growing. Without exception each company contacted confirmed that there had been an increase in demand for hardwood flooring of all types. In some cases the market had grown by a factor of 4 or 5 over the past few years. Some contacts suggested that there was greater demand for character grade, relative to other hardwood, flooring products. One company indicated that they had not really pushed character grade flooring made from British wood as there had been a limited supply. Otherwise the proportion sold/laid by companies varied very considerably.

There are currently four leading hardwood flooring suppliers in the UK:

- \* Tarkett, the market leader;
- \* Junckers following close behind;
- \* Kahrs; and
- \* Bruce.

All these firms are principally importers, and foreign owned. The two main UK flooring firms are Atkinson & Kirby, and Wincanders, both of whom are agents for imported material as well as flooring manufacturers. A large number of small firms import finished flooring. In addition, there are around six smaller UK firms producing solid flooring from homegrown hardwood, including some intermittent production in Scotland. This small number of domestic manufacturers is growing due to a greater awareness of the market opportunities, although the percentage of solid hardwood flooring supplied from trees grown and processed in the UK remains very small.

Importers and foreign manufacturers

sell their timber using a variety of mechanisms:

- \* agents (e.g. Wicanders);
- \* timber merchants (e.g. Timbmet);
- \* builders merchants (e.g. Harcros and Jewson).

The product normally ends up with flooring contractors, of which there are an estimated 2,200 in the UK, with around 200 in Scotland. Small domestic producers using homegrown hardwoods generally sell direct to the customer.

### **Product specification and market requirements**

The key purchasing criteria for customers are, perhaps not unexpectedly, price and fashion. Encouragingly a recent American Hardwood Export Council survey (AHEC, undated) indicates that UK customers are becoming more adventurous in their tastes, with knots seen as features rather than defects. Without exception, the Business Development Services study (BDS, 1997) reported that it is essential for character grade flooring to be supplied tongued and grooved on the ends, as well as the sides. Where consistent visual appearance is important then prime grade products, such as Junckers, sell best. Character grade products come into their own where a practical, durable product is required at a reasonable cost such as in pubs, clubs/discos, hotels and some shops. Another benefit claimed for character grade is that its natural appearance enables it to blend in with a range of furnishings and surroundings. The most commonly mentioned hardwood flooring timbers were oak, maple and beech.

Opinions differed over the other possible characteristics of character grade flooring:

- \* The 1.2 metre length was generally considered reasonably consistent with the imported sizes, though some felt this would restrict access to certain customer types. Whilst the average north American length is just under 1 metre long, they also have access to high quality products and the flexibility to supply timber in a variety of lengths. In summary, 1.2 metre lengths would be “acceptable” though

longer lengths are preferred.

- \* There was a similar degree of variability over the desired width and thickness of character grade boards, compounded by some confusion over terminology.

Using the definitions:

width = face width;

depth = thickness.

The consensus on requirements, as shown in figure 1 (Rolf, pers. com.), (inside back cover) was:

Width: 56-87 mm  
(range 44 - 175 mm)

Depth: 19-20 mm when nailed onto joists;  
10-12 mm when nailed onto an existing floor.

- \* Flooring contractors varied in their the demand for pre-finished as against unfinished flooring. Some stated that the use of pre-finished flooring meant it could be fitted by less qualified staff, whilst others prefer unfinished timber which they sand and seal. The latter product also allowed the contractors to obtain a higher proportion of the added value from the customer.
- \* The presence or absence of colour was another variable, with opinion ranging widely from considering it extremely important to unimportant, and including those who considered it a distinct advantage. The important point was that people needed to know what they were getting, and to get the colour that they specified.

## Price

There was a reasonable degree of consistency in the information supplied on the prices paid for solid hardwood flooring and the prices at which it was charged out.

- i. Bought in price in 1997:

Unfinished French/African etc low grade flooring	£4 - 8 per m <sup>2</sup>
Unfinished character grade flooring:	£12 - 18 per m <sup>2</sup>
Finished prime grade flooring	£23 - 30 per m <sup>2</sup>

- ii. Charge out price in 1997:

The mark up was generally in the order of 60%, with a 100%+ increase in price per m<sup>2</sup> when it had been laid, sanded and sealed in a customers house.

## Is Scottish timber or timber with high environmental standards an attraction?

Most of the people interviewed during the study would, in principal, be prepared to buy flooring made from Scottish or British grown timber, but would not be interested in paying more for it and would want to be sure of the continuity of supply. In other words:

“same product, same price as imports”

Scottish manufacturers, if they want to sell into this market on any scale thus have a considerable challenge ahead to achieve parity with the dominant imported supplies. Given these preconditions there was, encouragingly, a widely held belief that there would be the potential for a good Scottish manufacturer to secure increased market share compared to imports. In order to achieve this increased market share the distributors and flooring contractors would be looking for a high level of marketing support equivalent to that provided by the major importers.

Throughout the study the variation in terminology caused some difficulty. Thus it would appear that some form of grading system for colour and amount of acceptable “variability” would be an important part of the marketing support to give the customer confidence that they were getting what they had ordered.

No opinions were expressed on the need for high environmental standards and it is clear that, in this marketplace, timber certification is not an issue. These findings are consistent with other recent research into attitudes to environmental issues in the construction industry (U Lee, pers. com.)

## Discussion

Character grade flooring is clearly a substantial market in the UK and one that is potentially open to domestic suppliers. Keen prices, consistent quality, volumes of supply, and strong customer support emerge as key factors of success for any solid hardwood flooring manufacturer.

Although it appears unlikely that there would be a price premium available for either Scottish-ness or high environmental standards there could be to be a potential market share advantage for a Scottish solid hardwood floor. However, in view of the data presented in the other studies in this report securing this market share will demand a considerable investment in production facilities and marketing support. It is unlikely that a very small wood processing business could satisfy these demanding requirements and so it is likely that only a larger company would be viable.

As a timber producer the company would be competing against very keenly priced imports of standard dimensioned stock and, given that there is no apparent price advantage in using only Scottish material, there would be considerable commercial pressure to combine both homegrown and imported flooring in the product mix. Much as a business might be sympathetic to the cause of Scottish timber any decision on the relative merits of these two approaches would need to be taken on hard-nosed marketing criteria.

## References

AHEC, undated, *An Illustrated Guide to Hardwood Lumber Grades*. American Hardwood Export Council, London.

Business Development Services, 1997, *The UK Hardwood Flooring Market*, Unpublished report to the Forestry Commission.

Rolf, B., (pers. Com.). Figure 1: Recommended sections for character grade hardwood flooring.

U Lee, Robert Gordon University, personal communication.



# 3

# THE PRODUCTION OF SCOTTISH HARDWOOD FLOORING

## Introduction

Character grade solid hardwood flooring, as defined in the second paper of this report, consists of short floorboards made from low to mid grade hardwood timber, with considerable colour variation. Recommended sections are given in figure 1, inside the back cover (Rolf, pers. com.).

Most low to mid-grade hardwood logs are suitable for making character grade flooring. Thus about 30% of a chipwood stack and most pallet wood could be utilised. There are no accurate estimates of the potential annual production of lower grade hardwood logs in Scotland. However, it is believed that the potential supply far exceeds current demand. Recent data collected by SHTMDG indicates that the current Scottish hardwood production is around 10,000 tonnes of chipwood logs and 30,000 tonnes of sawlogs per annum. It is likely that the firewood market takes at least this amount although there are no reliable figures for this.

As outlined below a small flooring factory could produce around 20,000 m<sup>2</sup> of flooring per annum, requiring 2,000 - 3,500 m<sup>3</sup> of roundwood. Experience in Scotland and Wales indicates that a flooring operation which offered a small premium over alternative markets (i.e. chipwood and firewood) would be able to attract sufficient roundwood, although, due to the predominant winter felling of hardwoods, the supply would tend to be seasonal. This issue could be resolved by a high level of stock-holding.

Recent Scottish experience indicates that a factory should certainly be supplying oak and birch flooring in response to the strong demand and it could also consider stocking ash

and elm. Sycamore and beech are less certain as customers tend not to ask for character grade flooring in these timbers. Further market research is required to determine how these timbers could most effectively be marketed as flooring. For example, it is possible that their good drying and machining characteristics could be exploited to produce block flooring of some kind.

## Initial timber processing

If a flooring operation was based upon an existing sawmill it may be cost effective to undertake at least some of the sawmilling on-site. However, the factory would probably need to buy in several types of timber, including from other parts of Scotland, and this is probably best bought in as sawn stock. Consequently, it may be more appropriate to dispense with in-house sawmilling and buy in all timber as dimensioned stock.

Sawn timber recovery from the log varies depending upon diameter and quality. Small diameter hardwoods (<25 cm diameter) will yield around 35% sawn timber while larger logs will yield closer to the industry standard of 50%. Cross cutting small diameter logs at 1.3 m gives the optimum balance between yield and handling costs (Vickers, 1999). Larger diameter logs should generally be cut into 2.5 m lengths. A flooring factory with in-house sawmilling also requires a market for the sawmill residues, in order to render the overall operation commercially viable.

A full in-house sawmilling operation to produce flooring blanks would require a minimum of:

Initial break-down saw	Re-saw
Cross cut saw	Roller beds
Dust extraction	Forklift

Several types of initial break-down saw are possible depending upon the specification what is being are cut. Vertical bandmills are the most common choice in the UK but for smaller diameter hardwoods (<25 cm) a double-slabber may be more cost effective. The sawn timber needs to be produced for an off-saw price of no more than £180 m<sup>3</sup> (£5 per cu ft). Thus it has to be an efficient operation. Mobile saws are too slow for this type of production. The timber is then graded, and stickered off the saw, with the stickers at a maximum of 30 cm spaces. The stacks are banded into packs which are not broken until they are kilned and in the factory. The full sawmilling operation requires two or three workers of whom one needs to be an experienced sawmiller.

## Timber grading

A common set of grading rules needs to be applied to all suppliers of flooring blanks and should be specified in the timber supply contracts. The contract will cover board quality, cross cutting, neatness of the stack and possibly moisture content (if the timber is being bought part air dried). The off-saw grade for top face and sides is roughly as given in table 2. Anything is permitted on the bottom face except rot & insect attack!

Further grading can subsequently be carried out in the factory into (at least) a premium, and a character grade. Probably 10% will be premium, 70% character and about 20% will be rejected or sold into other markets or as very cheap flooring.

## Drying

Kiln drying is required to reduce the moisture content of the boards to the required specification. Most kiln drying of hardwoods in Scotland is done using dehumidifier kilns. These are relatively low cost and simple to operate but have the disadvantages of being slow and not particularly controllable. The main alternative to dehumidifiers is a conventional heat-vent type kiln which with its precise control of moisture and temperature allows for fast, uniform drying according to well tested schedules. Small conventional kilns are becoming increasingly available.

The current moisture content standard for timber flooring is 8-10 % (BS-8201:1987). This may be difficult to achieve in practice

Table 2. Top face and sides grading requirements.

Effect	Condition
Length tolerance	+1- 2%, with square cross cutting
Live and small dead knots	Accepted except near the ends
Any discoloration	Accepted except for spalting and drying marks
Sapwood	Accepted
bark inclusion, rot or insect damage	<u>Not</u> accepted
Bending and twist	<10% variation per board
cupping of boards	Minor is accepted
End checking	<100mm, no shakes

using dehumidifier kilns and so, depending upon the kiln set-up the older moisture content standard of 10% +/- 2% is a more realistic specification. For floors laid over under-floor heating the moisture specification has to be 6-8% and a premium is usually charged for this.

With dehumidifier kilns it is cost effective to part air dry the timber in a shed for a minimum of three months which will reduce the moisture content to around 30%. Conventional kilns may not require this. Low drying costs are crucial to a profitable operation and need to be in the region of £70 per m<sup>3</sup> (£2 per cu ft). This is only possible with an efficient fully mechanised operation.

Best recommended kilning practice should be followed including weighting the packs and testing sample boards for moisture variation and stress. Drying is best done in-house to ensure quality control. The minimum equipment requirements are: air drying sheds, a forklift and several lorry container sized dehumidifier kilns. Expect to loose about 5% of stock due to kilning degrade.

A second hand insulated lorry container makes a cheap and effective dehumidifier kiln and several lorry container sized kilns will be required for full production. This type kiln can be set up for £5,000 although it should be realised that such a set-up is slow and not as controllable as more sophisticated kilns. A

fully equipped conventional kiln of equivalent size will cost about £20,000. For small scale kilning operations (i.e. less than 1,000 m<sup>3</sup> throughput per annum), dehumidifier kilns may be the most cost effective alternative. Higher throughputs would require a conventional kiln. A 20 ft lorry container fitted with a dehumidifier kiln will dry about 7 m<sup>3</sup> per cycle with an average drying time of 30 days (assuming part air dried stock). Allowing for down time this gives an annual capacity of 77 m<sup>3</sup>. Allowing for kilning degrade this would produce 250 m<sup>2</sup> of 20 mm thick flooring per cycle, or 2,750 m<sup>2</sup> of flooring per kiln per annum. As the machining capacity of a flooring operation is much greater than this (see below) drying capacity is probably the biggest bottleneck in the system.

## Machining

The minimum machinery requirements are:

**Cross cut saw** - This must be robust and very accurate. It is used for squaring the ends prior to molding and for cutting out defects. The current cost for a good second hand machine around is £1,500.

**Moulder** - A six headed moulder (six cutter) is the standard choice, however, there are several options. For example, a four cutter could be used with the timber passed through twice. The first pass straightens and squares the boards then the second pass puts on the final profile. An old second-hand four cutter might cost around £4,000. A newer second-hand six cutter would cost upwards of £22,000. A larger machine capable of heavy production would cost upwards of £35,000. Most second-hand moulders would require a motor upgrade in order to comply with health and safety legislation.

**Double ended tenoner (DET)**- There are two types of DET, of which the saw type is most effective for flooring. A second-hand saw type DET would cost between: £5,000-10,000.

**Dust extraction** - A capacity large enough to cope with a moulder would be required.

**Miscellaneous equipment** –forklift, roller beds etc.

**Humidity controlled workshop** - The minimum appropriate size would accommodate a volume of stock and is

probably 200 m<sup>2</sup> at a build cost of around £100 per m<sup>2</sup>.

A six cutter would have a through-put of 15-17 m per minute. Allowing for down time a basic second-hand moulder and DET could machine around 0.25 m<sup>2</sup> per min or 80 m<sup>2</sup> per day. This equates to around 20,000 m<sup>2</sup> per annum. Seven 20 ft lorry container kilns would be needed to supply this output. With modern moulding equipment the machining output could probably be increased to 0.4 m<sup>2</sup> per minute, in which case conventional heat-vent kilns would be more economical than dehumidifiers.

It is probably fair to forget *just-in-time* production for this type of business. Supply of raw materials and demand of the finished product both fluctuate, sometimes widely, making considerable stock holding capacity a necessity in any flooring factory. Probably the main stock-holding would be in kiln-dried or part machined blanks as these could easily be converted into finished product. Thus if a four cutter was used for moulding then the machined blanks could be stock-piled between passes through the moulder (Carruthers, 1967).

It is easy to produce a poor quality products. Good products depend upon proper grading, good kiln drying, well set up machines, and skilled operators. Quality control needs to be built into each stage of the production process. There is no technical reason why lower grade hardwoods cannot be machined with an acceptable finish.

## Staffing requirements

The full operation requires around six employees. This assumes:

- 1 manager
- 1 sales officer
- 1 administration assistant/book keeper
- 1 skilled machinist with a lot of experience of working British hardwoods.
- 2 general workshop staff

This is an optimum number and a new operation might start with fewer, such that the manager also undertakes sales, but it would need to be expanded by 2-3 persons if an in-house sawmilling operation was included.

Table 3. Minimum costs for a flooring factory set-up based on 2001 prices.

Item	Rate	Cost
Factory	space 200 m <sup>2</sup> @ £100 per m <sup>2</sup>	£20,000
Sheds	Space 200 m <sup>2</sup> @£50 m <sup>2</sup>	£10,000
Kilns	7 dehumidifier @ £5,000	£35,000
<u>Machinery</u>		
Moulder	A very basic new 4 cutter or second hand 6 cutter	£20,000
DET		£10,000
CC Saw		£3,000
Dust extraction		£4,000
Forklift		£5,000
Miscellaneous		£10,000
<b>Total</b>		<b>£110,000</b>

## Capital requirements & turnover

Using second-hand equipment the minimum set-up cost would be something like the figures in table 3.

These costings exclude all associated costs such as site, services, professional fees, and all office, staffing and vehicle costs. The in-house sawmilling operation is also excluded. Depending upon individual circumstances it may of course be possible to rent some of the equipment listed above. It might also be possible to scale up an existing wood manufacturing operation as demand increased.

Depending upon thickness and timber type, the selling price of the finished product into the trade would be between £15 to £25 per m<sup>2</sup>, see paper 2 in this report. At an output of 20,000 m<sup>2</sup> per annum the operation would have an annual turnover of £300,000 to £500,000. The working capital requirement for such a venture would probably be a minimum of around £30,000, in the first year.

## References

BS-8201:1987, *Code of Practise for Flooring of Timber*.

Carruthers, J (1967). *The machine planing of hardwoods*. Forest Products Research Laboratory. HMSO London.

Rolf, B., (pers. com.) Figure 1: Recommended sections for character grade hardwood flooring.

Vickers G., 1999, *Evaluation of the Blossom Double-Slabber Portable Sawmill (TN 23/98)* Forestry Commission, Dumfries.

# DISCUSSION

The studies indicate that there is a market for hardwood flooring produced in Scotland, provided that the product can compete in the volume market by matching the quality and price of imports. Individual sawmills have already attempted small-scale forays into this market place, either by producing one-off runs of flooring for individual customers, or by producing larger quantities for sale to the general market. So far, no more than limited success has been achieved, and for any significant progress to be made, consideration must be given to setting up a new factory as has just been outlined.

The lack of capital amongst existing hardwood sawmills has already been identified as the key constraint to the manufacture of a flooring product in Scotland. While the papers point out that an investment of £100,000 may bring about the birth of a viable flooring manufacturing business, it is unlikely that any of the existing established sawmills are in a position to make this financial commitment alone, even with the support of Local Enterprise Companies or other public funds. In addition, because small sawmills have attempted to start these businesses in the past with no success, there is now a fear of failure based on the experience of others.

The way forward has to overcome both of these problems, the lack of capital, and the lack of confidence. There are a number of different routes forward:

- \* These papers could form the basis of research to enable an entirely new player to move into the sector with the capital and commitment to make a new business successful.
- \* One of the existing sawmills could make the commitment and go to the market to borrow the finance required.
- \* Existing sawmills could form a new company to raise all the capital to start a new flooring factory from scratch.
- \* Existing sawmills could co-operate more fully to enable the product to

be made without the large investment and risk being required.

Only the third and fourth routes would be attractive to existing sawmillers, because those go some way to solving the problem of lack of confidence.

The third route still requires the raising of £110,000, but the risk is spread amongst a number of partners and therefore offers a degree of comfort to each one.

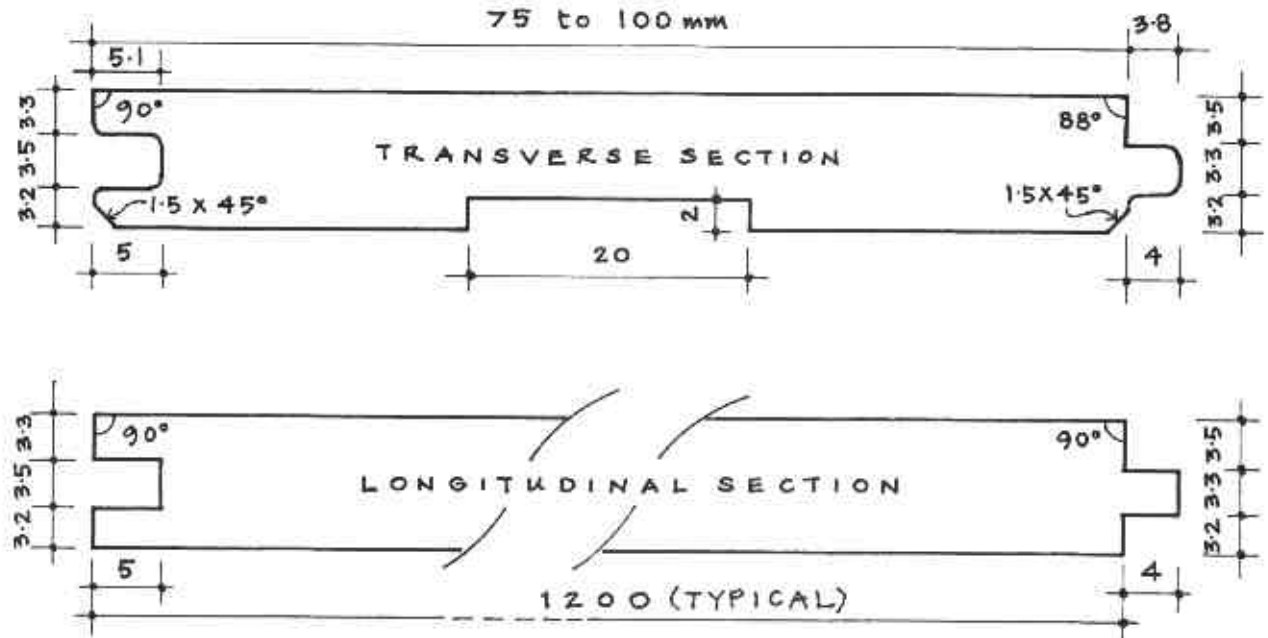
The fourth route would involve a number of partners raising the finance for appropriate machinery like the moulder, double end tenoner and cross-cut saw, but individually, the sawmills would upgrade their sawing and kilning capacity to enable each of them to supply the short standardised lengths which would be needed. Each partner would, therefore, be a supplier to the new flooring company, and each partner would be responsible for upgrading his own production, yet each partner would also have a share in the new manufacturing enterprise. The financial commitment of each partner would therefore be in two parts: one entirely devoted to improving his own output and therefore remaining entirely within his own control (and to the benefit of his existing business), and the other, an investment in the new manufacturing business. The size of this financial commitment would be related to the level of co-operation that was brought about. In theory, partners could supply storage, materials handling, labour and administration as well as stock in the form of kiln-dried standardised lengths.

**So far, none of these routes has been taken successfully. Perhaps now is the time to consider the next step.**

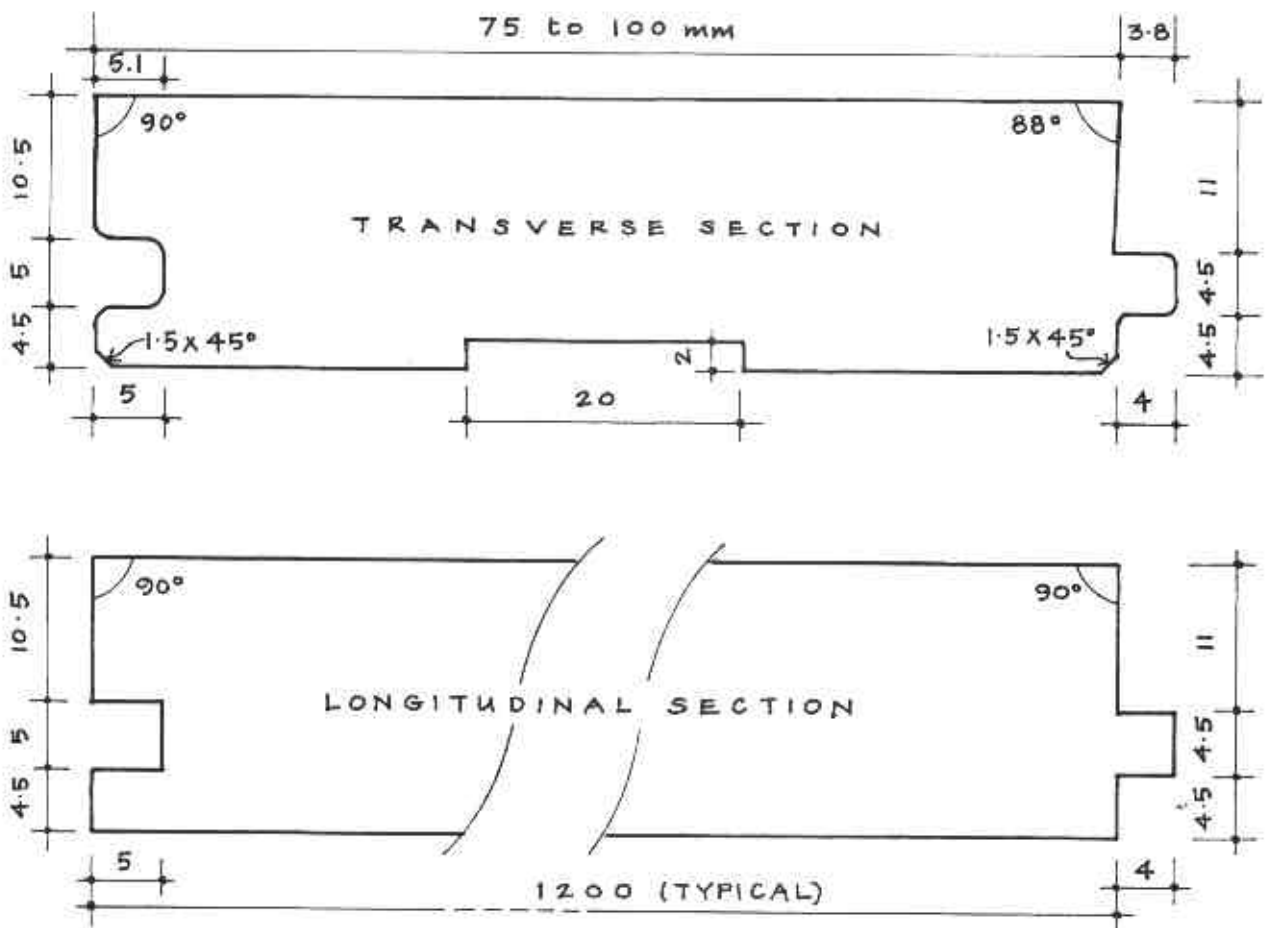


FIGURE 1: Recommended sections for character-grade hardwood flooring

NOTE: All dimensions in millimetres  
All radiussed dimensions = 1 mm



A. TYPICAL SECTIONS THROUGH 10 MM THICK FLOORBOARD



B. TYPICAL SECTIONS THROUGH 20 MM THICK FLOORBOARD

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