Crop Module: Spinach

Effective from 1st June 2016 – 31st May 2017 : version 3.2 (Crop Risk Category 1)
This crop specific module for spinach has 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 David Norman of Fresh Produce Consultancy Ltd.
## ADDITIONAL REQUIREMENTS AGAINST CURRENT STANDARDS

<table>
<thead>
<tr>
<th>STANDARDS</th>
<th>HOW YOU WILL BE MEASURED</th>
<th>RECORDS (to be kept for 2 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA.a Key</td>
<td>The Risk Assessment covers measures to be taken to minimise nitrate content in spinach</td>
<td>Risk Assessment i.e. HACCP</td>
</tr>
<tr>
<td>A Risk Assessment must be carried out for all products from planting through to packing and storage</td>
<td></td>
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</tr>
<tr>
<td>EC.m.6</td>
<td>Records include type and total nitrogen content, application rate and results of any tissue and/or soil testing or similar tests carried out before the application of liquid feed</td>
<td>Fertilisers/ soil improvement product application records</td>
</tr>
<tr>
<td>Records must be kept of all applications of fertilisers/ soil improvement products</td>
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</table>
## CROP SPECIFIC STANDARDS

<table>
<thead>
<tr>
<th>STANDARDS</th>
<th>HOW YOU WILL BE MEASURED</th>
<th>RECORDS (to be kept for 2 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CQ.27.a</td>
<td>Application timing with regards to harvest date</td>
<td>Application dates and harvest dates</td>
</tr>
<tr>
<td><strong>Where slug pellets are used, controls must be in place to prevent them being taken up into the harvester</strong></td>
<td></td>
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</tbody>
</table>

| CQ.27.b   | Testing of the soil is carried out between January and March | Soil analysis results linked to date and location |
| Nitrate levels in the soil must be analysed | The test should be carried out to a depth of between 0 and 30cm | Soil nitrogen reserve estimates |
|           | For crops grown outside January to March nitrogen levels in the soil should be estimated using the following data: | |
|           | - Jan – March test results | |
|           | - amount of fertiliser applied to previous crop | |
|           | - rainfall | |
|           | - crop off take of Nitrogen | |
|           | - preceding cropping (particularly amount of ploughed-in crop debris) | |

| CQ.27.c   | Late top-dressing or side injection is not undertaken | Planting and application dates |
| Nitrogen must not be applied late in the crop life (REVISED) |

| CQ.27.d   | Samples taken immediately prior to harvest | Dates and times when samples taken |
| Nitrate levels in spinach must be monitored | Samples taken from each field | Weather conditions on days prior to sampling |
|           | Samples made up of an aggregate of at least 10 plants by walking a W pattern across the sample area | Test results |
|           | Testing is undertaken at lab which participates in FAPAS | Lab details |
|           | Testing method is based on hot water extraction (BS EN12014-2/1997) | |
|           | Test results are compared to the EU maximum nitrate levels allowed in spinach | |

| CQ.27.e   | Harvest time records compared to dispatch timing records | Harvest records |
| The interval between harvest and dispatch must be no longer than 48 hours in order that water loss does not occur to the extent which concentrates nitrate content | Delivery/ collection records |
GUIDANCE

SITE AND SOIL MANAGEMENT

Rotations

It is important to implement a rotational strategy into spinach production. An ideal rotation would be one year in three. Continuous spinach will lead to a build-up of pests and diseases.

Over-wintered spinach is occasionally grown to enable supplies to be available before spring sown spinach is ready for harvesting. It is important that the over-wintered crop is not placed in close proximity to the spring spinach otherwise cross transfer of disease may take place.

It is important to destroy old spinach crops rapidly and effectively, followed by rapid incorporation of crop debris, in order to avoid a carryover of diseases such as downy mildew.

ENVIRONMENTAL PROTECTION & CONTAMINATION CONTROL

PLANT PROTECTION PRODUCT CHOICE

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. 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 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 for “baby leaf” approvals for spinach crops harvested between cotyledon and 8 leaves but search for “spinach” for crops to be harvested after the 8 leaf stage.

A search on the Extension of Authorisation for minor use in the UK (EAMU’s 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.

PEST, DISEASE AND WEED CONTROL

PEST CONTROL

Aphids

Aphid attacks can occur at any time during the growing season but it is during the summer months that these attacks are likely to be more serious. *Aphis fabae*, the black bean aphid and *Myzus persica*, the peach potato aphid, are the most likely species to be found on spinach.

Cultural control: At the present time there is no successful cultural control of aphids. As with disease minimisation, it is wise not to allow crop residues to linger after harvest.

Chemical control: A number of effective actives are currently approved for baby leaf and spinach as EAMU’s including, spirotetramat, acetaprimid, pymetrozine and pirimicarb. Check on LIAISON for currant approval options for baby leaf or spinach, depending on crop harvest stage. Note that where peach potato aphid is the target there is likely to be resistance to pirimicarb and pyrethroid sprays.

Bean seed fly (*Delia platura*)

This opportunist pest can cause considerable damage to the germinating spinach crop in late May and early June. However, it can be a problem throughout the season.

Cultural control: Attacks from the bean seed fly often follow where crop residues have been incorporated into the soil. The flies are attracted to decaying organic material. Attacks from this pest have increased proportionally with the amount of spinach being grown, and in particular with the lack of crop rotation. It is important not to follow too closely behind an area where crop residues have recently been incorporated.
Chemical control: Seed treatment with 'Force ST', a 200g/l tefluthrin product offers a high degree of control against this pest on baby leaf and spinach crops.

Caterpillars

These are an occasional pest on spinach. Silver Y caterpillars are sometimes a problem. These caterpillars can be monitored successfully using pheromone traps.

Cultural control: There is no cultural control for caterpillars. Covering crops with fine netting will restrict the access of the pest.

Chemical control: Approved formulations of pyrethroid insecticides such as cypermethrin, deltamethrin or lambda-cyhalothrin are effective in controlling caterpillars. Bacillus thuringiensis will also control caterpillars. This material is more specific to caterpillars than pyrethroids and is less harmful to predators, but as it is slow acting it may not always be suitable for a fast growing crop such as spinach. Spinosad offers the benefit of being quicker acting than Bacillus thuringiensis but still has a good environmental profile.

Beet leaf miner (Pegomya hyoscyami)

The larvae of the mangel fly will attack spinach. Although there is a spring hatch, the most serious problem usually occurs in August and September. The fly larvae mines the spinach leaves, often leaving the product unsaleable.

Cultural control: There is no cultural control available.

Chemical control: There are no approved pesticides currently available, spinosad as used for the control of caterpillars may give some incidental control.

Slugs

Slugs are not frequently a problem in spinach production. Late summer drilled crops are the ones most likely to be affected.

Cultural control: Selection of ‘slug free’ fields is important. Infestations can often be determined by test baiting. The disposal of all trash after harvest is important as this avoids a food source for both slugs and snails. This can be achieved most satisfactorily with a crop burner.

Chemical control: Many metaldehyde, and ferric phosphate based slug pellets are approved for use on spinach and baby leaf crops. However, it is rarely necessary to apply an overall treatment. Occasionally, a section of the crop near a grass headland may warrant treatment. However care should be taken to ensure pellets are not taken up into the harvester, so any applications should be early in the crops life.

DISEASE CONTROL

Downy mildew (Peronospora farinosa)

Downy mildew is one of the most serious diseases of spinach. It can spread with devastating speed and can result in complete loss of crop if climatic conditions are favourable to its development.

Plant breeding has provided resistance to a number of strains or races of D.Mildew. At the present time, cultivars that have resistance to races Pfs 1-15 are available. The problem is that D. Mildew is a very diverse pathogen and it is an impossible task for the plant breeder to keep ahead of the diversification of the disease, new races are constantly being identified.

Description: The Americans call spinach downy mildew ‘blue mould’. This is, in fact, quite an accurate description of the disease. Pale yellow blotches appear on the upper surface of the leaf and fluffy grey- blue patches can be found on the under surface of the leaf. The fluffy patches on the underside of the leaf contain the airborne spores of the disease.

Cultural control: Choosing cultivars which have resistance to all known races of downy mildew. Avoiding growing spring spinach next to an over-wintered spinach crop will reduce the chance of disease spread. A well-drained open site is preferred as this is less likely to favour the development and spread of the disease. Avoid over-watering which will create a humid atmosphere and provide conditions which will encourage the development of the disease. Perhaps most important of all is to ensure that as soon as harvesting is completed, the crop debris is removed either by ploughing or burning. Lowering populations can help increase the air movement within the crop and this can help reduce the risk of the rapid spread of the disease.

Chemical control: A range of products with differing modes of action are available to help prevent and control the spread of downy mildew. Check by searching on LIAISON for either “baby leaf” crops or “spinach” crops depending on the number of leaves at harvest, alternate products with differing modes of action to help prevent the build-up of resistance. Seed dressings which contain metalaxyl M help to protect the plant from emergence up to the cotyledon stage against downy mildew.

Seedling diseases

There are a number of soil-borne diseases which affect spinach. Although frequently referred to as ‘damping off’ these include the Pythium and Rhyzoctonia species. In warm, wet soil condition, Fusarium species may also contribute to plant death. It is not always easy to identify soil-borne diseases of spinach and a pathological investigation may well be necessary to pinpoint a particular pathogen. However, a commonality of both
**Pythium and Rhyzoctonia** is that they often occur in wet soils and are usually more widespread where there is a history of spinach growing on the same land.

**Description:** Both *Pythium* and *Rhyzoctonia* can cause collapse and death of the young seedling. *Pythium* is often associated with collapse of the plant at soil level while *Rhyzoctonia* is sometimes indicated by a blackening of the tap root.

**Cultural control:** Choose well drained sites and try to maintain a rotation. Do not over-water during the germination of the crop.

**Chemical control:** Order seed treated with fungicides to help the control of damping off diseases.

### VIRUS CONTROL

**Cucumber mosaic virus (CMV)**

Although only occasionally seen, cucumber mosaic virus is probably the most important virus to affect the spinach crop, especially in seasons where there is high aphid pressure.

**Description:** Yelllowing of the younger leaves and in severe cases plant death may take place. Because the trend is to harvest spinach at a much younger stage of growth, CMV has been seen much less frequently in recent years. The disease is aphid transmitted, especially by *Myzus persicae*.

**Cultural control:** Rapid disposal of trash after harvest is most important. Once a reservoir of infection has established, subsequent eradication of the problem will be difficult.

**Chemical control:** Good aphid control will greatly lessen the chances of the disease being transmitted.

**Leaf Spotting Diseases**

Spinach suffers from several leaf spotting diseases. The most common of these are *Cladosporium* and *Stemphylium*. Also, occasionally observed is *Colletotrichum* (Anthracnose). These leaf spot diseases exhibit certain similarities in appearance and their identification is best confirmed by an experienced agronomist or laboratory diagnosis by a plant pathologist. An explanatory leaflet on these diseases (FV268) is available from the Horticultural Development Council.

**Cultural control:** This is best achieved by good rotation as *Stemphylium* and *Colletotrichum* in particular can survive on spinach debris. A rotation of two years should be observed if either *Stemphylium* or *Cladosporium* has been identified on a previous spinach crop. Recent work indicates that some of these leaf spot diseases are almost certainly seedborne, certain hot water treatments of the spinach can be very effective on treating *Cladosporium* and reducing the levels of *Stemphylium*.

**Chemical control:** Boscalid plus pyraclostrobin offers a good level of control.

### Weed control

Sterilising is sometimes carried out prior to the production of baby and infant spinach, because of the difficulty of obtaining good weed control by conventional methods. Sterilisation is usually carried out using Basamid® (dazomet), Residual pre-emergence herbicides such as lenacil offer reasonable levels of weed control, check for off-label approvals on LIAISON, using the crop definition “baby leaf” or “spinach” depending on harvest stage.

### NUTRITION

Recommendations for the applications of phosphate, potash and magnesium should be based on recent soil analysis, a guide to application rates may be found in the appendix.

**Nitrogen**

Spinach is a fast growing crop and requires adequate supplies of nitrogen. Growers should take into account the amount of residual nitrogen in the soil. This may be considerable say following a leafy crop such as lettuce, especially when combined with high temperatures that will encourage nitrogen mineralisation.

Assessing soil mineral nitrogen is a useful guide to the available soil nitrogen supply. However, analysis has to be undertaken close to drilling as the amount of available nitrogen will depend upon factors like the soil temperature, the moisture content of the soil and the levels of organic matter in the soil.

**Nitrates**

Unfortunately, under conditions of low light levels and slow growing conditions, spinach is particularly prone to accumulating nitrates in the stems and leaves. Because of this growers have to be aware of the EC maximum nitrate levels in spinach that presently exist. For fresh spinach they are as follows:

<table>
<thead>
<tr>
<th>Harvest period</th>
<th>Maximum nitrate content (mg NO₃/kg fresh product)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st October to 31st March</td>
<td>3500</td>
</tr>
<tr>
<td>1st April to 30th September</td>
<td>3500</td>
</tr>
</tbody>
</table>
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.

Growers should monitor the nitrate content of their spinach and information about this and the laboratory used should be available. The frequency of monitoring will depend on the quantity and continuity of the spinach grown. 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.

A project funded by HDC and undertaken by Warwick HRI has demonstrated a suitable method for monitoring nitrate levels at farm level. Details of this may be obtained from the HDC. This method can be used to supplement the monitoring carried out by the grower using accredited laboratories.

A guideline is given in the Industry Code of Practice which is included in the appendix to this document.

Growers have to be able to demonstrate that they follow the Industry Code of Good Practice in order to minimise the nitrate content of spinach grown. A copy of the Industry Code of Good Practice is given in the Appendix.

To minimise the amount of nitrates present in spinach, the NFU, working with DEFRA, LACOTS and Consultants, have prepared an Industry Code of Practice. All spinach growers are required to follow this Code of Practice. It is a requirement of the Food Safety Act, the controlling Act for the contaminants in Food Regulation that a grower is able to provide written records that they have complied with the Code.

Potash and phosphate

The requirements for potash and phosphate are given in the Appendix.

Magnesium

Magnesium deficiency will soon become evident in spinach as a chlorosis following the fine veins in the leaves. In the case of soils deficient in magnesium, a quick release form of magnesium such as kieserite should be incorporated into the seedbed at least three weeks before planting. Foliar sprays of magnesium sulphate are also effective in correcting a slight deficiency. Leaf tissue tests can quickly establish if magnesium leaf levels are low enough to require foliar applications of magnesium. Care has to be taken when applying magnesium sulphate solutions during periods of very hot weather.

IRRIGATION

Spinach prefers growing in warm, moist conditions so the ability to irrigate the crop is essential. Methods of applying irrigation are equally important as the soft, delicate leaves of spinach can be damaged by the use of large droplets from a rain gun. Sprinkler irrigators, either as static lines or mounted on a boom which moves within the crop, are preferred and will generally give better results than a rain gun.

RESIDUES AND CONTAMINANTS

Red Tractor Farm Assurance 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 application 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

Currently there are no particular residue issues associated with this crop but the awareness needs to be maintained for any future issues. For example the pyrethroid insecticides cypermethrin and deltamethrin have been detected in imported crops and care should be taken to try and achieve as long a harvest interval as practicable with these pyrethroids.
APPENDIX 1: FERTILISER REQUIREMENTS

The following recommendations are based on nutritional requirements for nitrogen, phosphate, potash and magnesium for all spinach types.

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Soil P, K, Mg Index or SNS Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>125</td>
</tr>
<tr>
<td>Phosphate(P₂O₅)</td>
<td>250</td>
</tr>
<tr>
<td>Potash (K₂O)</td>
<td>275</td>
</tr>
<tr>
<td>Magnesium (MgO)</td>
<td>150</td>
</tr>
</tbody>
</table>

1 Nitrogen

Top dressing rates will vary between the requirement for a baby leaf crop and that of a mature spinach crop. Baby leaf crops will require less nitrogen than a mature full leaf crop. Baby leaf crops are defined as crops harvested between the cotyledon and 8 true leaf stage.

As a general rule, no more than 100kg/ha N should be applied as a top dressing for the first crop. Subsequent crops may require only half this amount of N. Nitrogen applications for over-wintered spinach should be applied only in the spring. For spring, summer and autumn crops applications should be made as close to the point of crop establishment as possible rather than later, towards the point of harvest.

Soil mineral nitrogen analysis gives a value of the nitrate and ammonium nitrogen in the soil and is an essential guide as to soil available nitrogen for mineral soil types. Testing should be carried out in the spring (January-March) just prior cropping using the top 0-30cm of the soil profile. For later crops the SMN value plus an estimate of SNS from residual fertiliser and crop debris of previous crops should be used to calculate nitrogen requirement, refer to RB209 http://www.defra.gov.uk/publications/files/rb209-fertiliser-manual-110412.pdf section 3.

2 Magnesium

Magnesium should be applied in a readily available form such as kieserite (MgSO₄·H₂O)
APPENDIX 2: INDUSTRY CODE OF GOOD PRACTICE TO MINIMISE NITRATE CONTENT OF UK GROWN SPINACH

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.

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 have 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 Red Tractor Fresh 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. Outdoor crops are naturally subject to the “weather”. However growers who use woven or polythene covers in their early plantings (February to April) 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 an essential tool and should be used to help estimate the available amount of nitrogen reserves in mineral soils. For spinach crops the 0-30cm depth is the most important and it is recommended to use a test to this depth. 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.

a. amount of fertiliser applied to first or previous crop
b. amount of rainfall
c. 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 Spinach variety: Although there is variation in nitrate residues between varieties and types of spinach 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.

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 as one from each sowing date, 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.
- Soil analysis results, date and location.
- 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.
- Date of any previous application of organic manure or soil conditioner with an estimate of total nitrogen applied.
- Date of planting and variety together with date of harvest.
- 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:
- Date and time of taking plant samples.
- Weather conditions on days prior to taking of samples.
- 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 for the Fresh Produce Scheme by Red Tractor Farm Assurance.
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>
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<tr>
<td>NSF</td>
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<tr>
<td>SAI Global</td>
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<tr>
<td>NIFCC (Northern Ireland)</td>
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<tr>
<td>QWFC (Wales)</td>
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</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
PO Box 6236, Milton Keynes  MK1 9ES
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