

CODE OF PRACTICE FOR THE MANAGEMENT OF AGRICULTURAL AND HORTICULTURAL WASTE

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ABOUT THIS CODE

1. This Code describes measures for minimising plant health risks from management of residues and associated waste from commercial handling of certain types of plant produce in Great Britain. It is intended to help farmers, growers, land based contractors, processors, graders, packers and hauliers minimise these risks while following good environmental practice. Adopting these measures will benefit the whole of British agriculture and horticulture as well as the wider environment.
2. This Code applies without prejudice to statutory controls on the management of waste on land, which aim to protect human health and the environment. These controls include Part II of the Environmental Protection Act 1990 and the Environmental (England and Wales) Regulations 2007 . Amongst other things, they provide for the licensing of waste disposal and waste recovery operations (which include the storage and treatment of waste). Advice on current legislative provisions can be obtained from the local office of the appropriate environment agency - the Environment Agency in England and Wales, or the Scottish Environment Protection Agency in Scotland.
3. This Code is voluntary and so has no legal force of its own. It aims to encourage 'best practice' in the disposal of waste from plant produce, and so compliance with it may mean that statutory enforcement action will not become necessary. However, in any legal proceedings relating to waste disposal, some reliance may be placed on this Code as a measure of best practice. This Code does not replace statutory plant health measures under the Plant Health (England) Order 2005, the Plant Health (Scotland) Order 2005 and the Plant Health (Wales) Order 2006

which include:

- **provisions against the spread of quarantine plant pests and pathogens (disease-causing organisms) within the European Community**
- **conditions for the planting, movement and disposal of certain plants and plant products**
- **provision for inspectors to take action to deal with likely or actual outbreaks of quarantine plant pests and pathogens.**

4. Agriculture Departments' inspectors will continue to monitor plant residues and associated wastes. Any finding of quarantine organisms will lead to statutory control action under the appropriate Plant Health Order.

THE NEED FOR THIS CODE

5. International trade together with the processing and preparation for marketing of ornamental, vegetable and fruit produce have greatly increased in recent years. The handling or processing of this material creates a risk that serious pests and pathogens will be introduced or spread within our agricultural or horticultural production systems if the associated soil, liquid waste and plant residues are not handled properly. The main quarantine pests and pathogens of concern, which are known to be transmissible in this sort of material, include potato ring rot and brown rot, potato cyst nematode (PCN), *Liriomyza* leaf miners and Colorado beetle. Those which are soil-borne are particularly liable to spread where soil is returned to agricultural land.

6. Simply disposing of waste to landfill can add significantly to business costs. Government policy is to encourage alternatives to landfill wherever they can provide a safe method of disposal. There are various options for reducing, re-using or recovering this material which, providing they are consistent with good practice for the protection of plant health, can make good business and environmental sense. This Code follows a risk-based approach, identifying methods of dealing with waste according to its potential to spread plant pests and pathogens.

SCOPE

7. The Code applies to all surplus solid and liquid matter derived from the commercial handling of fruit, ornamentals, potatoes, and root and leafy vegetables *except* prepared fruit and vegetable material received in frozen or dried form (as these are unlikely to present plant health risks). The material covered includes:

- soil or other growing media
- wash water
- trimmings and peelings
- outgrades and any other plant debris

8. The measures in this Code are aimed at all stages of the marketing chain prior to retail sale. These include:

- washing, trimming, grading and packing on farm
- washing, trimming, grading and packing for industrial purposes or multiple retail outlets
- factory processing (e.g. preparation for freezing, drying, canning and potato chipping and crisping)

- cooking premises (e.g. for beetroot)
- associated storage and transport operations

ASSESSING THE RISK

9. Risks of spreading plant pests and pathogens vary according to the commodity concerned and its place of origin. Produce brought into Britain generally poses the greatest risk, but it is also possible that harmful organisms of limited distribution in this country could be present in home-grown material. It is not practicable to list all commodities covered by this Code or to assess individually the scale of risk they present. You should therefore carry out a risk assessment for the produce you handle. Alternatively, you could commission an assessment from a suitably qualified person, such as a consultant specialising in measures to prevent the spread and establishment of plant pests and pathogens.

Factors to consider are:

- **Source:** is the produce from abroad or from an area of Britain where a serious pest or pathogen is known, or is likely, to occur? The distribution of plant pests and pathogens is a major consideration when conducting a risk assessment. Many countries maintain up-to-date lists of pests and pathogens occurring in their territories and worldwide distribution maps are available for many serious organisms. These will help to identify whether plant material from a particular source represents a high risk.
- **Crop:** the nature of the commodity will narrow the list of pests and pathogens which need to be considered. Various reference sources are available listing the organisms to which particular crops are susceptible or which they may carry. Pay particular attention to pests and pathogens which are not already established in Britain and assess the risk of their spread and establishment. For example, waste from potatoes imported from countries where potato brown rot or ring rot is present, or from leafy vegetables from areas where Colorado beetle is present, should be assumed to be of greater risk and treated with particular care.
- **Pests/pathogens:** consider the biology of the pests and diseases identified as a possible risk. For instance, some fungal pathogens produce hardy resting spores; some viruses and viroids can be heat-tolerant, and some nematodes produce cysts. All of these can be particularly resistant to treatment and can survive for long periods in soil or other growing media. If introduced into watercourses, the potato brown rot bacterium is capable of infecting *solanaceous* weeds resulting in on-going water contamination and the risk of infecting potato crops through irrigation.
- **Type of waste:** consider the nature of the waste. Of particular concern is waste containing soil or growing medium which could harbour pests and pathogens, not just from the crop itself but also from crops grown in previous rotations. Carrots might, for example, have been grown in soil contaminated with Potato cyst nematode from a previous potato crop.

10. Generally speaking, if the risk of waste you handle is assessed as medium to high in each of the categories at paragraph 9, you should consider it **high risk** and ensure

that it is either disposed of appropriately or properly treated before any re-use (see paragraphs 11, 12 and 13 below). Waste assessed as **low risk** (i.e. the risk in one or more categories at paragraph 9 is assessed as low) does not need to be treated before re-use, but this is always a sensible precaution. These are, however, only general guidelines: actual risks from material you handle can be determined only by specific risk assessments.

Important

If you are in any doubt about the plant health risk of any material you process, seek guidance from your local office of the Fera Plant Health and Seeds Inspectorate (PHSI) or Scottish Government, or from your professional adviser.

MANAGEMENT OPTIONS

11. In accordance with Government policy on waste management, the preferred options for dealing with plant residues, soil, growing media and waste water are: (a) reduction, (b) re-use, (c) recycle, (d) recover, and lastly (e) disposal. In order to ensure that waste is recovered or disposed of without endangering human health or harming the environment, a permit is required by any establishment of undertaking carrying out a waste management activity. Permits are obtained from the Environment Agency. However certain exemptions from the need for a permit for waste recovery operations (or disposal operations at the place of production of the waste) are available. There is a requirement to register to operate under an exemption, again with the Environment Agency, and the amount of information required to register varies depending on the level of risk the activity poses. Full details of the exemptions available and how to register can be found on the Environment Agency website. Examples of relevant available exemptions are those for chipping, shredding, cutting or pulverising of plant waste matter or the exemption for the deposit of plant tissue agricultural waste at the place of production.

(a) Reduction

It is generally good practice to leave as much waste as possible at source. This can be done by:

- cleaning root crops on the farm or, preferably, in the field to minimise the amount of soil adhering to them. When loading potatoes, for example, use a cleaner-loader and return soil to the field of origin
- wherever possible, carrying out trimming and grading operations in the field, leaving the excess behind to be grazed by livestock or ploughed in afterwards. Alternatively, these operations can be carried out elsewhere on the farm and the waste returned to the field of origin. Material should also not be deposited in areas where water run-off to the rest of the field is prevalent, or in areas prone to flooding. **Caution:** this may not be advisable at some times of the year for crops grown in Nitrate Vulnerable Zones (because of risks of nitrate leaching) or those affected by common pests and pathogens such as *Phytophthora*, *Fusarium*, *Verticillium*, *Sclerotinia* or stem and bulb nematode. If in doubt, you are strongly recommended to take professional advice
- specifying low levels of waste in contract conditions of purchase, especially for

imported produce.

(b) Re-use/Recycling

Provided that proper consideration is given to risks of spreading serious plant pests and pathogens and, if appropriate, special treatments are undertaken to eliminate them, you are urged to re-use/recycle surplus material wherever possible. This can be done by:

- recirculating washing water after appropriate treatment (see paragraph 13)
- re-using solid waste for horticultural or agricultural purposes, for example as growing media, mulch, soil improver, green fertiliser or animal feed.

If material has been assessed as low risk it may be suitable for composting, anaerobic digestion or lower temperature aerobic digestion (see paragraph 14 (a) to (c) below) before re-use. Where the risk is high, however, one of the more effective heat treatments specified at paragraph 14 (d) - (f), or higher temperature aerobic digestion (paragraph 14(c)), should be used. If these precautions are not available, or cannot be undertaken cost-effectively, you should consider disposal (see below).

(c) Disposal

Where disposal of **solids** is unavoidable, either because they are of particularly high risk or because there are no cost-effective alternatives, you should consider the following options:

- disposal at a landfill site with an appropriate licence from the relevant environment agency. You should give disposers sufficient information about the waste to ensure that they can treat and dispose of it properly (e.g. high risk soil should be buried at a minimum depth of 2 metres, not used for capping). All waste must be treated before it is sent to a landfill site. Advice on treatment options is available from the Environment Agency.
- disposal in an incinerator permitted under the Pollution Prevention and Control permitting regime.

12. It is very important that high-risk plant waste which is still viable (i.e. capable of re-growth) is adequately heat treated or disposed of by one of these methods. Where, however, they are impractical, especially with regard to operations which generate large quantities of surplus soil (such as potato processing), you should consider recovery to land which presents no significant risk of spreading plant pathogens. Infill on construction sites, landscaping or road embankments is likely generally to be of low risk, although care may be needed where these are close to arable land to avoid contamination and a waste licensing exemption would need to be registered. It may also be possible to use non-arable agricultural or horticultural sites or non-productive land on arable or horticultural premises, providing you consider the risks carefully. **If in any doubt, avoid such sites entirely.** You should note that recovery at these sites of plant waste is subject to statutory waste controls and transport of waste off these sites may also be subject to statutory control (see paragraph 2).

13. Every effort should be made to minimise **liquid** waste and to recycle washing water wherever it is possible to do so. Where disposal is unavoidable:

- under **no** circumstances should untreated liquid waste be disposed of on

arable or horticultural land

- water that has been used for peeling or washing vegetables, including potatoes, **must not** be emptied or allowed to flow into a watercourse (including coastal waters, estuaries, lakes, ponds, rivers, streams, canals, and field ditches) **unless** you have written consent to discharge from the appropriate environment agency (for which a charge will be made). Such water may need to be settled and/or biologically treated to meet the standards set before you can discharge it into a watercourse or public sewer, for which consent to discharge is required from the appropriate environment agency, water service company or water authority. Failure to follow this advice could make the person concerned liable to prosecution under water legislation for causing pollution. Various water treatment measures are outlined in paragraphs 15 – 18.

Note: You have a legal 'duty of care' (along with everyone else who handle waste) to keep such waste secure so it does not spill, or blow away and that you only give it to an authorised person. It is your duty to ensure that the waste goes to a proper site (licensed or exempt), and to give the person a transfer note describing the waste and signed by both of you. You must keep a copy of transfer notes for a minimum of 2 years. Further guidance is available in the Defra publication 'Waste Management, The Duty of Care, A Code of Practice' which is available on the Defra website at:

<http://www.defra.gov.uk/environment/waste/legislation/pdf/waste-man-duty-code.pdf>

Treatment and disinfection procedures

Treatment of solid waste

14. Treatment of solid plant material which exposes it to elevated temperatures can minimise or eliminate the risk of transmitting plant pathogens and pests in re-used plant material.

(a) Composting

This is an aerobic and exothermic process during which the temperature rises above 50°C (and sometimes above 70°C) for several weeks (the thermal inactivation stage which decomposes the material), dropping below 40°C as the decomposition process declines. Composting is not a sterilisation process, however, in well-managed systems it can lead to the eradication of the majority of plant pathogens and pests, as well as a reduction in the volume of plant waste requiring disposal. The success of composting for eradication purposes depends very much on the type pest or pathogen present, the type of system used, the maximum temperature achieved and the duration of this temperature, the number of turnings used to ensure that the whole mass is exposed to this temperature, as well as the water content. The European and Mediterranean Plant Protection Organisation (EPPO) Phytosanitary Procedure 'Guidelines for the management of plant health risks of biowaste of plant origin' (PM 3/66 (2)) advises that the minimum requirement for eliminating most plant pests and pathogens is that during the thermal inactivation phase, the entire mass should be exposed either to a temperature of at least 55°C for a continuous period of 2 weeks or 65°C for a continuous period of one week (or for enclosed systems at least 60°C), with a water content of at least 40%. Some well-managed and monitored composting systems such as those meeting the BSI PAS 100: 2005 standard achieve temperatures of $\geq 65^{\circ}\text{C}$ for seven days with a moisture content of $> 50\%$ and at least two turnings. This would effectively eliminate most harmful pests and pathogens. However, heat-tolerant pests and pathogens can survive these time/temperature

combinations, and so will not be eradicated without an additional heat treatment before or after processing. These are mainly plant pathogens that produce hardy-resting spores (e.g. clubroot – *Plasmodiophora brassica*) and some heat-tolerant viruses and viroids (e.g. *Tobacco mosaic virus*, *Potato spindle tuber viroid*). EPPO recommend that where the waste is known or suspected to contain heat-tolerant pathogens all of the waste should be exposed either before or after processing to 74°C for 4 hours, 80°C for 2 hours or 90°C for 1 hour using wet heat. For the heat treatment to be effective the particle size of the material being treated should preferably not be larger than 12mm and the moisture content must be sufficient to guarantee heat transfer between and inside the particles. Systems that are unmonitored or that are known to work to a lower specification than the minimum recommended by EPPO will help to reduce pests and pathogens, but may not eliminate them entirely. These should therefore be used only for low risk waste.

Many local authorities operate composting schemes and often welcome material of commercial origin to supplement domestic sources. Charges usually compare favourably with landfill (typically around 60% less). Alternatively, you could develop your own scheme, seeking professional advice if necessary. Whatever method of composting is used, it is important that the temperature profile of the composting mass is monitored regularly to ensure that the required operating conditions are met. EPPO recommend that temperatures should be recorded in at least three representative zones of the mass being treated unless technically unfeasible and that during the thermal inactivation stage these records be made at least once every working day. Where an additional heat treatment is used the temperature should be monitored and recorded continuously during that period.

(b) Anaerobic digestion

As there is scant information on the efficacy of anaerobic digestion against plant pests and pathogens, EPPO recommend that any plant material which is processed in this way should be heat-treated either before or after processing to 74°C for 4 hours, 80°C for 2 hours or 90°C for 1 hour using wet heat. Alternatively the digested residue can be subjected to composting.

(c) Aerobic digestion

This allows micro-organisms to oxidise or digest aerobically solid wastes and usually requires the addition or injection of air into the waste. Solids must normally be suspended in water to increase the efficiency of aeration. Aerobic digesters are available commercially as aerated containers, or as lagoons or ditches for holding open bodies of water. The process is more rapid than anaerobic digestion and temperatures in sealed containers may often exceed 50°C, increasing its efficacy. Higher temperatures increase the likelihood of eliminating plant pests and pathogens, although the duration of digestion and the temperatures achieved will depend on the equipment used. You should refer to manufacturers' recommendations. Paragraphs 15 -18 below explain the use of aerobic digestion as a secondary treatment for liquid waste.

(d) Boiling

This will eliminate most plant pests and pathogens from solid waste, providing all material is held at boiling temperature for an appropriate period which is dependent on particle size. Approximate guide times are 10 minutes for suspended solids, 20 minutes for particles up to 2 cm in diameter and 30 minutes for particles up to 10 cm in diameter. Particles larger than this should be broken down or given longer treatment.

(e) Steaming

This is a common method of eliminating plant pests and pathogens from horticultural waste, for example by placing it in a steam-retaining pit and covering it with suitable impervious material. To be effective, the steam should be applied so that all parts of the material reach 80°C for at least one hour.

(f) Dry heat

Pests and pathogens are more difficult to eliminate from dry material. A minimum temperature of 120°C for at least 1 hour will usually eliminate pathogens and pests, provided that you ensure that the whole bulk of material attains this temperature for the full period.

Note: The treatment of plant waste may require a waste management licence or exemption from waste management licensing (paragraph 2). See the Environment Agency's website for further information (www.environment-agency.gov.uk).

Treatment of liquid waste

15. Liquid waste must usually be treated in order to meet discharge consents from the appropriate environment agency or, when discharging to sewer, to meet trade effluent consents from a water company. Discharge consents relate both to the constituents of the effluent and the proportion of suspended solids. Various treatments may be applied to liquid waste and, in general, the greater the number of treatments, the lower the risk.

(a) Primary treatment

This is the removal of suspended solids by screening, sedimentation or simple filtration. It will remove soil and other particulate matter but will not eliminate all plant pathogens. A farm settlement tank or pool could be used for this purpose.

(b) Secondary treatment

This involves biological oxidation by filter beds or oxidation ditch systems (activated sludge). It converts dissolved nutrients into biomass and assists in the further sedimentation of solids. Populations of some micro-organisms can also be reduced by this process. It cannot, however, be relied upon to eliminate pests and pathogens from high risk waste.

16. Solids which have been separated from waste water may be treated using measures outlined in paragraph 14, according to the assessed risk.

17. Where low risk waste is being processed, treated water can be re-circulated or discharged (providing it satisfies the appropriate consents). Where, however, waste has been assessed as high risk, further water treatment is likely to be needed to eliminate any residual harmful organisms. Such treatments include:

- ultra-violet irradiation
- heating
- microfiltration
- ozonation
- disinfection by environmentally acceptable (non-persistent) chemicals

18. The choice of the most appropriate treatment will be determined by the nature of the organism potentially present, the composition of the liquid waste (especially solid and organic matter content) and the volume to be processed. Various mobile or permanent treatment plants are available for on farm use. In circumstances where treated water is unlikely to be returned to the agricultural environment, such as final

discharge to sea outfalls or saline estuaries, such supplementary treatment may not be necessary. Advice should be sought from your local PHSI or Scottish Government and the agency issuing the discharge consent.

Storage and transport

19. You are recommended to carry out the following measures in order to minimise plant health risks:

(a) Handle, store and dispose of your own produce separately from brought-in material and isolate processing lines, storage and waste facilities from any crop areas on the same site. If you cannot avoid mixing the waste from your own produce and brought-in material, you should treat it all as "brought-in" for disposal purposes. In addition, cover all waste that is temporarily stored prior to safe disposal and ensure adequate isolation from all water courses.

(b) Store and transport all waste in closed or covered receptacles or vehicles, and ensure that liquid waste cannot seep into production land, drains or watercourses.

(c) Clean and disinfect all vehicles and equipment used for waste transport regularly. Ideally, this should be after each batch of material of common origin. You may consider sweeping and/or washing down of vehicles and equipment as a practical interim measure prior to disinfection (see paragraph 20).

(d) Any bags or sacks that have been used to remove solid waste should be disposed of with that waste. Bags or containers of waste designed for disposal should also be sealed to prevent the escape of any pests that may be present.

(e) Split containers and spoilt produce which cannot be salvaged should be re-used or disposed of in accordance with the measures and procedures described in paragraphs 11 and 12.

Disinfection of machinery, equipment, vehicles etc

20. Items to be disinfected should first be thoroughly washed or brushed free from soil and debris. You should carry out the whole operation away from production land or (for equipment used on contaminated land) at the point of leaving the affected area. For disinfection of machinery or equipment, use a proprietary disinfectant suitable for the organism(s) potentially present and follow all the manufacturer's label recommendations. You may apply the disinfectant with a hand held knapsack sprayer set to give a coarse spray taking all recommended precautionary measures. Pressure washing with a steam cleaner can also be effective, but must be carried out **thoroughly** to ensure that surfaces reach temperatures sufficient to kill pathogens. Water which has been contaminated with cleaning materials must not be allowed to flow into a watercourse. Specific requirements on disinfection may be imposed by statutory notice issued under plant health legislation where land is known to be contaminated with a quarantine organism.

Additional precautions for growers

21. Good hygiene practices are important to reduce plant health risks. Growers should always be alert to the risk of spread of plant pests, for example through soil on shared machinery, other equipment (including hand tools, footwear and clothing) or vehicles. These should be washed and disinfected as appropriate when moving between production sites.

22. Farmers apply sewage sludge to agricultural land as a relatively cheap form of fertiliser and for its organic matter. It is believed that sewage treatment processes are generally effective in eliminating harmful plant pests or pathogens present in the raw material, although in some situations further precautions are required. For example, potato cyst nematodes are known to survive sewage treatment and so treated sludge should not be applied to land used for potato production. If you supply or spread sludge on agricultural land you must meet the requirements of the Sludge (Use in Agriculture) Regulations. The Code of Practice for Agricultural Use of Sewage Sludge provides detailed guidance and includes a specific recommendation against applying sludge to land in which transplanting crops such as seed potatoes or basic nursery stock are grown. The code is available at:

www.defra.gov.uk/environment/water/quality/sewage/sludge/index.htm

Notification of known or suspected problems

23. You are reminded that there is a statutory obligation under Plant Health legislation to notify Agriculture Departments of the known or suspected presence of any quarantine pest or harmful organism not normally found in Great Britain.

Any suspicions or concerns about the plant health status of any plant material should be reported as soon as possible to your local PHSI office (in England and Wales) or Scottish Government (in Scotland).

Further information

24. If you need further information or advice on the operation of this Code, please contact:

In **England and Wales**, your Fera local PHSI office (details of which are available on the Fera website at: www.fera.defra.gov.uk/contactUs/contactPlh.cfm, or the PHSI office at York:

Tel: 01904 465625

Fax: 01904 465628

Email: planthealth.info@fera.gsi.gov.uk

Websites:

England: www.fera.defra.gov.uk/plants/

Wales: <http://new.wales.gov.uk/topics/environmentcountryside/?lang=en>

In **Scotland** your local Scottish Government (details of which are available on the SERD website at: <http://www.scotland.gov.uk/Topics/Agriculture/Aocontacts/contacts>), or the Scottish Government Rural Payments and Inspectors Directorate (SGRPID), Edinburgh:

Tel: 0131 2446345/6351

Fax: 0131 2446509/6539

Email: plant.health@scotland.gsi.gov.uk

Website: www.scotland.gov.uk

25. For further information on water discharge consents and waste regulations, please contact your local environment agency office (details of which are available on the Environment Agency website at:

www.environment-agency.gov.uk/agriculturalwaste

Helpline: 0845 6033113

26. In Scotland, further information can be obtained from the Scottish Environment Protection Agency (SEPA). Contact details are available from SEPA's website at:

<http://www.sepa.org.uk>

27. General guidance on waste issues is contained in Defra Codes of Good Agricultural Practice for the Protection of Soil, Air and Water (these can be viewed online at: www.defra.gov.uk/farm/environment/cogap/index.htm) and, in Scotland, the Scottish Government's Code for the Prevention of Environmental Pollution from Agricultural Activity (this can be viewed online at:

www.scotland.gov.uk/Publications/2005/03/20613/51366).

In particular, the Water and Soil Codes offer advice on applying wastes to land and the Water Code offers advice on storage of liquid wastes and prevention of water pollution. Hard copies of these are obtainable from:

Defra Publications
Admail 6000
London
SE99 7TP
Tel: 08459 556000
Email : defra@cambertown.com

The Welsh Assembly Government
Cathays Park
Cardiff
CF10 3NQ
Tel: 029 2082 3683
Email: assembly-publications@wales.gsi.gov.uk

(In Scotland)
Blackwell's Bookshop
53 South Bridge
Edinburgh
EH1 1YS
Tel: 0131 6228258
Email:
business.edinburgh@blackwell.co.uk