Crop Module: Lettuce (field)

Effective from 1st June 2016 – 31st May 2017: version 3.2 (Crop Risk Category 1)
This crop specific module for field lettuce been written to complement and avoid duplicating the generic principles of the Red Tractor Farm Assurance Fresh Produce Scheme standards. It is advisable to read the Red Tractor Farm Assurance Fresh Produce standards before reading this crop specific module. This module is designed to stimulate thought in the mind of the reader. It contains crop specific guidance and standards, where applicable, in addition to the requirements stated in the generic Fresh Produce standards. Within this module the important requirements outlined in the crop specific standards section will be verified during the Red Tractor Farm Assurance assessment and compliance will form a part of the certification/approval decision.

Disclaimer and trade mark acknowledgement

Although every effort has been made to ensure accuracy, Assured Food Standards does not accept any responsibility for errors and omissions. Trade names are only used in this module where use of that specific product is essential. All such products are annotated® and all trademark rights are hereby acknowledged.

Notes: Pesticide Information

The Red Tractor Fresh Produce team has been working with Fera to provide tailored access to the LIAISON database for all Red Tractor Fresh Produce members. This system allows individual growers access to all information for plant protection products approved for use under the Red Tractor Fresh Produce Scheme.

LIAISON can be accessed under the Produce tab via the “Checkers and Services” page where you will also find a user manual. Searches will be filtered specifically for the crops for which you are registered. Once you have logged onto the site and clicked on the LIAISON hyperlink you will be directed to the LIAISON home screen.

You will need a username and password and these will be sent once you have registered:

http://checkers.redtractor.org.uk/rtassurance/services.eb.

Red Tractor Fresh Produce Guidance Notes on Microbial Routes of Water Contamination

For further guidance on the microbial routes of water contamination including its use, source, storage application timing and method, quality, equipment hygiene, and sampling please refer to the following http://assurance.redtractor.org.uk/contentfiles/Farmers-6541.pdf. From October 2016 this guidance will be upgraded to a Fresh Produce Standards additional bolt on.

General Introduction

Following a systematic approach will help growers identify and manage the risks involved in crop production. This module is based on a typical crop production process and food safety, health & safety, environmental and quality hazards are identified. Appropriate controls may then be established to minimise risk. Food safety and health & safety issues always take precedent over quality and environmental controls. The layout of this module follows the same structure as that used in the Red Tractor Farm Assurance Fresh Produce Standards. The content of the module is reviewed prior to the issue of updated editions. The review process considers both new developments and all relevant technology which has emerged since the last review was completed and which have been found to be both workable by the grower and beneficial to the environment. The aim is to transfer such information and technologies to growers.

Acknowledgements

Red Tractor Farm Assurance Fresh Produce gratefully acknowledges the contribution of all consultees in the preparation of this module particularly members of the British Leafy Salads Association and David Norman of Fresh Produce Consultancy Ltd.

Front cover image credit: David Norman.
None for this crop module

### CROP SPECIFIC STANDARDS

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GUIDANCE

CHOICE OF VARIETY OR ROOTSTOCK AND PLANT HEALTH CERTIFICATION

PLANT PROPAGATION

Producers should satisfy themselves that their transplants are grown in hygienic conditions to ensure that they are planted out in a pest and disease free condition.

Plant raisers should be registered with Fera Plant Health and Seeds Inspectorate under the EU Marketing Scheme. The major plant raisers have also produced and abide by, their own code of practice. The Plant Propagation Material (PPM) Standard.

Growers should be able to produce evidence that any propagated material has been produced within a verifiable production system.

Any chemical control of pests and diseases which can be applied at the propagation stage should be used:

a. to target the problem directly, and

b. to minimise usage in the field at a later date.

Any treatments used should be agreed with the purchaser and accurate records of application should be kept.

Growers must receive records of all pesticide applications to the lettuce plants in the propagation stage.

CHOICE OF VARIETY

Over the last few years the range of lettuce types grown has widened considerably. Most other types of lettuce listed below have shorter growing periods than iceberg lettuces, therefore it is especially important to take particular note of the harvesting intervals required when using pesticides on these faster growing speciality lettuce types. There is now a wide availability of varieties with resistance or tolerance to various pests and diseases. Resistant or tolerant types are available for lettuce root aphid, lettuce currant aphid as well as a range of downy mildew races. Selection of varieties with a good level of resistance or field tolerance to pest and disease is crucial reducing field application of insecticides and fungicides.

All the pesticides referred to in this document have been used safely on speciality lettuces but as new cultivars are constantly being developed and introduced to the market, it is important to test crop protection chemicals on small areas of new cultivars before adopting them for more widespread use - this is especially true of herbicides.

As a general rule, all speciality lettuces require less nitrogen than iceberg. Indeed too much nitrogen can lead to excessive tipburn in the little gem and cos types and lead to loss of colour in the coloured varieties.

Continental/Speciality lettuce

These include Lollo Bionda, Lollo Rossa, Batavia, Red and Green Oak Leaf.

Lollo Rosso will generally have the best colour when produced at the beginning and end of the outdoor season i.e. May and October harvest. In fast growing conditions during higher temperatures and especially if it is given excessive nitrogen, it tends to lose its colour.

One of the main problems with speciality lettuces is “mud splash”. Close plant spacing to ensure good ground cover is worth considering. Ground cover mulches also work well for certain types.

Some growers wash the finished product.

Romaine or cos lettuce

These lettuces have regained considerable popularity over the past few years. The major problem with this type of lettuce is tip burn. The problem is especially severe if the crop has to suffer extremes of wet and/or hot dry weather. The aim should be to ensure an adequate and even supply of water to the crop and to harvest the product before it becomes over mature. Calcium sprays have been tried in an attempt to alleviate the problem, but with very little success. The problem tends to be worse during the summer months. Some of the cultivars which have recently been introduced have improved tolerance to tip burn.

Iceberg and ‘Crisp’ lettuce

Most seed catalogues treat iceberg and crisphead as one and the same. However, in the selection of a crisp variety, consideration should be given to varieties suitable for bagged presentation where the wrapper leaves are kept on.

For iceberg lettuce the outer wrapper leaves are removed and the lettuce wrapped in a polypropylene or polythene film before being vacuum cooled for shipping.

Endive

The escarole or smoothed-leafed endive and the frisee type both require consistent watering otherwise tip burn will become a serious problem. Note endive whilst a member of the compositae family belong to a different
genera, that of Chicorium, species endivia. Rather than to the genera Lactuca, to which the lettuce belong. As such pesticide approvals for lettuce do not cover Endive and only products specifically approved for endive may be used. Endive, Escarole and Raddichio are not specifically covered in this module or in the approved pesticide sections, growers should check on the LIAISON® or CRD websites for current approvals.

**Little Gem**

There are some excellent strains of little gem lettuce available with good disease resistance. A small fast maturing lettuce, little gem is very sensitive to hot, dry conditions and an adequate amount of moisture should be available at all times or tip burn may result.

**Flat or butterhead lettuce**

Although far less widely grown outside than a few years ago, there is still a small market for this type of lettuce. There have been considerable advances in plant breeding over the last few years due to use of this lettuce type under protection and some of the new cultivars of flat lettuce have resistance to most races of downy mildew. The majority of flat lettuce production in the UK is produced under protection.

**Baby leaf lettuce**

Baby leaf lettuce are generally direct drilled at a high density and machine harvested between the cotyledon and eight true leaf stage. As such this type of lettuce now comes under the category “baby leaf”. Please note that for the 2015 cropping season onward a new crop definition category exists for crops grown as “baby leaf” this means that for pesticide authorisations, including EAMUs, a baby-leaf crop will now be defined as the young leaves and petioles of any plants grown for harvest beyond the seedling stage (after true leaves have formed) but before the eight true-leaf stage – in other words, any salad crops harvested before eight true leaves will be classed as baby leaves. That means products that are currently authorised for use in crops such as spinach, lettuce, chard, beet leaves, rocket, lambs lettuce and land cress can no longer be used on these crops when they are grown as baby leaves. They can only be used if the crops are grown and harvested past eight true leaves.

So, search LIAISON® for “baby leaf” approvals for lettuce crops harvested between cotyledon and 8 leaves but search for “lettuce” for crops to be harvested after the 8 leaf stage.

**SITE AND SOIL MANAGEMENT**

**SITE HISTORY**

Field grown lettuce can be grown on a wide variety of soil types. Very heavy soils are best avoided as these present difficulties at both planting and at harvest. Very light soils are best avoided when growing iceberg lettuce. Soils for the production of iceberg and romaine should ideally possess good water retention properties. On very light soils irrigation often has to be applied right up to harvest and this practise can lead to significant increases in tipburn or bacterial head breakdown which can seriously affect the quality of the final product.

Field grown lettuce is planted from February onwards. Early crops planted in February and March are normally covered with fleece or polythene. This covering of early crops provides an ideal opportunity to reduce chemical inputs, especially insecticides. The physical barrier of a covering of fleece or polythene will also help prevent against infestation from insect pests and attack by birds such as pigeons.

Every effort must be made to recover and recycle plastics and fleece materials. If recycling is not possible plastics should be disposed of at a registered landfill site. At the present time recycling facilities for fleece are limited.

**CROP ROTATION**

Crop rotation will help reduce the build-up of pests and diseases. The length of the rotation will depend on several factors such as availability and suitability of site, water resources and management available.

So many factors influence the production of field-grown lettuce that although one year breaks between lettuce crops are generally attainable, the more beneficial longer breaks are not always achievable.

**ENVIRONMENTAL PROTECTION & CONTAMINATION CONTROL**

**THE BASIC APPROACH TO CROP PROTECTION**

**Integrated crop management (ICM)**

ICM involves the production of quality crops with the minimum use of pesticides. To achieve this aim, it is important to monitor crops carefully at every stage of production in order to assess the need for crop protection products, whilst at the same time selecting products which will do least harm to the environment. In order to achieve these aims those responsible for monitoring crops should have a thorough knowledge of crop protection, especially of beneficial insects and the need to protect wildlife.
As field grown lettuces are grown throughout the UK it would be impossible to lay down absolute guidelines for ICM, as these will vary with growing techniques and the particular geographic location. Some growers will find they have greater pest and disease pressure than others do; what is required is an awareness of the conditions prevailing at any one time. These conditions will not just apply to visible pests or disease, but should encompass other factors such as pest and disease forecasting and meteorological conditions.

PLANT PROTECTION PRODUCT CHOICE

Selection of pesticides

Full details of pesticides currently approved for use on lettuce are given on the CRD website www.pesticides.gov.uk or at the LIAISON® website. For crops harvested after the 8 true leaf stage search for “lettuce”, for crops harvested between cotyledon and 8 true leaves then search for “baby leaf”.

Great care should be taken to read the product label. This is particularly important in respect of the number of applications permitted on a crop. The use of water traps and coloured sticky traps is especially useful in helping monitoring not only pests but also predators. The use of disease forecasting systems will help better target fungicides.

Regular inspection of crops is essential. Early treatment with a suitable pesticide can result in early elimination of the pest or disease with the minimum use of pesticide. Established infestations of pests, especially aphids, can often be difficult to deal with and can result in extra pesticide applications.

When selecting a pesticide, consideration should always be given to the effect the product will have on predators. Products such as those based on Bacillus thuringiensis to control caterpillars and pirimicarb to control aphids are examples of products least likely to harm predators.

Mixing of pesticides

Manufacturers list on their label compatible mixtures with other pesticides. These are referred to as approved tank mixtures. Not all mixtures of pesticides a grower may wish to use are so approved. A grower may mix two or more pesticides together without a label recommendation, providing 'no person shall combine or mix for use, two or more anti-cholinesterase compounds unless the approved label of at least one of the pesticides products states that the mixture can be made'.

Harvest intervals

If a product has a “harvest interval” of 14 days this refers to the interval between the times that the crop was sprayed until the time when the product is harvested. Growers are required to adhere strictly to stated intervals. Time of day of pesticide application and the time of day of harvest should be recorded, along with the date of application, especially when using short harvest interval products on fast growing crops.

It is most important that a grower establishes a visual procedure to help identify harvesting intervals within the crop. Some growers prefer coloured markers, other use labels to indicate when a block of crop is clear or the harvest interval. A visual field system often has greater practical value than a record book that may not be seen by everyone involved with the crop. The establishment of a visual system in addition to written records does make everyone aware of harvest intervals and avoids costly mistakes. A positive harvest release system is strongly advised, where harvest crews are not permitted into a particular block of crop for harvest without a specific written instruction from the crop manager.

PEST, DISEASE AND WEED CONTROL

PEST CONTROL

Aphids

A number of aphid species attack lettuce. Aphids can make lettuce totally unmarketable as well as spreading virus diseases. The two most commonly occurring species are the lettuce currant aphid (Nasonovia ribisnigri) and the peach-potato aphid (Myzus persicae). The lettuce root aphid (Pemphigus bursarius) is also a serious pest in some areas. There are now several cultivars of lettuce which offer resistance to the lettuce currant aphid and/or the lettuce root aphid. These cultivars are already widely available for ‘iceberg’ types and some are also now available for other types of lettuce such as romaine, little gem and specialty types.

Cultural control: Removal of infested trash, which might carry aphid infestations, is important. Removal of weeds from within the crop is important, as aphid transfer from weed to crop can be significant. Select varieties resistant to Nasonovia ribisnigri during the months when expected pressure from this aphid is likely to be high.

Chemical control: There are a number of effective materials available for the control of aphids and these can be found on the CRD website or on LIAISON®. It is important to monitor the crop very regularly, as aphid infestations that become established in the lettuce crop are extremely difficult to remove. Care should always be taken to select a pesticide, wherever possible, which will

Examples of products least likely to harm predators include:

- Pirimicarb
- Bacillus thuringiensis
- Nasonovia ribisnigri
- Myzus persicae
- Pemphigus bursarius

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be least harmful to beneficial insects. Complete control of aphids is not possible without the use of insecticidal seed treatments, the actives imidacloprid (approval for Holland application) and thiamethoxam (approval for Holland application only) will give control for at least some of the early life of the crop and should be used during periods of high aphid risk. Use of these seed treatments will reduce the subsequent need for spraying in the field. A number of foliar applied insecticides are available which will need to be applied in the later stages of growth, approved products can be found from the LIAISON® database. The approval of the fully systemic active spirotetramat (Movento) has offered improved control of the lettuce currant aphid. There is need to carefully consider product choice when peach potato aphid is present in the crop as resistance to pirimicarb and pyrethroids is widespread so use of products with alternative modes of action is important.

Lettuce root aphid (*Pemphigus bursarius*)

Lettuce root aphid (LRA) is a difficult pest to control. Conventionally LRA overwinters as eggs on black and Lombardy poplars. In the spring the newly hatched insects live inside characteristic flask-shaped galls on the leaf stalks. They then migrate to their summer hosts, including lettuce, although the timing of the migration varies from year to year it usually starts around mid-June. Lettuces, especially young plants, are vulnerable to attack.

If lettuces are replanted on the same land, wingless aphids from the previous crops may survive in the soil and attack successive crops, although in practice, this is rare.

Cultural control: Serious attacks of LRA generally only occur if enough aphids migrate from poplars and the conditions then favour their development on lettuce. In particular they require dry soil conditions to survive. In many years few aphids survive on poplar, possibly because few eggs were laid the previous year. In other seasons numbers decline rapidly just before migration takes place. Predators (e.g. anthocorids) are often believed to be responsible.

By monitoring poplar trees in May and June for LRA, useful information can be gained about the size and timings of the attacks. A number of aphids closely related to LRA, but which do not attack lettuce, also live on poplars. It is therefore important to identify the species correctly; this is not difficult as each species produces characteristic shaped galls.

Yellow water traps placed in lettuce crops just before emergence is expected to take place provides additional information about how many aphids complete the migration successfully. Although migration can last up to four weeks, the main flight usually lasts between 10-14 days. Irrigation of dry soils is important both before and after migration. It is however, appreciated, that this should fit in with normal commercial practice.

There is a difference in the ability within cultivars to withstand attacks of LRA. These should be fully investigated by the grower. Furthermore, cultivars are available which exhibit a very high tolerance to LRA.

Chemical control: Options for chemical control of this pest have increased since the approval for the use of imidacloprid (Gaucho) as a seed dressing. The active thiamethoxam (Cruiser) applied as a seed treatment also offers good levels of control, but at present both these approvals are only permitted to be applied in Holland. Control of aphids is currently only feasible by seed treatments. Although the fully systemic active spirotetramat (Movento) claims to offer control by foliar spray, but this has yet to be tested under a heavy pressure season.

Not more than one application of imidacloprid treated seed may be sown, nor more than one planting of transplants grown from treated seed made, to any area of soil in any one calendar year. It should be emphasised that the vigour of the seed as well as the quality of the pill containing the seed is important for any insecticide seed treatment. A check may occur during the propagation stage of the treated seed and this check is likely to be more serious if the seed is of poor vigour and/or the pill of poor quality.

Caterpillars

The most damaging and economically important species attacking lettuce is the Silver y moth (*Autographa gamma*). Certain other species attack lettuce, particularly some tortricid moths such as the Fax tortrix moth (*Cneophasia asseclana*).

Cultural control: Very little can be done to control this pest by cultural means. Early crops that are covered with fleece or polythene will give a high degree of protection. Silver Y moths can be successfully monitored with pheromone traps, these give an indication of when large migrations are occurring which help the accurate timing of pesticide applications.

Chemical control: Approved materials can be found on the CRD website or at LIAISON®. It is important to control these pests before they enter the heart of the plant where control is virtually impossible. Although pyrethroids are effective materials when used to control caterpillars, they are very broad spectrum products which kill a wide range of insects, including predators. Materials based on *Bacillus thuringiensis*, or spinosad should also be considered as they are more specific and are less broad-spectrum insecticides.

Cutworm

Cutworms are the caterpillars of noctuid moths, the most common of which is the turnip moth (*Agrotis segetum*). The chemical treatments for surface feeding caterpillars will also control young cutworms at the leaf feeding stage.
**Cultural control:** By applying irrigation, cutworms can be controlled successfully whilst they are in their aerial feeding stage, by the time they are feeding underground though irrigation is ineffective. Irrigation should be timed in conjunction with cutworm warning systems to target the early life cycle of the pest. If the catches are used in conjunction with weather data, control by irrigation or sprays can be timed precisely. HDC provide cutworm warnings to grower members in their weekly pest bulletin service. Keeping the crop and the land before planting free from weeds will help in reducing cutworm attacks.

**Chemical control:** Spray timing for cutworms is critical. Monitoring the arrival and build-up of the turnip moth by the use of pheromone traps is an excellent way of assessing risk. If control by irrigation or rainfall is not possible then all materials recommended for caterpillars will control the larvae of the cutworm when it is feeding on the aerial parts of the plant. Once cutworms enter the soil, no chemical or cultural method of control is effective.

The important aspect of accurate monitoring is that pesticide application can be kept to a minimum.

**Leatherjackets and wireworms**

Occasional damage can occur, especially when infested grassland is brought back into cultivation or around field margins near uncropped areas.

Leatherjackets are the larvae of the crane fly (Tipulidae spp.) whilst wireworms are the larvae of the click beetle (Agriotes spp.).

Although these two pests are quite different in appearance, both attack the roots of the crop and both are often found where grassland, particularly long term grassland or set aside, has recently been ploughed. During the last few years, there has been an increase in the amount of wireworm damage and this may be due to the fact that some of the more persistent materials, which were once recommended for their control, are no longer available, also where previous field grass margins have been incorporated back into cultivation.

Due to the lack of chemicals recommended for the control of wireworms and leatherjackets, it is important that the suggestions made under cultural control are put into practice if serious damage is to be avoided.

**Cultural control:** In the case of wireworm and leatherjackets an effective method of control following long term grassland is to plough up the grassland in February or March, and fallow the land during the summer months. Cropping in the following or subsequent years.

**Chemical control:** At present, there are no chemicals approved for use in lettuce.

**Slugs**

Slugs have become an increasingly important pest of field grown lettuces over the last few years. A succession of mild winters has ensured high survival rates and the straw burning ban has meant that those growers in a cereal rotation face dealing with increasing amounts of trash which also encourages overwintering populations.

**Cultural control:** Removal of infected trash and keeping the crop as free from weeds as possible will help. Where a weedy or wet headland is known to harbour a high slug population, a wide sterile strip between the headland and the first planting should be maintained.

New biological methods of control, using the nematode Phasmarhabditis hermaphrodita are now available for commercial use. Such treatments may also be used in organic systems. Ferric phosphate may now also be used in organic systems, although this use will need to be cleared with the relevant accreditation body before use.

**Chemical control:** Control is best achieved by baiting with slug pellets. Materials based on ferric phosphate or metaldehyde are effective, but from an integrated pest management point of view, pellets based on metaldehyde or ferric phosphate are less harmful to ground beetles than methiocarb used to be, which is why methiocarb has now been banned. Test baiting must be carried out in order to establish population levels and to ascertain whether baiting is necessary. It is especially important to avoid spreading pellets into hedgerows or other conservation areas.

The use of methiocarb pellets has been withdrawn by the EU, the final date for application of methiocarb pellets was 19th September 2015. Rates and total application amounts for metaldehyde have also become more restrictive following the detection of metaldehyde in groundwater. It is very important to check the label of any new stock of slug pellet products as rates of application and total dose limits vary widely with different products. A metaldehyde stewardship scheme has been started to help maintain the use of the important active, it also provides guidelines on individual and total application rates, further details can be found at [http://www.getpelletwise.co.uk/](http://www.getpelletwise.co.uk/).

**DISEASE CONTROL**

**Downy mildew (Bremia lactucae)**

This is a particularly damaging disease of lettuce, especially in the late summer and autumn when conditions are favourable to the spread of the disease. Leaf wetness is necessary for the germination of D.mildew spores. It is characterised by yellow patches on the upper surface of the leaves and the fluffy white spores on the under surface of the leaves.
**Cultural control:** Rapid disposal of trash is particularly important. This prevents transfer of the disease from wind-blown spores. It can also help by preventing the formation of the D.mildew oospores, the resting body of the disease. Cultivars vary in their resistance to Downy mildew. It is important to select cultivars which have resistance to as many races of the disease as possible in order to minimise pesticide inputs. e.g.: BL 1-25. New strains of mildew are frequently being isolated and it is important to check with your agronomist as to the latest situation in respect of resistance to Downy mildew.

**Chemical control:** A multi-site dithiocarbamate fungicide such as mancozeb will offer some protection and provides a good base for a control programme. Combinations of a dithiocarbamate and metalaxyl M will also give some control but resistance to metalaxyl M does exist. Fosetyl-aluminium plus propamocarb hydrochloride can be applied in the propagation stage. Products based on propamocarb hydrochloride, dimethomorph or mandipropamide will also offer control. The strobilurin fungicides pyraclostrobin and azoxystrobin will also offer a degree of control of downy mildew. Computer models are available which assess the risk of downy mildew infection periods in conjunction with weather data. By using these models and identifying high risk infection periods, it is hoped that fungicide timing can be targeted more accurately, and therefore be more effective that the conventional programmed approach.

**Grey mould (Botrytis cinerea)**

*Botrytis* can attack the crop at any stage although it is more prevalent under cool wet conditions which tend to be more regular in the early and late part of the season. The disease can invade as a secondary infection following physical damage, for example transplanting damage or an attack of Rhizoctonia.

**Cultural control:** Damage from Botrytis can be reduced by avoiding deep planting, not planting very large plants, avoiding damaging seedling plants and not overwatering. Rapid destruction of infected trash following crop removal is important.

**Chemical control:** Several fungicides are now available for controlling this disease. Fungicides which offer good control of botrytis include boscalid plus pyraclostrobin, cyproconazole plus flu菌oxoniol and azoxystrobin. Iprodione may also offer some level of control although resistance to iprodione has been detected. In all cases, the disease is best controlled if the fungicide is applied early in the life of the plant.

**Rhizoctonia**

*Rhizoctonia solani* is a soil-borne disease that can be serious in cold, wet conditions. Rhizoctonia is difficult to distinguish from *Botrytis* in the field.

**Cultural control:** The same cultural methods that apply to Botrytis will also help reduce Rhizoctonia.

**Chemical control:** Iprodione will give some suppression of this disease if applied at an early stage. Fungicides based on the strobilurins also offer some control of this disease.

**Sclerotinia (S. sclerotium and S. minor)**

A disease, which is becoming more widespread and that can be a serious problem, especially when warm, damp conditions prevail in the spring and autumn. The fluffy white fungal growth occurs at the base of the lettuce, accompanied by the small black resting sclerotia which are about 0.75 - 1.0cm long. In the more advanced stages of the disease the whole of the base becomes rotten and the plant quickly wilts and dies. The sclerotia can remain dormant in the ground for several years. A new forecasting system has been developed from HDC funded research for predicting the germination of sclerotinia inoculum in the soil and is available to run in the MORPH environment.

**Cultural control:** Avoid fields and adjacent fields that have a history of Sclerotinia. Diseased plant material should ideally be removed from the field although it is appreciated that this is not always practical. Certain other crops such as carrots, celery, dwarf beans, peas and beans are also affected by S. sclerotiorum and these are best avoided in the lettuce rotation, as are fields which have recently grown oil seed rape.

**Chemical control:** Iprodione will have some effect on Sclerotinia although the degree of control of Sclerotinia is extremely variable. However, fungicides based on boscalid plus pyraclostrobin and cyproconazole plus flu菌oxoniol give improved control of sclerotinia. More work is needed to determine the optimum time as to when the product should be applied, in order to obtain maximum suppression of the disease. *Sclerotinia* is often particularly serious when the crop is grown under covers as the protected environment often encourages the germination of the sclerotia. An early application of strobilurin fungicides is necessary to obtain the maximum degree of control.

**Note on the use of strobilurin based fungicides.** At present, products based on strobilurin based fungicides are effective. However, over-use will inevitably lead to resistance. It would be sensible to apply no more than two applications of any strobilurin based fungicide to any one crop of lettuce.
**Beet western yellow virus (BWYV)**

This virus disease causes interveinal yellowing and is sometimes confused with magnesium deficiency. Aphids spread the virus and as the virus is retained by the aphid for long periods widespread and long distance infection can take place.

**Cultural control:** It is important to keep the crop as free from weeds as possible and in particular, to keep the crop free of weeds which are a host to the disease such as shepherd’s purse and groundsel.

**Chemical control:** Efficient control of aphids should be maintained. Currently spirotetramat offers probably the most effective foliar systemic spray, however insecticides from other groups including pymetrozine, acetaprimid and pirimicarb may be used in rotation to help resistance management. Check the CRD website or LIAISON® for currently approved products. Insecticidal seed treatments offer a good level of control for this problem.

**Butt rot (Bacterial)**

A sudden collapse of the plant may well be due to butt rot. However, the disease is not always easy to identify, as there are many other diseases that can affect the base of the plant.

**Cultural control:** Removal of trash after harvest may help to prevent carryover of the disease. Preventing over-watering is the other factor that will help reduce the incidence of disease.

**Chemical control:** There are no chemical control measures as the main cause, (Erwinia spp.), are bacteria and no effective materials have been found for their control in lettuce.

**Ringspot (Microdochium panattonianum)**

This disease is sometimes referred to as anthracnose or lettuce shot-hole disease. It can occasionally be serious, especially on little gem and cos-type lettuces. Plants exhibit small sunken brown spots on the leaves and midribs once fully developed the centres can form holes, which can occasionally be mistaken for slug grazing. The disease is particularly bad in wet, mild seasons.

**Cultural control:** As the fungus is carried on plant debris, crop hygiene is extremely important and it is imperative that infected debris is removed as soon as possible.

**Chemical control:** Although not specifically recommended for the control of Ringspot, fungicides based on strobilurins have been shown to give some control of this disease. Scotts Octave®, which contains prochloraz, has an EAMU approval for lettuce and can also give some control. A recent HDC trial suggests that fungicides based on boscalid and pyraclostrobin give good levels of control. This research also confirms that strobilurin based fungicides have a good effect on this disease.

**Big vein**

Big vein is a widespread virus disease of lettuce, which is carried by the soil borne fungus, *Olpidium brassicae*. The problem is often most evident in early and late season lettuce, i.e. when the temperature is cooler.

**Cultural control:** Scrupulous hygiene is required of the propagator as the disease can be transmitted in soil attached to transplant trays. All trays used to propagate lettuce plants should be cleaned of soil and washed with a proprietary disinfectant before re-seeding. Trays containing lettuce plants should not be placed directly on to bare soil, they should be placed on a concrete floor or the soil should be covered e.g. by clean mypex. If the disease is identified in a particular field, great care should be exercised in order to prevent big vein spreading to other fields. Thorough removal of soil from tractor and trailers working in contaminated fields will help prevent transfer of the disease, although there is no guarantee that this will be 100% effective. Resting spores of *Olpidium* can persist in the ground for many years. Rotation is also very important, as successional lettuce crops grown in a field which has a history of big vein, will exhibit increasingly severe symptoms of the disease.

**Chemical control:** No chemical control is currently available for this disease which emphasises that strict hygiene measures, especially tray disinfection and elimination of soil contamination in the propagation phase, are critical.

**Lettuce mosaic virus (LMV)**

This disease causes crinkling and necrotic spotting of the leaves. Aphids spread the virus, which can initially be seed borne.

**Cultural control:** Virus-tested seed, with under 0.01% infection, should be used. The crop should be kept free of host weeds, especially groundsel.

**Chemical control:** Efficient control of aphids should be maintained. Currently spirotetramat offers probably the most effective foliar systemic spray, however insecticides from other groups including pymetrozine, acetaprimid and pirimicarb may be used in rotation to help resistance management. Check the CRD website or LIAISON® for currently approved products. Insecticidal seed treatments offer a good level of control for this problem, although transmission is in a non-persistant manner so can take place within seconds of an aphid feeding.

**Cucumber Mosaic Virus (CMV)**

This disease causes crinkling and veinal chlorosis, often with vein browning. Symptoms can easily be confused with LMV and so laboratory identification is recommended.
**Cultural Control:** Efficient control of aphids should be maintained. Currently spirotetramat offers probably the most effective foliar systemic spray, however insecticides from other groups including pymetrozine, acetaprim and pirimicarb may be used in rotation to help resistance management. Check the CRD website or LIAISON® for currently approved products. Insecticidal seed treatments offer a good level of control for this problem, although transmission is in a non-persistent manner so can take place within seconds of an aphid feeding.

The virus is hosted by a wide range of weed species and can be spread from them to crops by aphids.

**WEED CONTROL**

Since expiry of the approval the active propachlor, the control of weeds in lettuce has become very much more difficult. None of the currently approved herbicides offer good control of mayweeds or groundsel. For sites badly affected with these weeds mechanical or hand weeding will be needed, such sites should be avoided for early covered crops. There has been significant development in recent years of mechanical hoes which combine GPS and/or vision guidance technology to assist with the removal of weeds both between and in the rows. Most growers now have to combine some form of mechanical weed control with the remaining herbicide options.

It is more difficult to use the full range of herbicides in the faster growing lettuce types such as the speciality types because of harvest interval restrictions. A 42 day harvest interval is just too short in the summer months. Some herbicides also have application date restrictions, such as s-metalochlor which may only be applied between 1st March and 31st May.

Weed control options include propyzamide, chlorpropham and the EAMU for pendimethalin, recently an EAMU has been issued for dimethenamide-P + pendimethalin, the addition of dimethenamide-P offers some control of groundsel, however growers are advised to check on LIAISON® for up to date information.

**APPROVED USES NOT INCLUDED ON THE PRODUCT LABEL**

In many circumstances, particularly for minor crops, product labels do not include all of the approved uses and growers wishing to check the approval notice of a particular product should note that this information is available using the LIAISON® search accessible via their Red Tractor Farm Assurance home page after logging in.

A search on the Extension of Authorisation for Minor Use in the UK (formerly known as ‘SOLAs’) by crop or product name should yield a results page. A click on the product name should link to a summary of the approval information. Near the bottom of the summary is the specific off-label number (e.g. 0246/09) and this link will open up a pdf of the current EAMU document giving details of the extension of use.

For crops harvested after the 8 leaf stage, search for the crop “lettuce”, for crops harvested between the cotyledon and eight true leaf stage search for the crop “baby leaf”.

**NUTRIENT REQUIREMENT**

**Nitrogen**

On the whole, the lettuce crop is not particularly responsive to large quantities of nitrogen. Particular attention should be given to the preceding crop, especially during the warm summer months, when nitrification is at its most efficient.

Excess nitrogen will result in a high nitrate content at harvest. It is very important to avoid high nitrate levels particularly in speciality lettuce, which tend to be harvested when they are less mature than iceberg types. Iceberg lettuce has a higher requirement for nitrogen than most other types.

All applications of phosphate, potash and magnesium must be applied according to the soil sampling and analysis results.

Typical fertiliser recommendations are given in the Appendix.

Soil pH is particularly important as the lettuce crop is sensitive to acidity. Results obtained as a result of a composite sample can be misleading. One of the best methods of checking pH is to use a GPS generated grid and test on a regular grid pattern. GPS waypoints can then be used to direct liming operations. In this way, any acid patches can be identified and spot treated accordingly.

Unless there is a well-defined isolated acid patch, soils are best limed according to their lowest pH. Sampling should be carried out in the spring as on some soils winter rainfall can significantly reduce the pH. Avoid overliming, especially on farms which grow scab sensitive crops such as potatoes, radish and beetroot, as high pH will encourage the development of scab.

When there is a need for lime and magnesium, magnesian limestone should be considered.

**Control of nitrate levels.**

As part of its programme on agricultural contaminants in food, the European Commission put forward proposals for a Commission Regulation specifying maximum limits for the nitrate content of vegetables, including lettuce.

Commission Regulation (EC) No.563/2002 set maximum levels for nitrates. These are summarised in the table on page 11.
The proposals arose as a result of concerns over the possible health effects of high dietary intakes of nitrate, to which vegetables make the single greatest contribution. The limits have been placed on the nitrate content of lettuce and spinach since these crops accumulate greater nitrate concentrations in their leaves than most other vegetables.

The EC’s Scientific Committee reviewed the toxicology of nitrate for Food (SCF) in 1990, as part of the considerations on the use of nitrate as a food additive in the manufacture of certain food products such as ham, bacon and some cheeses. The SCF set an acceptable daily intake (ADI) for nitrates which is rarely, if ever, exceeded by consumers in the UK although this is not the case in some other member states.

<table>
<thead>
<tr>
<th>Product</th>
<th>Harvesting Dates</th>
<th>Maximum Level (mgNO₃/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh lettuce (protected and open grown lettuce listed below)</td>
<td>Harvested 1st October to 31st March and grown under cover.</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>Grown in the open.</td>
<td>3000</td>
</tr>
<tr>
<td></td>
<td>Harvested 1st April to 30th September Lettuce grown under cover Lettuce grown in the open air</td>
<td>4000 3000</td>
</tr>
<tr>
<td>‘Iceberg type’ lettuce</td>
<td>Harvested 1st October to 31st March</td>
<td>2500</td>
</tr>
<tr>
<td></td>
<td>Harvested 1st April to 30th September</td>
<td>2000</td>
</tr>
</tbody>
</table>

An EU Regulation has been agreed at a Standing Committee meeting in Brussels. The Regulation includes the following changes to the current Commission Regulation (EC) 1881/2006:

An increase in the maximum levels for nitrate in fresh spinach to 3,500mg/kg (all year, no seasonal differences);

An increase in the maximum levels for nitrate in fresh lettuce (non-iceberg) to 5,000mg/kg (winter protected); 4,000mg/kg (summer protected); and 3000mg/kg (summer outdoor);

An introduction of a maximum level for nitrate in rocket (rucola) of 6,000mg/kg (summer harvested) and 7000mg/kg (winter harvested);

The discontinuation of the derogation from the maximum levels for certain Member States including the UK, for produce grown and intended for consumption in the respective territories.

There are no changes to current maximum levels for nitrate in preserved, deep-frozen or frozen spinach, fresh lettuce (winter outdoor) or iceberg lettuce.

(Revised) Growers must be aware of current EC legislation with respect to nitrate levels and they must monitor nitrate levels in their lettuce on a regular basis. For sampling, a minimum of 10 units per laboratory sample is required. Samples should be sent to a laboratory participating in FAPAS. The Food Standards Agency recommend that a method based on hot water extraction (BS EN12014-2/1997) should be used.

**TRACE ELEMENTS**

**Manganese**

Some soils, especially those high in pH and/or those with high levels of organic matter, crops can suffer from manganese deficiency. This deficiency often shows in the younger leaves as an inter-veinal chlorosis. The best way to correct a manganese deficiency is by applying manganese sulphate or to use one of the proprietary formulations that are on the market.

**Magnesium**

Magnesium deficiency shows as intervienal yellowing on the older leaves. The symptoms are very similar to western yellows beet virus and so analysis is recommended for confirmation. Foliar sprays of magnesium sulphate will rectify the problem which may also be associated with poor rooting activity caused by waterlogging or compaction. Other trace element deficiencies may show from time to time but all trace element deficiencies should best be identified by tissue analysis.
IRRIGATION

Correct management of irrigation is an integral part of growing outdoor lettuce. When lettuce is grown from blocks or modules, it is essential that rapid establishment is achieved. This invariably means that suitable quantities of water are applied to the crop soon after planting.

Once the crop is established, irrigation requirements will vary according to soil type, crop growth stage and prevailing weather conditions. Deciding on the amount of irrigation and when the irrigation is to be applied is an acquired skill. The use of a spade to determine available moisture is often helpful. However, there are other more scientific methods of determining moisture requirements, such as electrical capacitance devices, neutron probes, tensiometers etc. These instruments are helpful, if only to back up the grower’s own judgement.

Water is a valuable resource and the use of drip or other low level types of irrigation should be considered, especially for crops sensitive to tipburn, where overhead irrigation close to harvest will cause head breakdown.

RESIDUES AND CONTAMINANTS

Red Tractor Farm Assurance Fresh Produce is aware that a key area in the production of fresh produce which requires continued attention by growers and their advisers is that of keeping pesticide residues to a minimum. The issue is not just one of meeting the MRL trading standard but ensuring that any individual or multi residues are kept as low as possible below this level.

The key targets are:

- Optimising the timing of fungicides and insecticides to the edible part of the crop
- Optimising the use of post-harvest treatments
- Ensuring at least the minimum harvest intervals are followed
- Ensuring that application equipment is regularly calibrated and applying products correctly

See the Appendix for the pesticide targets and guidance on this crop.
### APPENDIX 1: FERTILISER REQUIREMENTS FOR OUTDOOR LETTUCE (KG/HA) REF. RB209 8TH EDITION

<table>
<thead>
<tr>
<th>Nutrient (kg/ha)</th>
<th>Soil Index P, K, Mg or SNS level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Nitrogen (N) (1)</td>
<td>200</td>
</tr>
<tr>
<td>Phosphate(P₂O₅) (2)</td>
<td>250</td>
</tr>
<tr>
<td>Potash (K₂O)</td>
<td>250</td>
</tr>
<tr>
<td>Magnesium (as MgO)</td>
<td>150</td>
</tr>
</tbody>
</table>

**Notes:**

1. The recommendations assume overall application, a starter fertiliser containing nitrogen and phosphate may be beneficial even at high N and P indices. Nitrogen levels are based on use by a full iceberg lettuce crop, rates may need to be reduced by up to 50% for baby leaf crops, some speciality/continental and little gem lettuce types and the small framed romaine lettuce types.

2. Even at a P Index of 4 or more up to 60kg/ha of phosphate as a starter fertiliser maybe beneficial. Consideration should be given to possible loss of phosphate from some sites and soils in the context of the Water Framework Directive.

There should be sufficient reserves of phosphate and potash for successional sowings in the same season, in some seasons, additional potash may be required especially following heavy rainfall.

*This table is a general guide for mineral soils only.* Soil mineral nitrogen analysis in the spring between January and March will give a useful guide as to the nitrogen requirement during the season. For more detailed recommendations consult the ‘Fertiliser recommendations RB209’ 8th Edition available from HMSO and published by DEFRA.
APPENDIX 2: REGULATIONS AND GUIDANCE ON LEAF NITRATE CONTENT OF OUTDOOR LETTUCE

An EU Regulation has been agreed at a Standing Committee meeting in Brussels. The new Regulation includes the following changes to the current Commission Regulation (EC) 1881/2006:

An increase in the maximum levels for nitrate in fresh spinach to 3,500mg/kg (all year, no seasonal differences);

An increase in the maximum levels for nitrate in fresh lettuce (non-iceberg) to 5,000mg/kg (winter protected); 4,000mg/kg (summer protected); and 3000mg/kg (summer outdoor);

An introduction of a maximum level for nitrate in rocket (rucola) of 6,000mg/kg (summer harvested) and 7000mg/kg (winter harvested);

The discontinuation of the derogation from the maximum levels for certain Member States including the UK, for produce grown and intended for consumption in the respective territories.

There are no changes to current maximum levels for nitrate in preserved, deep-frozen or frozen spinach, fresh lettuce (winter outdoor) or iceberg lettuce (2,000-2,500mg/kg).

The Regulation will enter into force on the twentieth day following that of its publication in the Official Journal of the European Union. All the changes to the maximum levels will apply from the date of its entry into force except the maximum levels for rocket, which has applied since 1 April 2012.

BACKGROUND

1. Nitrate in food

Nitrate is a natural component of vegetables although the levels present are affected by growing conditions, fertiliser use and plant species/variety. Light is the main influence on nitrate concentrations in plants. Plants take up nitrogen in the form of nitrate and convert it into proteins via amino acids (during photosynthesis). Low light conditions (such as in winter or during cloudy spells in summer) can result in a lower rate of photosynthesis, creating an accumulation of nitrate in the tissues.

Vegetables are the main source of nitrate in the diet and contribute to 70 to 90 per cent of the total nitrate intake. Green leafy vegetables, such as lettuce and spinach, naturally contain higher levels of nitrate than other foods.

Studies of nitrate in food have demonstrated that there can be both beneficial and potentially detrimental health effects. In 1995, the EC Scientific Committee on Food (SCF) agreed to retain its earlier Acceptable Daily Intake (ADI) for the nitrate ion of 3.65mg/kg body weight (equivalent to 219mg/day for a 60kg person).

The UK has carried out annual monitoring for nitrate in lettuce and spinach since 1996. Every Member State is required to monitor and report levels of nitrate in lettuce and spinach as part of a European Commission Regulation.

The levels of nitrate detected in lettuce and spinach do not pose a risk to consumer’s health; all dietary exposure estimates were below the Acceptable Daily Intake (ADI) set by the European Commission’s Scientific Committee for Food (SCF).

2. Monitoring

The UK Monitoring Programme for Nitrate in lettuce and spinach began in May 1996 in accordance with Article 3 of Commission Regulation (EC) No. 194/97. This monitoring continues. The samples are representative of production and geographic distribution of growers in the UK. The programme is supervised by the Food Standard Agency. Samples are taken by Trading Standards Officers and analysed by the appropriate Public Analysts. All the analysts participating in the Monitoring Programme meet the criteria laid down by European Commission paper (doc. VI/4800/96) ‘Guidelines for Laboratories Carrying Out the Determination of Nitrate in lettuce and spinach: EC Monitoring Programme’ and have demonstrated satisfactory performances for nitrate analyses in the Food Analysis Performance Assessment Scheme (FAPAS). Any laboratory providing this service should have specific accreditation for nitrate analysis in leafy salads.

3. Cultural advice to growers

3.1 This cultural advice has been prepared using research knowledge acquired to date including that from other EU Member States particularly the Netherlands. All growers must follow this cultural advice. It is a requirement of the Food Safety Act, the controlling Act for the nitrate regulation that a grower must be able to provide written records that they have complied with this Code and they will be required to provide this for Assured Produce auditors, their customers and Local Authority Food Safety Act inspectors. It will be a legal offence that may lead to prosecution if a grower fails to provide the information required. It is advised growers incorporate this Code under their HACCP programmes to ensure they are complying.
3.2 Light maximisation:
The objective is to maximise light availability. Out-door crops are naturally subject to the "weather". However, growers who use woven or polythene covers in their early plantings (February to May) should make every effort to maximise light availability, due diligence must be used with regard to the gram weight of the cover material used. Due regard must be given to allowing a period of natural light (no covers) prior to harvest. New material must be used where there is doubt as to sufficient light transmission through existing cover material due to soil contamination.

3.3 Nutrition:
3.3.1 Analysis of the soil for nitrate-nitrogen plus ammonium content is a valuable tool and should be used to help estimate the available amount of nitrogen reserves in mineral soils. For most lettuce crops the 0-30cm depth is the most important. This test is best carried out in the spring between January and March. After this time testing may be inaccurate due to the rise in soil temperatures and incorporation of crop debris. For any subsequent crops, the grower should use all the relevant data to ascertain what his nitrate nitrogen levels are i.e.

- amount of fertiliser applied to first or previous crop
- amount of rainfall
- crop off take of Nitrogen
- preceding cropping (particularly the amount of ploughed-in crop debris.).

3.3.2 Timing:
Apply all the Nitrogen required as given in the table above, at or as close to planting time as possible rather than using late top-dressings or side injection.

3.4 Lettuce variety:
Although there is variation in nitrate residues between varieties and types of lettuce no variety offers at present a consistent means of achieving the proposed levels. Some varieties with claims for low nitrate content exhibit other agronomic shortcomings. Some coloured and speciality lettuce types may be more at risk from higher nitrate levels than iceberg types.

3.5 Post-harvest handling:
The interval between harvest and sale should be as short as possible to avoid water loss which would be expected to “concentrate” the nitrate content of the fresh product. An interval of 48 hours should be the targeted maximum.

3.6 Nitrate monitoring samples:
3.6.1 Sampling and analytical procedures are essential elements of due diligence. A competent laboratory using a validated method of analysis should conduct analysis of samples. This would require the laboratory to be accredited by UKAS and participate in FAPAS or similar proficiency testing scheme. For example, laboratories should be able to demonstrate that they achieve a satisfactory performance (i.e. z-scores between +2 and -2) in FAPAS nitrate rounds. Any laboratory testing for nitrate should have specific accreditation for nitrate analysis in leafy salads.

3.6.2 Samples taken immediately prior to harvest for the purposes of monitoring the effectiveness of this code should be taken one per eight hectares of each crop, samples should be an aggregate of at least 10 plants taken by walking a W pattern across the entire sample area. Further samples should be taken if there is a prolonged spell of unseasonably dull weather, since these conditions are likely to result in higher nitrate levels than would usually be expected. This sampling requirement is in addition to any samples demanded by customers or enforcement authorities for their own purposes.

3.7 Records required:
3.7.1 The following records must be kept for all crops, and retained for 2 years.

a. Soil analysis results, date and location.

b. Date of nitrogen fertiliser applications per crop, to include base and any supplementary feed. The results of tissue testing, or any other such test, if carried out, before the application of a liquid feed. The type and total nitrogen content of fertiliser should be recorded together with application rate.

c. Date of any previous application of organic manure or soil conditioner with an estimate of total nitrogen applied.

d. Date of planting and variety together with date of harvest.

e. Previous crops grown.

3.7.2 In addition, the following records must be kept for crops being sampled, and analysis results retained for 2 years:

a. Date and time of taking plant samples.

b. Weather conditions on days prior to taking of samples.

c. Results of sample analysis certificate and name of laboratory/analyst performing the analysis.

3.7.3 The grower should keep all these results and a copy supplied to, and kept for reference by, the grower’s marketing organisation if one is being used. They will be made available to any authorised person, e.g. enforcement officers, on request.

4. Status of this code
The National Farmers Union in consultation with Defra and others, originally prepared this Code of Good Practice. It was revised in 2012 by Red Tractor Fresh Produce for the Red Tractor Assurance scheme.
APPENDIX 3: GUIDELINES ON MINIMISING PESTICIDE RESIDUES

These guidelines have been produced after consultation between crop stakeholders and the Assured Produce crop author. They will be developed over the coming seasons as knowledge on minimising residues develops. Growers should consult with their crop protection adviser to ensure other best practices are not compromised before considering these guidelines. The table below lists the active ingredients that may give rise to crop residues and details potential alternative strategies.

<table>
<thead>
<tr>
<th>Active ingredient</th>
<th>Target: pest, weed, disease</th>
<th>Current position</th>
<th>Suggested guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>lambda-cyhalothrin</td>
<td>Caterpillar</td>
<td>7 days</td>
<td>Increase to 10 days self-imposed harvest interval</td>
</tr>
<tr>
<td>dithiocarbamates</td>
<td>downy mildew</td>
<td>14-28 day harvest interval</td>
<td>Use a maximum of 2.0 kg/ha straight mancozeb (Karamate). No more than two applications per crop. No more than three applications of products containing dithiocarbamates</td>
</tr>
<tr>
<td>iprodione</td>
<td>Botrytis/Sclerotinia</td>
<td>21 day harvest interval</td>
<td>Use within 21 days of planting</td>
</tr>
<tr>
<td>cyprodinil &amp; fludioxonil</td>
<td>Botrytis/Sclerotinia</td>
<td>7 days harvest interval</td>
<td>Use within 28 days of planting</td>
</tr>
<tr>
<td>boscalid &amp; pyraclostrobin</td>
<td>Botrytis/Sclerotinia</td>
<td>14 day harvest interval</td>
<td>Use within 28 days of planting</td>
</tr>
<tr>
<td>propamocarb hydrochloride</td>
<td>downy mildew</td>
<td>14 day harvest interval</td>
<td>Use within 28 days of planting</td>
</tr>
<tr>
<td>dimethomorph</td>
<td>downy mildew</td>
<td>7 day harvest interval</td>
<td>Increase to 10 days self-imposed harvest interval</td>
</tr>
<tr>
<td>mandipropamid</td>
<td>downy mildew</td>
<td>7 day harvest interval</td>
<td>Increase to 10 days self-imposed harvest interval</td>
</tr>
</tbody>
</table>

* Ensure any guidance given to use within a certain number of days of planting allows at least the minimum harvest interval, especially during summer months and on fast growing lettuce types such as continental/specialty/little gem types.
Certification Bodies

Your routine point of contact with the Scheme is through your Certification Body. Certification Bodies are licensed by Red Tractor to manage membership applications and to carry out assessment and certification against the Standards. The table below shows which Certification Bodies apply to each enterprise.

<table>
<thead>
<tr>
<th>Certification Body</th>
<th>Beef and Lamb</th>
<th>Dairy</th>
<th>Combinable Crops and Sugar Beet</th>
<th>Fresh Produce</th>
<th>Pigs</th>
<th>Poultry</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSF</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>SAI Global</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>Acoura</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>NIFCC (Northern Ireland)</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QWFC (Wales)</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NSF Certification
Hanborough Business Park, Long Hanborough, Oxford  OX29 8SJ
Tel: 01993 885739    Email: agriculture@nsf.org    Web: www.nsf-foodeurope.com

SAI Global Assurance Services Ltd
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