

Growing Thatching Straw in Wales

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1. Background

For thousands of years the roofs of dwellings and farm buildings throughout the UK have been thatched with cereal straw. Even in parts of Wales where cereals were not a major crop, small plots of wheat or oats were usually grown for subsistence purposes and generated useful amounts of straw for thatching roofs. Oat straw degrades much more quickly than wheat straw, however, and the best straw for thatching in England and Wales has always been grown from older, tall-stemmed varieties of 'winter' (autumn sown) wheat.

Although many buildings in Wales are still thatched, all of the thatching materials now used in Wales are imported from England or from outside the UK. On many roofs traditional straw thatch has also been replaced with water reed imported from Turkey, Eastern Europe or South Africa, resulting in a loss of ancient thatch of archaeological importance as well as local employment and income.

Growing thatching straw can be a profitable alternative crop for many small and medium sized farmers - straw is currently selling for £ 650-750 per ton (delivered). Unfortunately, the 'antique' reaper-binders and threshing machines still used by straw producers are not plentiful in Wales, and the relatively inexpensive, small-scale machinery that would allow many small producers to grow straw is not commercially available. Reaper-binders in good working order are not impossible to find, however, and straw threshing and combing machinery is available in adjacent English counties. Relatively little support would be required in order to develop small-scale machinery that could change the situation significantly within the next few years.

Growing thatching straw requires a shift in growing technique as well as a change of variety. Only wheat varieties that produce straw c. 90-110 cm in length are suitable for thatching, whereas modern wheat varieties average only 70-80 cm. Adding nitrogen fertiliser to modern hybrid wheat will increase the length of the straw - but the straw will then be weaker and will not perform well on a roof. Thatchers insist on using straw grown that has been grown with very little chemical fertiliser, which forces growers to use older varieties that 'naturally' produce tall, strong stems. These older varieties also produce less grain, but this is not a problem as grain is largely a 'waste' by-product (chicken feed) for straw producers. Thatching straw is therefore grown in low input conditions, although many conventional growers will use a herbicide to control weeds instead of frequent cultivations and crop rotation.

The goal of the research that was part-funded by Glasu in 2004 and 2005 was to help identify varieties of thatching wheat suitable for growing in Welsh conditions. This is an essential first step towards securing a reliable market for Welsh-grown thatching straw in Wales and England. Research has already generated a list of c. 20 older varieties and varietal mixtures of wheat that produce good quality thatching straw in low input conditions. Growing conditions in most of Wales are not as conducive to growing wheat as those in East Anglia, but conditions in Somerset and Devon - where most of the country's 'combed wheat reed' is grown - are not so dissimilar. Climate change may also improve growing conditions in Wales in the short and medium term - c. 50% of the straw crop in England was lost due to poor weather

in 2003/04, whereas trial plots in mid Powys in the same year produced an excellent crop.

Thatch is a uniquely 'sustainable' roofing material that could increase farm incomes and rural employment in Wales. Unfortunately, no reliable figures are available on the number of thatched buildings in Wales or the acreage required for 'self-sufficiency'. Essential acreage figures are probably in the order of only 75-125 acres. Very few thatchers (3 known to the author) actually live and work in Wales, and all of the materials (both straw and water reed) used are imported. Wales could easily become 'self-sufficient' as regards thatching straw within a few years because of the small size of the existing market, but thatch is rapidly becoming a more popular roofing material throughout the UK and Welsh growers could theoretically supply good quality straw to the English market.

2. Description of project

a. Project design

The plots were planted in the same location as the 2003/04 trials on certified organic land at Gwernyfed Farm, Three Cocks, nr. Brecon. The land was ploughed and harrowed, and seed was planted using a conventional hydraulic seed drill during a dry spell in late-November 2004. The trial plots consisted of 5 large plots (of 1-3 drill widths x c. 50 m) and 20 smaller plots surrounded on all sides by a 'sacrificial' (i.e. anti-deer and rabbit) mixture containing over 75 older varieties of wheat, rye and oats. The total area planted measured c. 3.5 acres.

All of the plots germinated well and grew rapidly through the winter – but not as rapidly as autumn germinating weeds which caused severe problems in some of the plots later in the season. Corn marigold was a particular problem and a significant 'seed bank' of weeds survives in the soils on this farm due to poor weed management prior to its conversion to organic production methods. Wet conditions also prevented the plots from being rolled in the spring, which would have flattened the relatively heavy clay soil and made it easier to cut the plots with the reaper binder. The plots were trimmed, weeded, rogued to maintain varietal purity/mixture and photographed throughout the summer of 2005.

The plots were harvested with a reaper binder in the second week of September, 2005. The sheaves were stooked in the field for 4 weeks and then carted and stored on a wagon under tarpaulin. Unfortunately, sheep escaped from an adjacent field and caused considerable damage to the stooked crop. Further damage – primarily to the grain – was caused by rats in storage. However, the main goal of this project was to produce good quality straw rather than seed so the loss of most of the grain is a disappointment rather than a disaster. All of the grain harvested (by combine) from the field margins and headlands was replanted in November 2005 and should produce c. 3 tons of high quality wheat for sale and experiment in late autumn, 2006.

Measurements of straw length and 'strength' – the most important characteristics of significance to thatchers – were made in the field and in the laboratory in July and November 2005. Samples from similar trials undertaken in Somerset and Buckinghamshire over the past five years provided useful comparative material for analysis. Detailed morphological or statistical analyses of thatching straw have yet to be undertaken anywhere in the UK, and in spite of the fact that it is the basis of a £ 50 million industry, thatching straw does not have a 'national' or 'agreed' quality standard. The limited funding available for this study, and the quality of the samples

obtained, did not justify a detailed morphometric analysis of these samples, and the results of this investigation must be considered preliminary, but the results clearly provide a basis for ranking the varieties grown in terms of their suitability for use as thatch in Welsh conditions.

b. Seed and varieties grown

Seed for the 2004/05 trials was obtained from experimental plots grown at Gwernyfed Farm, Three Cocks, nr. Brecon in 2003/04, supplemented with seed and new genotypes obtained from similar trials undertaken in Somerset and Buckinghamshire in 2002/03 and 2003/04. The varieties grown form part of a list of preferred varieties of which seed was available for Glasu-sponsored trials organised at short notice in December 2003. All of the most common winter wheat (*Triticum aestivum*) varieties currently grown for thatching in England were grown, including:

1. *Maris Widgeon* - 1963
2. *N59* - 1957
3. *Maris Huntsman* - 1972
4. *Squareheads Master* - 1880's
5. *Aquila* - 1982
6. *Little Joss* - 1910
7. *Victor* - 1908

These varieties are ranked above in order of their probable acreage in England in 2004/05.

Many successful straw producers grow a mixture of varieties with similar ripening times and stem lengths. Blends of the following varieties were also grown:

8. *Maris Widgeon*, *N59*, *Squareheads Master* and *Aquila*
9. *Squareheads Master* and *N59*
10. Historic wheat blend (c. 70 'heritage' varieties)
11. Rivet wheat mixture (5 varieties)

The 'primitive' hulled wheats spelt (*Triticum spelta*) and emmer (*T. dicoccum*) were staple crops in Wales in prehistory but have not been grown since the end of the Roman period. Several varieties of spelt, in particular, have produced top quality thatching straw in trials in the West Country. Both pure and mixed plots of spelt and emmer were grown to assess their performance compared to 'modern' varieties.

12. Spelt mix
13. Spelt + Emmer (6 varieties)

At present straw growers do not have a 'spring option' as no modern varieties produce suitably tall and strong-stemmed crops from a spring planting. However, a number of older, unlisted varieties do produce suitable straw when planted before early April. In the 2004/05 trials a 'spring thatch' mixture was planted in the autumn to assess its suitability as a winter option.

14. Spring wheat mix

Triticale, a modern artificial cross between pasta wheat (*TRITicum durum*) and winter rye (*SeCALE cereale*), has become a very common thatching material in many parts of the UK over the past 6-8 years. Its popularity is due to the fact that it can be grown

continuously on the same land using chemical fertilisers and sprays, and produces a tall-stemmed straw that is flexible and creates an attractive finish. It is a hardy crop developed primarily to produce high protein animal feed, but has a relatively soft stem inherited from its rye parent. Many experienced growers and thatchers will not use Triticale for main coat thatching.

15. Triticale '*Purdy*'

Rye was also a common crop in Wales in past centuries, and produces a tall, flexible but relatively soft straw that is ideal for ridging but unsuitable for main coat thatching.

16. Rye mix

The modern varieties *Smuggler* and *Clare* which are recommended for organic cultivation were grown in adjacent plots for comparative purposes only as they produce c. 70 cm straw unsuitable for use as thatch.

17. *Smuggler*

18. *Clare*

All of the thatching varieties trialled have long been outclassed as baking wheats. Only one, *Maris Widgeon*, is available commercially from a single distributor in the West Country (Pickards Seeds, Burrington, Devon). Seed of all of the other varieties cannot legally be obtained due to the strictures of the National List of Permitted Varieties - EU legislation policed by DEFRA. Officially, seed of unlisted varieties cannot be bought, sold or even given away, so that legally new straw growers have no option but to grow *Maris Widgeon* if they wish to grow thatching straw. Unfortunately, *Maris Widgeon* does not produce top quality thatching straw and dedicated growers who wish to grow the highest quality straw they can have no choice but to obtain seed illegally from other growers.

3. Results

1. Straw quality

The results of the 2004/05 growing trials confirmed that the many of the wheat varieties that are currently grown for thatching in the UK also grow very well in Powys. They also confirm that – as in England - three varieties that are grown for thatching in other parts of the UK (*Aquila*, *Maris Huntsman* and *Maris Widgeon*) do not produce the highest quality straw. These assessments have been made primarily on the basis of straw length and a comparative subjective assessment of straw quality (stem strength, hardness, colour, and stem diameter). Resources were not available to conduct laboratory tests to provide a more rigorous assessment of morphological characteristics of importance such as stem diameter, stem wall thickness or 'waxiness' (wax is the main barrier to water ingress, and therefore a critical factor controlling the rate of decay).

2. Straw length

Straw length is a critical factor in thatching straw. Short straw has to be fixed in shorter courses than longer-stemmed straw in order to achieve an equivalent depth of material on a roof, resulting in greater labour costs and a tendency for straw to 'stack' on a roof (which reduces water shedding and thus increases the rate of decay). Wheat straw routinely grew to over 140 cm in the late 1700's, but had

decreased to c. 110 by 1900 and less than 80 cm by the 1960's. Modern semi-dwarf baking wheats are too short to be used in thatching. Straw cannot be used for combed wheat style thatching if the cut stem length falls below 80 cm, and most thatchers will not thatch with straw less than 90 cm in length.

Table A. Straw length - 2004/05

No.	Variety	cm >	ave. height	cut height
18	Clare		78	68
17	Smuggler		80	70
5	Aquila		86	76
3	Maris Huntsman		96	86
1	Maris Widgeon		100	90
7	Victor		106	96
8	Maris Widgeon, N59, SHM & Aquila		110	100
2	N59		112	102
9	SHM & N59		114	104
14	Spring wheat mix		114	104
10	Historic wheat blend		115	105
12	Spelt mix		115	105
13	Spelt + Emmer		115	105
6	Little Joss		118	108
4	Squareheads Master (SHM)		120	110
11	Rivet wheat mixture		129	119
15	Triticale var. 'Purdy'		130	120
16	Rye mix		136	126

The results from 2004/05 allow the varieties grown to be grouped into three categories based on stem length – short (<90 cm), intermediate (90 – 110 cm) and long-stemmed (> 100 cm) varieties:

a. Short-stemmed varieties (unsuitable)

The modern organic baking wheat varieties *Clare* and *Smuggler* produce straw that is clearly too short for use as thatch.

Unfortunately, the 1980's variety *Aquila* which also produces very short straw continues to be grown for thatching, primarily in the West Country. *Aquila* has short, stiff straw resistant to 'lodging' (falling over), and is used primarily by growers farming conventionally who achieve the additional stem height required by thatchers through larger inputs of artificial nitrogen – which puts the crop at a higher risk of lodging.

Maris Huntsman was a popular thatching wheat in the 1980's and early 1990's, and is still grown for its straw in many parts of the UK. It yields well on heavy soils with low to moderate inputs of nitrogen, but produces relatively short straw unsuitable for combed wheat reed style thatching on lighter soils, or when grown organically or with the very low inputs of nitrogen preferred by thatchers.

b. Intermediate length varieties

Six varieties and six varietal mixtures produced straw with a cut length between 90 - 110 cm.

Maris Widgeon has probably been the most popular variety of wheat grown for thatching over the past 30 years. It yields well when grown with moderate to low inputs of nitrogen, but will produce straw shorter than 90 cm when grown on light soil or in organic conditions.

An experimental mixture of 10 older spring wheats also produced a relatively short straw, resistant to lodging, that may eventually provide a 'spring option' hitherto unavailable to straw growers. Unfortunately, it cannot be offered to growers or thatchers because existing seed legislation (the 'National List of Permitted Varieties') makes it illegal to sell or pass on seed of an 'unlisted' variety.

The older, traditional, thatching varieties *Victor* (1908), *Squareheads Master* (1880's), *Little Joss* (1910) and *N59* (1956) all performed very well in the 2004/05 trials, and produced tall, flexible straw with minimal lodging.

A 'thatching blend' containing *Maris Widgeon*, *N59* and *Squareheads Master* and *Aquila*, blended initially for use in richer soils, performed well but would have produced a taller and more even crop without the presence of *Aquila*. A blend of over 75 older wheat varieties including c. 20% *Squareheads Master* also produced a good quality sample but would probably produce a higher yield and more even crop if the shortest 25% of varieties in this blend were eliminated – this will probably occur naturally over subsequent seasons.

The pure spelt and spelt + emmer blends both produced good quality samples of sufficient length, but the emmer accession grown produces very long straw that is more prone to lodging than spelt and ripens considerably later, and should be grown as a pure crop in order to assess its suitability for thatching. Emmer can also be grown as a spring crop, and experimental plantings in Berkshire in 1998-2001 suggest it may provide another spring option for straw growers.

c. Long-stemmed varieties

Rivet wheat was grown throughout most of the UK in the medieval period but fell out of favour in the mid-late 19th century. It yields very well on heavy soils, but ripens two or three weeks later than most bread wheats which makes it less suitable for growing in areas with high rainfall such as Wales. It produces thick-walled straw well suited for thatching, but its straw can often be too long for many thatchers who are used to working with straw less than 100 cm in length.

Triticale was not widely used for thatching until the early-mid 1990's, but now provides perhaps half of all of the thatching straw used in the UK. Its rapid rise in popularity is not related to its performance on roofs, but rather to the fact that it is less challenging to grow, can be grown on the same field with artificial inputs year after year, and is reliably long and easy to thatch with. *Triticale* is a cross between rye and durum wheat, and like rye produces relatively soft straw compared with good quality bread wheat. No scientific research has been done to assess the relative performance of *triticale* and wheat straw, but most experienced thatchers will choose to thatch with bread wheat given the choice. Most older *Triticale* varieties easily produce straw long enough to be used as thatch, and most are also suited for growing in Welsh conditions. As with all of the older wheat varieties,

however, the most suitable for thatching are 'unlisted' and cannot legally be acquired by a new grower because of the strictures of the 'National List of Permitted Varieties'. The older variety 'Purdy' is probably the most popular variety of *Triticale* grown at the present time.

Rye produces tall, and relatively soft and flexible straw ideal for use on ridges but too soft for main coat thatching. Historically, it was grown and used in areas (including much of Wales) that were considered unsuitable for growing wheat.

3. Production issues

Growing high quality thatching straw requires more than a simple change of variety, and many growers who have made the switch believing that easy profits could be attained with little additional effort have been sadly disappointed. This project has highlighted many of the key challenges facing new growers.

a. Climate, weather and planting time

It is essential that the previous year's stubbles are worked down well, and that the soil is prepared for planting as early in the autumn as possible. Seed should be drilled (or broadcast if there is no other option) by the middle of October in order to guarantee a good crop with a well developed root system, particularly in organic conditions. If conditions are good, however, seed should be planted in late September or early October for suitable conditions cannot be guaranteed to re-occur in October or November. Older wheat varieties require a long period of exposure to cold (vernalisation) in order to produce grain-bearing stems, but all of the wheats used in the 2004/05 trials will produce straw from a mid-late December planting.

b. Soil, nitrogen and lodging

All of the varieties planted grew well in the moderately heavy clay-loam soil at Gwernyfed Farm. Heavy clay retains moisture and nutrients, and older thatching varieties will produce very tall stems and lodge (fall over) if they are grown on moist, heavy clay with even moderate amounts of nitrogen – whether this is derived from farmyard manure, green manure, ploughed in lea or artificial fertilisers. Taller, older varieties must be grown in low nitrogen conditions to prevent the crop from lodging, whereas shorter varieties (or varietal mixtures containing shorter varieties) *require* a little more nitrogen to produce a healthy crop. Although most of the bread wheat plots suffered some degree of lodging, this was not a major problem and did not significantly reduce the efficiency of the reaper binder at harvest time. Spelt wheat was particularly resistant to lodging in this year's trials. Lodging was most acute in the fine-stemmed spring wheat mixture, but this mix is unlikely to tiller so profusely and lodge from a spring planting.

c. Harvest, storage and processing

Wheat grain is normally harvested when it is 'dead ripe' in order to prevent spoilage in storage. Thatching straw, however, must be harvested before the crop is fully ripened and while there is still a little green tissue visible on the stem. This is inevitably done using a reaper binder, and sheaves are then stooked in the field and left to dry for two or three weeks (until the straw and weeds cut with it) is dry. The grain ripens normally in the husk and usually suffers no reduction in quality.

The crop is then carted from the field and either stored in a thatched rick or indoors for several months to mature before it is 'combed' to remove the grain and short and broken stems to produce 'combed wheat reed' for thatching.

Challenges can obviously occur at each of these steps. If the harvest is delayed by only a few days in hot, dry weather, the straw will ripen fully and become brittle and thus be of little value for thatching. Unexpected delay can be caused by breakdown of machinery (eg. a tear in the canvas belt of a reaper binder). Reaper binders are not rare but they are not common, and although spare parts can normally be obtained, it is essential that the reaper is in good condition prior to harvest and that the operator is experienced and familiar with the machinery used.

Depending on how many green weeds have been bound into the sheaf, it is often better to allow a crop to stook for only a week or 10 days in dry weather rather than 3-4 weeks of wet weather. Although persistent rain will cause the grain to sprout and discolour the straw, rain usually dries fairly quickly and moderate rain will not damage the crop. It is the moisture within plant stems (esp. weeds) and grain that will encourage mould, discolour the straw and ruin the grain. A crop that appears very dry will still lose a great deal of moisture in storage indoors or in a rick. Straw that has been stored in a well-thatched rick will always be easier to comb and will produce a higher quality sample of both straw and grain.

Perhaps the greatest challenge facing a new straw producer in Wales is the almost total absence of combing equipment. Traditionally, the thatching straw used in Wales, like that of the West Country, was lashed against a trestle or heavy object and combed by hand to remove weeds and short stems. Since the early 1900's straw has been combed mechanically using a purpose-built 'combing box' that sits over the drum of a threshing machine. This equipment requires a gang of c. 8 people to operate, but a great deal of straw can also be combed in one day with an experienced team. It may not be feasible to hire a contract comber to process less than 10 acres (= c. 12 tons of straw) on a farm in Powys (depending on distance), but it may well be feasible to transport the crop to a contractor. 'Long straw' thatch is produced by running the grain-bearing straw directly through the drum of threshing machine rather than through a 'combing' box. This strips the grain and lightly crushes the straw. Unfortunately, long straw style thatching is in rapid decline and 'long straw' is not well suited for use on roofs in high rainfall areas such as Wales.

Small scale machinery could easily be constructed that would allow producers to comb their own straw efficiently and profitably. At least 10% of UK straw is now 'combed' in Poland using converted washing machines with drums fitted with combing pegs.

d. Yield

No comparative calculations were made of straw and grain yields of the individual plots grown in 2004-05 due to the damage caused by sheep and rats. However, it is highly likely, based on field observations, that most of the suitable thatch varieties yielded c. 1.0-1.2 tons of combed straw per acre and an equivalent amount of grain. Both the yield and quality of the straw were comparable with samples obtained from professional straw growers in the West Country.

e. Marketing

All of the straw grown in 2004/05 could easily have been sold for c. £ 650-700/ton as combed wheat reed. Master Thatcher Alan Jones collected several sheaves of

wheat from the experimental field prior to the main harvest for demonstration purposes, and offered to purchase the entire crop in spite of the varietal variation in stem length. Unfortunately, the crop was damaged by sheep in the stook and was stored in less than optimal conditions after harvest, and it was decided not to allow any of the experimental straw to be used for commercial purposes. There is clearly a demand for good quality thatching straw in Wales and adjacent English counties, and Welsh museums and home owners would almost certainly purchase high quality Welsh straw if it was available.

4. Conclusions and recommendations

1. There is a clear and steady demand in Wales for good quality 'combed wheat reed' thatch grown in Wales.
2. Most of the wheat varieties currently being grown in England for thatch also grow well in Powys and will probably perform adequately in other parts of Wales.
3. The main obstacle preventing an expansion of this sector is the lack of traditional 'thresher/combers' or alternative, small-scale, equipment similar (and ideally safer) to that being used in other parts of Europe. Relatively little funding would be required to construct an efficient small-scale comber using existing designs.
4. Field scale trials of a small selection of the varieties grown in 2004/05 would provide a more reliable 'recommended list' for potential growers.

5. Bibliography

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