To bale – or not to bale?

How will you account for the rising value of nutrients tied up in straw when deciding whether to bale or incorporate? CPM investigates.

By Charles Abel

With fertiliser costs having leaped as much as five-fold since last season, growers should have a fresh think about when to bale their straw and when to incorporate.

Although incorporation has its downsides — for example, the cost of running a straw chopper together with the extra cultivation hassles; additional autumn nitrogen demand and greater slug, weed and disease risks — can you really afford to send nutrients worth up to £50/ha off down the road?

Data from the British Hay and Straw Merchants Association (BHSMA) shows merchants were paying £35-48/t for wheat straw and £45-63/t for barley straw ex-farm this spring. That’s equivalent to £175-315/ha for a cereal crop yielding 5t/ha of straw.

“There was a lot of debate last year about the nutrient value of straw and how it should be reflected in the prices,” says the BHSMA’s Jane Lawman. “But the difficult harvest was the main reason people ended up paying more.”

**Obvious advantage**

Three years ago, wheat straw was worth just £20-35/t (equivalent to £100-175/ha for a 5t/ha straw crop) so when the nutrient value of the straw was worth just £12/ha, the potential for profit from baling was obvious.

But now the nutrient value is worth up to £50/ha, the balance is less clear — particularly when the various agronomic and management factors are taken into account.

Yet the BHSMA claims baling is still profitable even with today’s higher P and K costs. Indeed, it points to nutrient data produced from the Elean straw-fired power station at Sutton in Cambs, where 200,000t of straw taken from across Eastern England averaged just 5.8kg/t potash (K₂O) and 0.5kg/t phosphate (P₂O₅).

Even at current fertiliser prices, that equates to a value of just £5 per tonne of straw, or £25/ha for a large wheat crop.

Incorporation carries significant costs too, it notes, and chopping on the combine requires 70-100hp of extra power — adding up to 30%, or £18.75/hr of additional fuel costs. Moreover, chopping can slow the output from the combine by up to 25%, or 10ha/day with new blades costing around £1,000/yr.

**Higher establishment cost**

In addition, the extra cultivation passes needed for incorporation could easily add another £30/ha to the establishment costs for the following crop, according to the BHSMA.

HGCA released new data this spring to help growers calculate the nutrient value of the straw when deciding whether to bale or incorporate, reflecting the soon-to-be-published and revised RB209 fertiliser guide.

“Straw contains significant nutrients, and incorporation helps maintain the soil structure and fertility to benefit long-term productivity,” says HGCA director of research, Prof Graham Jellis. Data on the published information sheet.
Table 1: Nutrients in straw (kg/t of fresh weight)

<table>
<thead>
<tr>
<th>Crop Type</th>
<th>Phosphate $P_2O_5$</th>
<th>Potash $K_2O$</th>
<th>Magnesium $MgO$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter wheat/barley</td>
<td>1.2</td>
<td>9.5</td>
<td>1.3</td>
</tr>
<tr>
<td>Spring wheat/barley</td>
<td>1.5</td>
<td>12.5</td>
<td>1.2</td>
</tr>
<tr>
<td>Oats</td>
<td>1.6</td>
<td>16.7</td>
<td>2.2</td>
</tr>
<tr>
<td>Oilseed rape</td>
<td>2.2</td>
<td>13.0</td>
<td>-</td>
</tr>
<tr>
<td>Rye</td>
<td>2.1</td>
<td>10.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Pea</td>
<td>3.9</td>
<td>20.0</td>
<td>1.7</td>
</tr>
<tr>
<td>Bean</td>
<td>2.5</td>
<td>16.0</td>
<td>1.8</td>
</tr>
<tr>
<td>Linseed</td>
<td>1.6</td>
<td>9.2</td>
<td>-</td>
</tr>
</tbody>
</table>

N.B. If the straw yield is unknown, base the estimate on the grain yield (assuming approximately 0.5t of straw for each tonne of grain in cereals).

Table 2: Nutrient values

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Cost *a (£/t)</th>
<th>Cost *b (£/kg)</th>
<th>Nutrients straw (kg/t)</th>
<th>Value in straw (£/t)</th>
<th>Value in 5t/ha straw crop (£/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triple super phosphate (46% $P_2O_5$)</td>
<td>650</td>
<td>1.41</td>
<td>1.2</td>
<td>1.70</td>
<td>8.50</td>
</tr>
<tr>
<td>Muriate of potash (60% $K_2O$)</td>
<td>550</td>
<td>0.92</td>
<td>9.5</td>
<td>8.74</td>
<td>43.70</td>
</tr>
</tbody>
</table>

*a Example prices only  
*b Divide nutrient price/£ by 10x percentage nutrient content to get cost/£

N.B. Each tonne of grain contains about 7.8kg $P_2O_5$, 5.6kg $K_2O$, and 2.0kg of $MgO$ – so a 10t/ha crop would require over £160/ha of bagged nutrient to replace this offtake.
The extra cultivation passes needed for straw incorporation can add £30/ha to the establishment costs for the following crop, says the British Hay and Straw Merchants Association.

The information sheet shows two ways to calculate the cash value of the nutrients in straw — depending on whether or not the weight of straw removed is known. This data differs significantly from that quoted by the BHSMA.

The aim should be to hold soil P and K indices at mid-2 or above, advises Chris Dawson. “The more you move into index 2-minus, the greater the risk to your business. And bear in mind that a mid-2 is an average for the field, so some areas may be lower — particularly where good yields have increased the level of nutrient off-take. You don’t want those to slip into the deficiency category.

“So bale by all means — straw is an output and farmers need all the income they can get at present — but do recognise that you’re getting rid of something of value. Instead of returning P, K, Mg and organic matter to the soil, you’re obviously removing it.”

Farmers should therefore reinvest some of the revenue from the sale of the straw to replenish those nutrients, he adds.

**‘Real concern’**

“The key is to avoid a loss of index which can impact on crop performance,” he continues. “After several decades of falling P and K inputs, this is now a real concern.” He stresses that it’s essential to use soil analysis to check soil indices, rather than simply assuming they’ll be alright.

The new data assumes wheat and barley straw output equates to 50% of grain yield, rather than 65% as used before. That reflects the adoption of shorter-strawed varieties, PGRs, higher stubble cuts and more aggressive combine threshing.

This change is significant because it means a 10t/ha crop of wheat is now assumed to produce just 5t/ha of straw — not 6.5t/ha as before — so reducing the total quantity of nutrients removed by baling.

Richard Ward, senior sales co-ordinator for Cleveland Potash, encourages farmers to take full account of the value of nutrients in their straw. “Everything has a value these days and farmers have a product in straw that they need to recognise the full value of.”

Jerry McHoul, of nutrient supplier, K&S, agrees: “Some contractors are trying to suggest that a lot of nutrient is washed out of the straw before it’s baled — but a lot of what they’re saying is pretty far fetched.

“It’s true that up to 25% of the potash may be leached out at worst — and that’s after significant rainfall, and leaving the straw in the field for longer than is sensible — but it’s wrong to say that it can all be washed back into the soil, or even half of it.” He adds that phosphate is quite fixed in the straw and won’t reduce much as a result of environmental factors.

So are farmers right to hold out for a higher straw price? “Remember that baling and removing the straw more than doubles the K off-take since more K is present is the straw than in the grain. So the K indices in baled fields tend to run down much faster than chopped fields.”

He notes that organic matter is being removed as well when baling. “A lot of arable soils are hovering around 1-1.5% organic matter and struggling to maintain their structure. Baling only adds to the problem.”

Too few farmers recognise the true value of nutrients tied up in their straw, he continues. “When they hear it can be as much as £50/ha, it comes as quite a shock.” He urges growers to factor the nutrient value into the straw price, and to reinvest in nutrients to replace what’s removed.

“The risk is that you could have index 2+ soils, and if the straw is baled and nutrients aren’t replaced, you could...”

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**Straw — incorporate or sell?**

**Incorporation**

- **Pros**
  - Returns nutrients to soil
  - Saves on labour
  - No wheeling damage from baling/carting
  - Can help cut nitrates losses
  - Adds organic matter and can improve the soil structure

- **Cons**
  - Diesel cost to chop straw
  - No additional income
  - Some soils may not be suited to incorporation
  - Competition with the crop for autumn nitrogen
  - More slugs and diseases

**Bale and remove**

- **Pros**
  - Extra income
  - Following crop establishment potentially easier and faster
  - Reduced slug pressure possible

- **Cons**
  - Significant nutrient removal
  - Income may not cover costs of operations and nutrients removed
  - Costs of baling and carting
  - Late baling/carting delays establishment
  - Soil damage if wet during baling/carting

Source: HGCA
There are plenty of growers who can afford the luxury of taking a P and K holiday on parts of their fields — without compromising yield,” believes Simon Parrington.

- easily drop to 2- after a couple of big cereal crops, and the next crop could push you into a position where limited potash availability causes borderline nitrogen inefficiency and significant yield loss.

“I recently visited a crop of winter malting barley at our long term K depletion trial site in Norfolk which was already showing the effects of inadequate K after a hard winter. Potash had been omitted on an index 1 soil, so it just shows what can happen.”

**Organic matter**

The value of the organic matter (OM) return is also commonly underestimated — especially by min-tillers where the extra OM goes a long way to help maintain the soil structure, he notes. “Magnesium is also relevant on many purely combinable crop farms and its removal should be factored into the cost. We have positive response data for Mg applied to cereals and rape on index 0 and index 1 soils.”

He admits there are occasional opportunities for ‘nutrient holidays’ but only if the right fields, or parts of fields, are targeted. “And this can only happen if the removal of nutrients through baling is taken into account.”

Pinpointing which areas of a farm need nutrient top-ups — and which can afford a nutrient holiday — is a process the Berks-based precision farming firm, SOYL, is championing this spring. Its data shows one-third of UK arable land needs no phosphate fertiliser this year, with one-in-four arable hectares capable of taking a potash holiday.

However, growers need to know which category their individual fields, and parts of fields, fall into — and that in turn could help them decide what to do with their straw.

“The temptation over the past 12 months has been to cut back on P and K as a knee-jerk reaction to prices, which have climbed up to five times their previous levels,” notes SOYL general manager, Simon Parrington. “Our figures show there are plenty of growers out there who can afford the luxury of taking a P and K holiday on parts of some fields — without compromising their yields. But there’s a similar number for whom indices are worryingly low.”

The company’s new ‘Planning with Precision’ programme aims to help growers save on compound fertiliser use without compromising crop yields. More
costly P and K fertilisers mean average savings are up from around £12/ha to £60/ha, he claims.

The company has taken, analysed and mapped soil samples using GPS equipment since 1993, and now has a client base covering over half-a-million hectares. Analysis shows 36% of samples at index 3 or above for P, and 26% of samples at index 3 or higher for K. Conversely, 35% and 22.5% of samples were at index 0 or 1 for P and K respectively.

"Those parts of fields, and some whole fields, will benefit most from P and K levels being restored — either through bagged nutrient alone, or with the inclusion of nutrients from manure and incorporated straw as well." SOYL's data shows 38% of the 21,000+ fields of wheat, barley and oats it has mapped had straw removed last year.

"If you want to save fertiliser sustainably this year, the first step is to carry out some detailed soil sampling of each field," continues Simon Parrington. "That will give you an indication of the variability, and the potential to save." He adds that the practice of taking one sample for each field or soil type belongs in the past and can be "very misleading".

SOYL's service includes GPS soil sampling one-year-in-four, with recommendations created for each year over the four-year life of the maps. Initial sampling, lab costs and maps, four years of advice and support, annual fertiliser plans, application maps and files for a GPS spreader cost £20/ha, or £5.50/ha/yr on SOYL's finance scheme.

But baling decisions don't hinge around nutrient values alone, notes ADAS consultant, Prof Brian Chambers. "It's true that straw is a by-product with a worthwhile value, hence its nutrient value needs to be taken into account. But a bigger issue could be timeliness. The last thing a grower wants in middle of a busy autumn is to be prevented from establishing the next crop because baling isn't complete, or because bales are waiting to be moved, or extra wheeling damage needs addressing. Most arable farmers are happy chopping straw on the combine and incorporating with heavy discs and the like.

"If seedbeds are a bit fluffy, rolling can achieve the consolidation needed to reduce the slug pressure." He believes incorporation doesn't add significantly to the level of weed or disease pressure. "It's a case of horses for courses. Just be sure to factor in the value of the nutrients if you're having the straw baled and removed."

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**More info**

HGCA  
[www.hgca.com](http://www.hgca.com)

Potash Development Association  
[www.pda.org.uk](http://www.pda.org.uk)

Fertiliser Manual (RB209)  

British Hay and Straw Merchants Association  
[www.hay-straw-merchants.co.uk](http://www.hay-straw-merchants.co.uk)

K&S Ltd  
[www.ks-uk reife.co.uk](http://www.ks-uk reife.co.uk)

Cleveland Potash  
[www.clevelandpotash.ltd.uk](http://www.clevelandpotash.ltd.uk)

ADAS  
[www.adas.co.uk](http://www.adas.co.uk)