Assessing the nutrient content of cereal straw

Cereal straw – use, incorporate or sell?
The 1993 ban on burning straw led to a considerable increase in the area of cereal straw which is baled. In recent years, over 60% of wheat and more than 90% of barley straw is estimated to have been baled. In 2007 (latest data), the straw from 75% of the total wheat and barley area was baled, while just 25% was incorporated.

Arable farmers without livestock can either return straw to soil or sell it.

Nutrient content of straw
Straw contains significant amounts of potash, and some phosphate and magnesium. Incorporation helps maintain soil structure and fertility to benefit long-term productivity. If straw is incorporated the nutrients it contains are returned to the soil. In this case only the phosphate, potash and magnesium contained in harvested grain needs replacing.

Each tonne of cereal grain harvested removes about 7.8kg phosphate \((\text{P}_2\text{O}_5)\), 5.6kg potash \((\text{K}_2\text{O})\) and 2.0kg magnesium \((\text{MgO})\).

Where straw is used on the farm where it was grown as feed or bedding for livestock the nutrients in the straw will be in the manure. However, it is advisable to replace the nutrients removed in the straw from the field on which it was grown because the manure is often applied to a different field. Nutrients in manure are a good way of increasing the phosphate, potash and magnesium content of soils that are below the target Index for these nutrients.

Where cereal straw is regularly sold off the farm, the guideline nutrient contents, shown in Tables 2 and 3 (together with those removed in the grain), are used to calculate the replacement dressings. Sample soil every 3–5 years to ensure that it is being maintained at target Index for P and K as shown in RB209.
Calculating nutrient content

There are two ways to calculate the cash value of nutrients and thereby the cost of replacing them with fertilisers. Note that spring cereal straw contains slightly higher levels of phosphate and potash than winter cereal straw.

1) Where weight of straw removed is known, see Table 2.

2) Where weight of straw baled and removed is not known an estimate of the nutrients removed in the straw has to be based on grain yield, see Table 3.

Table 2. Guide to nutrient contents (kg/t) of fresh-weight straw

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Winter wheat/barley straw</th>
<th>Spring wheat/barley straw</th>
<th>Oat straw</th>
<th>Oilsed rape straw</th>
<th>Rye straw</th>
<th>Pea straw/haulm</th>
<th>Bean straw/haulm</th>
<th>Linseed straw</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphate (kg P₂O₅/t)</td>
<td>1.2</td>
<td>1.5</td>
<td>1.6</td>
<td>2.2</td>
<td>2.1*</td>
<td>3.9*</td>
<td>2.5*</td>
<td>1.6*</td>
</tr>
<tr>
<td>Potash (kg K₂O/t)</td>
<td>9.5</td>
<td>12.5</td>
<td>16.7</td>
<td>13.0</td>
<td>10.0*</td>
<td>20.0*</td>
<td>16.0*</td>
<td>9.2*</td>
</tr>
<tr>
<td>Magnesium (kg MgO/t)</td>
<td>1.3*</td>
<td>1.2*</td>
<td>2.2*</td>
<td>n.d.</td>
<td>n.d.</td>
<td>1.7*</td>
<td>1.8*</td>
<td>n.d.</td>
</tr>
</tbody>
</table>

Table 3. Guide to nutrient contents (kg/ha) of wheat and barley straw

<table>
<thead>
<tr>
<th>Nutrients in straw</th>
<th>Winter cereal straw</th>
<th>Spring cereal straw</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphate (kg P₂O₅/ha)</td>
<td>grain yield (t/ha) x 0.6</td>
<td>grain yield (t/ha) x 0.8</td>
</tr>
<tr>
<td>Potash (kg K₂O/ha)</td>
<td>grain yield (t/ha) x 4.8</td>
<td>grain yield (t/ha) x 6.3</td>
</tr>
<tr>
<td>Magnesium (kg MgO/ha)</td>
<td>grain yield (t/ha) x 0.6</td>
<td>grain yield (t/ha) x 0.8</td>
</tr>
</tbody>
</table>

Value of nutrients

Example calculations of value per kg of nutrients in straw, if sold:

Using a single-nutrient fertiliser, eg triple superphosphate (TSP) for P₂O₅ and muriate of potash (MOP) for K₂O, divide the price per tonne by 10 times the percent nutrient content.

- Using TSP (46% P₂O₅) at £650/t: £650/460 = £1.41/kg P₂O₅
- Using MOP (60% K₂O) at £550/t: £550/600 = £0.92/kg K₂O

*Example prices only

Further information

Potash Development Association
http://www.pda.org.uk/

This Information Sheet is based on information provided by Chris Dawson, the Potash Development Association and Johnny Johnston, Rothamsted Research.

The Fertiliser Manual (RB209)
(in the process of revision, 2009)


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Information Sheet 05/Spring 2009

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