

Quality compost

Using quality compost to benefit potato crops



WRAP helps individuals,
businesses and local authorities
to reduce waste and recycle
more, making better use of
resources and helping to tackle
climate change.

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What is quality compost?

Compost is a natural product which results from the controlled biological decomposition of biodegradable materials, such as garden and food waste. Compost helps retain moisture in the soil, provides vital, slow release nutrients to crops and can lead to long term yield increases. Importantly, using compost made from recycled resources is sustainable and can increase soil organic matter and water holding capacity. The BSI PAS 100 compost certification scheme provides a baseline quality standard for compost, ensuring that it is consistent, safe and reliable to use. In 2007, the Quality Protocol for Compost (QPC) was launched in England and Wales to provide a clear framework for the production and supply of quality compost. It builds on BSI PAS 100 and clarifies which waste materials can be used in quality compost production, reinforcing traceability throughout the production process by ensuring accurate record keeping. QP compliant compost is classed as a product, not a waste, and therefore does not require an exemption for its use on agricultural land.

Soil organic matter

The importance of soil organic matter

- Organic matter is a key indicator of soil quality. It improves the water-holding capacity of sandy soils and aids drainage in heavy soils. It also makes the cultivation of heavy soils easier. The risk of soil slumping, capping and erosion by water is reduced at higher soil organic matter contents. Maintenance of soil organic matter status is a cross compliance requirement under the Single Farm Payment Scheme, and in England and Wales, maintenance of soil organic matter status is also a component of the Soil Protection Review, which must be updated annually. The soil's biological activity from micro-organisms and fungi through to earthworms is also increased, which helps to maintain soil fertility.
- 30t/ha (which is a typical rate of green compost application that would supply the maximum amount of total manure nitrogen allowed in Nitrate Vulnerable Zones of 250kg/ha) supplies approximately 6t/ha of organic matter.
- A high proportion of this is in a lignified (stabilised) form, so the organic matter in compost is likely to have a longer-lasting beneficial effect in soil than other organic materials, such as solid farm manures and paper crumb.

Regular use of compost will help to maintain and enhance soil organic matter levels and will be of particular value for potatoes grown on lighter soils where irrigation availability is limited.

Supplying nutrients

Compost provides crop available nutrients which can help to build up natural soil fertility and provide savings in the use of inorganic fertilisers. It is a particularly good source of potash so is especially beneficial for root crops such as potatoes, which have a high potash requirement.

How can quality compost benefit potato crops

- Helps to maintain and enhance soil organic matter levels.
- Improves soil water holding capacity and workability.
- Supplies major crop-available nutrients and trace elements.
- Improves crop establishment and yields.

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A flowering field. Supplied by SCRI.

Based on the analysis of a large number of green compost* samples, typical nutrient content data is summarised in the table below. Typical analysis data is also summarised for food included compost*, although it is based on more limited sample numbers. The nutrient content of compost products will vary depending on the feedstocks and treatment process. Compost suppliers will be able to provide specific nutrient content data for their compost.

Typical total nutrient contents (fresh weight basis):

Compost type	Dry matter (%)	Nitrogen (kg/t)		Phosphate (P ₂ O ₅)	Total (kg/t)		
		Total	Readily available		Potash (K ₂ O)	Sulphur (S O ₃)	Magnesium (MgO)
Green	60	7.5	<0.2	3.0	5.5	2.6	3.4
Food included	60	11	0.6	3.8	8.0	3.4	3.4

Nutrient management and compost fertiliser replacement value

Field experimental data indicates that green compost supplies only very small amounts of crop available Nitrogen (N) and that inorganic fertiliser N application rates should not be changed for the next crop grown after the initial compost application. For food included compost, it appears that around 5% of the total N applied is available to the next crop grown (irrespective of application timing). Following the repeated use of green and food included composts, long-term soil N supply will be increased.

Around 50% of the phosphate in compost will be available to the next crop grown, with the remainder being released slowly over the crop rotation. Around 80% of compost potash is in a soluble form and is readily available for crop uptake.

As for other organic materials, allowance must be made for the phosphate (P) & potash (K) supplied by compost applications when calculating inorganic fertiliser requirements (see Defra Fertiliser Recommendations book, RB209 - new version due out this year). At lower soil indices (e.g. P ADAS Index <3, SAC moderate or lower); K ADAS Index <2+, SAC moderate or lower) inorganic fertiliser will also generally need to be applied to support optimum crop needs and quality.

Where the crop potash requirement is > 300kg/ha it is best to apply half of this in the autumn/winter and half in the spring so this may affect the timing of compost applications which will typically supply 150kg/ha of crop available potash. Compost also has a small liming value that can balance the acidifying effects of inorganic fertiliser nitrogen, although the small amount of lime in compost is unlikely to affect scab risk. The sulphur (S) and magnesium (Mg) content of compost will also contribute to the maintenance of soil reserves.

Based on recent fertiliser prices (June 2008) i.e. 110p/kg P₂O₅ and 60p/kg K₂O the typical fertiliser replacement value of green compost is £7-8/tonne and around £10/tonne for food included compost. The price of inorganic fertilisers is likely to remain high for the foreseeable future.



Preparing potato beds. Supplied by ADAS.

Example: Green compost applied at 30t/ha prior to maincrop potatoes, SNS Index 0, P Index 3, K Index 2+

	Nitrogen (N)	Phosphate (P ₂ O ₅)	Potash (K ₂ O)	Financial saving
1. Estimate total nutrients in green compost (kg/t)	7.5	3.0	5.5	
2. Estimate available nutrients in green compost (kg/t)	0	1.5	4.4	
3. Nutrients supplied by 30t/ha compost that are equivalent to inorganic fertiliser (kg/ha)	0	90	165	
4. Value of NPK supply from compost	0	£99	£99	£198/ha
5. Nutrient requirements for potato crop (kg/ha)	200	130	275	
6. Nutrients supplied by 30t/ha compost available for potato crop (kg/ha)	0	45	132	
7. Inorganic fertiliser needed allowing for compost nutrients (stage 5 minus stage 6) kg/ha	200	85	143	
8. Actual saving for potato crop from compost use	0	£50	£80	£130/ha

Assumes P₂O₅ £1.10/kg, K₂O 60p/kg, P availability 50% in first year, K availability 80% in first year.

The evidence: trials of compost on potatoes

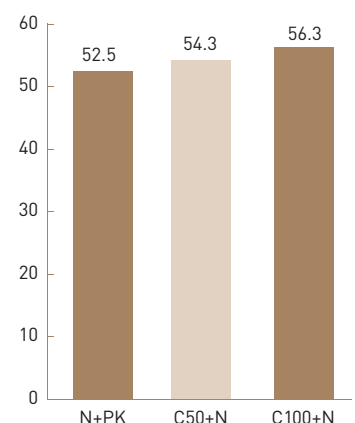
Replicated, long-term field trials, initially funded by landfill tax credits (Shanks First Fund and the British Potato Council) and now by WRAP, were managed by Enviros Consulting Ltd on seven trial fields in Suffolk, Essex and Lincolnshire. The trials demonstrated that annual compost applications at 50t/ha, or 100t/ha every other year, in conjunction with Nitrogen fertiliser, could increase potato yields by 2 to 3t/ha. These effects were evidenced after just 2 or 3 years of compost application and further benefits can be expected with the longer term use of compost, particularly on the lighter soil types, as is currently being investigated this year on two of the sites.

The trial also demonstrated the long-term benefits of compost applications on soil structure and water retention.

Phil Wallace, Technical Director for Enviros, said: "Trials such as these, where compost has been repeatedly applied to the soil since 1999, amply demonstrate how compost can change the structure of soil over time and how this can bring benefits in both dry and wet weather."

The full report on the trials can be found at:
<http://www.compost.me.uk/>

Average potato yields t/ha



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Phil Wallace, Technical Director for Enviro

A potato Nitrogen response experiment was carried out as part of the Composting Research Ltd project (funded by the Waste Recycling Group and administered by Waste Recycling Environmental Ltd). On the sandy textured soil test site at ADAS Gleadthorpe in Nottinghamshire in 2007 food included compost was applied at 30t/ha and compared against no compost and a range of inorganic fertiliser nitrogen application rates. The food included compost had a nitrogen efficiency of 4% of total N applied. The longer term effects of continuing compost application on soil quality and fertility will be assessed at the end of the project in 2009.

Using compost in practice

Where to get hold of compost

There are now over 150 producers on the BSI PAS certification scheme so to find a compost supplier near you please visit www.wrap.org.uk/composting and follow the link to the online compost suppliers' database.

What you need to know before applying compost:

- When using compost, as with other organic material inputs, you must comply with Nitrate Vulnerable Zone (NVZ) rules where relevant (i.e. the field spreading limit of 250kg/ha total N per year, which equates to around 30t/ha for most green composts, and around 20t/ha for typical food included composts). You should also take account of guidance in the Defra Code of Good Agricultural Practice to Protect Water, Soil and Air Quality (England and Wales) or the Prevention of Environmental Pollution from Agricultural Activity (PEPFAA) Code in Scotland. As compost is low in readily available nitrogen it is not subject to closed spreading periods in NVZs.
- An exemption from the Waste Management Licensing Regulations is not needed for BSI PAS 100 certified compost if it also complies with the Quality Protocol. In Scotland, BSI PAS 100 compost is not regarded as a waste and can be used without further regulation in accordance with good agricultural practice.
- In England and Wales when using compost which complies with the Quality Protocol the farmer/land manager is required to provide certain information to the Environment Agency e.g. where the compost was applied, the rate used, date of application and soil analysis. This data is input via the webtool <http://qualitycompost.org>.
- Customer requirements, such as Assured Produce crop protocols, must also be considered.
- Other guidelines for the use of compost in potatoes are currently being considered.
- Composts containing any animal by-products (e.g. catering wastes) are subject to stringent processing requirements and covered by restrictions on use in accordance with the Animal By-Products Regulations (ABPR); this ensures that they are safe and fit for purpose.



Spreading compost.

How to apply compost

It is important that compost is applied evenly and at a known application rate. An adapted manure spreader with a rear discharge can be used. The aim should be to apply evenly with a coefficient of variation (CV) of less than 25%. This should be possible as long as application equipment is well maintained and calibrated. Application rates can be calculated from knowledge of the capacity of the spreader and the number of loads applied per field and the field area. Spreading costs are typically £2-3/tonne.

Compost can be applied at any time of year when soil conditions are suitable, although there are some restrictions on applications of organic manures/composts for certain options in Entry/Higher Level Countryside Stewardship (e.g. no manure/compost allowed on uncropped cultivated 6m margins and no manure/compost allowed on over-wintered stubbles until 15 February).

Further sources of information

For further information about the benefits of quality compost and compost trials visit www.wrap.org.uk/composting

Other useful sites:

- The Association for Organics Recycling
www.organics-recycling.org.uk
- Defra
www.defra.gov.uk
- The Environment Agency
www.environment-agency.gov.uk
- Scottish Environmental Protection Agency
www.sepa.org.uk
- Composting Research Ltd
www.compostresearch.com
- ADAS UK Ltd
www.adas.co.uk
- SAC (Scottish Agricultural College)
www.sac.ac.uk
- Enviros Consulting Ltd
www.enviros.com
- Organic Resource Agency
www.o-r-a.co.uk
- SCRI (Scottish Crop Research Institute)
www.scri.ac.uk
- For more information about Animal By-Products Regulations:
<http://www.defra.gov.uk/animalh/by-prods/default.htm>

* Green compost = garden waste such as grass cuttings, prunings and leaves.
Food included compost = household kitchen waste fit for human consumption.

Copy supplied by ADAS (Brian Chambers, Susie Holmes and Selwyn Richardson), SAC (Audrey Litterick) and with a contribution from Enviros Ltd (Phil Wallace).



Composting in progress.

Based on recent fertiliser prices (June 2008) i.e. 110p/kg P₂O₅ and 60p/kg K₂O) the typical fertiliser replacement value of green compost is £7-8/tonne and around £10/tonne for food included compost. The price of inorganic fertilisers is likely to remain high for the foreseeable future.

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