

# 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.

**Table 1. Incorporate or sell straw?**

Incorporating straw	Removal and sale of straw
<p><b>Advantages</b></p> <ul style="list-style-type: none"> <li>– Adds organic matter to soil and can help improve structure.</li> <li>– Returns nutrients to soil.</li> <li>– Potential to reduce nitrate loss.</li> <li>– No structural damage to soil from baling and carting in wet conditions.</li> <li>– No delay from baling and carting.</li> <li>– Lower labour requirement, unless baling and carting is by contractor.</li> </ul> <p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>– Extra diesel used to chop straw.</li> <li>– Potential to increase slug and disease problems.</li> <li>– Competition with crop for available soil nitrogen in autumn.</li> <li>– Possible incorporation difficulties on some soil types.</li> <li>– No additional direct income.</li> </ul>	<p><b>Advantages</b></p> <ul style="list-style-type: none"> <li>– Income from straw sale.</li> <li>– Potentially easier and faster establishment of following crop.</li> <li>– Possibly reduced slug problems.</li> </ul> <p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>– Costs of baling and carting, unless purchased by contractor.</li> <li>– Significant nutrient removal from field.</li> <li>– Delays in baling and carting may delay establishment of following crop.</li> <li>– Possible structural damage if soils are wet during baling and carting.</li> <li>– Income from sale of straw may not cover costs of operations and nutrients removed.</li> </ul>

## Key points

### Identify options for straw:

Use on-farm, incorporate or sell.

*Nutrients in straw are especially valuable after 2008 fertiliser price rises.*

### If straw removed:

Nutrients need to be replaced to avoid decline in soil fertility.

*Nutrients removed can be calculated from either tonnage of straw (Table 2) or grain harvested (Table 3).*

### If straw left in field:

Nutrients in straw are returned to soil and need not be replaced.

*Nutrients removed in harvested grain still need to be replaced.*

### If straw sold:

Estimate monetary value of nutrients removed in straw.

**Always consider your local conditions and consult a FACTS-qualified adviser if necessary.**

## 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 ( $P_2O_5$ ), 5.6kg potash ( $K_2O$ ) and 2.0kg magnesium ( $MgO$ ).

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.

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

	Phosphate kg P <sub>2</sub> O <sub>5</sub> /t	Potash kg K <sub>2</sub> O/t	Magnesium kg MgO/t
Winter wheat/barley straw	1.2	9.5	1.3*
Spring wheat/barley straw	1.5	12.5	1.2*
Oat straw	1.6	16.7	2.2*
Oilseed rape straw	2.2	13.0	n.d.
Rye straw	2.1*	10.0*	1.0*
Pea straw/haulm	3.9*	20.0*	1.7*
Bean straw/haulm	2.5*	16.0*	1.8*
Linseed straw	1.6*	9.2*	n.d.

\* best estimates from relatively few samples. n.d. = no data.

Example calculations where weight of straw removed is known:

**5 tonnes of winter cereal straw** can be estimated to contain:

6.0kg P<sub>2</sub>O<sub>5</sub> (5 x 1.2kg P<sub>2</sub>O<sub>5</sub> per tonne)

47.5kg K<sub>2</sub>O (5 x 9.5kg K<sub>2</sub>O per tonne)

6.5kg MgO (5 x 1.3kg MgO per tonne)

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

Nutrients in straw	Winter cereal straw	Spring cereal straw
Phosphate (kg P <sub>2</sub> O <sub>5</sub> /ha)	grain yield (t/ha) x 0.6	grain yield (t/ha) x 0.8
Potash (kg K <sub>2</sub> O/ha)	grain yield (t/ha) x 4.8	grain yield (t/ha) x 6.3
Magnesium(kg MgO/ha)	grain yield (t/ha) x 0.6	grain yield (t/ha) x 0.8

Example calculations where weight of straw removed is not known:

**A hectare of cereal straw from a 6t/ha spring barley crop** is estimated to contain:

4.8kg P<sub>2</sub>O<sub>5</sub>/ha [6 (t/ha) x 0.8]

37.8kg K<sub>2</sub>O/ha [6 (t/ha) x 6.3]

4.8kg MgO/ha [6 (t/ha) x 0.8]

Actual values for specific crops may vary. High rainfall between the onset of senescence and baling may leach some potash from straw.

## 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 P<sub>2</sub>O<sub>5</sub> and muriate of potash (MOP) for K<sub>2</sub>O, divide the price per tonne by 10 times the percent nutrient content.

– using TSP (46% P<sub>2</sub>O<sub>5</sub>) at \*£650/t:  
 $\frac{650}{460} = £1.41/\text{kg P}_2\text{O}_5$ .

– using MOP (60% K<sub>2</sub>O) at \*£550/t:  
 $\frac{550}{600} = £0.92/\text{kg K}_2\text{O}$ .

\* 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)

<http://www.defra.gov.uk/farm/environment/land-manage/nutrient/fert/rb209/index.htm>

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