Red Tractor Assurance *for Farms*

Fresh Produce Scheme





Crop Module: Garlic

Effective 1st September 2015

Red Tractor Assurance

Welcome

This crop specific module for garlic 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://assurance.redtractor.org.uk/rtassurance/services/Registration/members.eb .

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

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Front cover image credit: Glen Allingham Really Garlicky Company.

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ADDITIONAL REQUIREMENTS AGAINST CURRENT STANDARDS

None for this crop module

CROP SPECIFIC STANDARDS

None for this crop module

GUIDANCE

CHOICE OF VARIETY OR ROOTSTOCK AND PLANT HEALTH CERTIFICATION

Varietal yield, quality and storage characteristics should be utilised to optimise the performance of garlic crops.

The need for specific seed applied pesticides should be justified and documented.

As there are no multipliers of garlic at present growers need to keep a nursery stock for future plantings which should be monitored and any diseased or rogue plants should be removed.

SITE AND SOIL MANAGEMENT

SITE HISTORY

Soil type and latitude have a major influence on the production system that can be used and on the quality of resulting bulbs.

The most suitable soil types are sandy loam to sandy clay loam, very fine sandy loam (silts), and some peat based soils.

The crop produces a coarse rooting system and whilst requiring a degree of firmness for good root/soil contact, the soil should be free from compaction and well drained. Irrigation is an essential requirement for production on sand-based soils (excluding silts).

Rotation and crop siting

Rotation has a role in minimising disease problems but may not prevent the build-up of two major soil-borne diseases over the course of time. It is generally accepted that the minimum rotation should be 1 in 4 years and ideally up to 6 years.

Garlic crops should be separated by a minimum distance of 800m from any commercial onion crop. Isolation reduces the spread of wind-dispersed leaf diseases. However, this may only be possible to a limited extent in commercial practice.

Choice of production system

Garlic can be produced in a number of different ways:

i. **Over-wintered**, cloves planted in late September/ October for harvest the following June/July.

ii. **Spring planted** cloves for harvest in July/August.

iii. **Spring drilled** from bulbils for harvest late August/ September. This will produce a single round clove which if planted the following year will develop into a conventional bulb

The choice of cultivar within each section has only a minor influence on disease susceptibility. Leaf diseases are encouraged by increasing population density and by humid conditions. Over-wintering types are the most susceptible to leaf diseases with spring-drilled being the least susceptible. Soil type as well as requirements for continuity of production will influence choice of production system. Larger bulb size, from lower plant populations has assisted reduction of foliar disease incidence.

Latitude

Bulbing is influenced by day length and hence site selection is influenced by latitude. In general terms, spring planting is only recommended in England

ENVIRONMENTAL PROTECTION & CONTAMINATION CONTROL

Integrated crop management

Garlic is subject to a number of disease problems and it is a guiding principle that pesticide inputs should be minimised through prevention rather than cure.

An integrated approach should be adopted using the following steps:

Good management and planning

a. Careful site selection to avoid potential or previous problems

b. Sensible crop rotation to avoid build-up of soil-borne problems or disease carry over from one crop to the next

Cultural preventative techniques

a. Good crop and field hygiene to minimise spread of soil borne problems by cultivation equipment etc. This is particularly important with green garlic harvesting. There is therefore a greater risk of transporting disease more widely with machinery

b. Avoiding spread of garlic waste except on farms unlikely to be involved in garlic production

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c. Minimise wind blown debris from harvesting and grading operations. Crop residues should be ploughed in as soon as possible. Waste trailers should be sheeted at all times in transit

Corrective action

Where control of pests/diseases is still required the following approach should be adopted:

a. Establish the need to take corrective action by regular monitoring and reference to forecasting techniques, when available

b. Consider effect of prevailing weather conditions

c. Where action is required, as a principle, the possibility of using biological or natural methods should be considered first

d. If chemical control is needed the following points should be considered, subject to achieving effective control:

- use the least toxic and persistent product.
- use the most selective product to reduce the impact on naturally occurring beneficial organisms.
- use the minimum effective dose rate.
- use appropriate application methods with properly maintained equipment.
- use the minimum number of chemical applications to achieve good control, for example in controlling downy mildew and Botrytis.

Growers should ensure that the minimum number of chemical applications are made to achieve good control for example in controlling downy mildew.

N.B. exceeding the maximum individual and maximum total dose rate is illegal under COPR.

PEST, DISEASE AND WEED CONTROL

PEST CONTROL

Stem and bulb eelworm (*Ditylenchus dipsaci*)

Eelworm attack is initiated by wet conditions. Control measures are influenced by soil type and local considerations.

Routine control measures are most likely to be necessary on very fine sandy loams and on heavier sandy clay loams, again based on previous knowledge of the area/field.

This pest also affects sugar beet and will survive on certain host weeds. Affected fields will remain so for many years even in the absence of garlic crops. Avoidance of such fields is, therefore, the first consideration.

Stem and bulb eelworm can cause serious losses in both field and store. Early field infection will cause foliage distortion followed by death of seedlings and resultant bare patches in fields (only in very serious cases will an entire field be uniformly infected). The margin of such patches invariably contains less infected bulbs with characteristically distorted foliage and soft bulbs when mature. Infected bulbs deteriorate rapidly in the initial drying process; the effects are exacerbated by stage 1 temperatures (25-30°C).

Stem and bulb eelworm can be spread to previously uninfected fields by contaminated bean seed and care should be taken to use only certified seed if beans are grown on the farm.

Good drainage is also essential as localised wet areas will encourage eelworm build up.

Thrips (*Thrips tabaci*)

Thrips are a pest of variable incidence. Control measures should be based on regular monitoring when the weather conditions are appropriate for attack. More commonly known as ‘thunder bugs’; thrips are most likely to attack garlic from June to August. The need for treatment should be judged on appearance of the orange nymphs as well as the symptoms on the plant.

This pest multiplies in the growing centre of the plant and leaves appear with silvery flecking and leads to distortion in more serious cases.

A certain level of flecking is acceptable before treatment is necessary, noting that control approaching harvest is of importance. Adult thrips can feed for a considerable period under skins of bulbs during storage causing downgrading in quality.

When treatment is considered necessary use deltamethrin. A repeat application may be necessary depending on prevailing weather conditions.

DISEASE CONTROL

White rot (*Sclerotium cepivorum*)

A persistent soil-borne disease that infects soils for many years, this disease is the most serious threat to garlic growing in many parts of the world where the climate is suitable.

Its long persistence (in order of 100+ years) is reflected in local knowledge and many fields are of known infection status. Incidence is not confined to garlic growing areas and source often relates to cottage gardens where onion or garlic waste has been composted in the past.

The disease initially infects roots and spreads back into the bulb causing destruction of tissue from the base upwards. This destruction is accompanied by a white cotton wool-like fungal growth. Early infection causes bulbs to completely rot in the field and later infections cause the total collapse of bulbs in store. Progress of infection is checked at the initial drying stage (28-30°C) but continues when the store is cooled.

There is development of control measures but it is therefore essential to:

Note infection areas on farm maps and not only avoid such areas but also where possible avoid spreading contaminated soil to other parts of the farm, particularly with cultivation equipment.

Monitor crops to ensure that any occurrence of infection is recorded. Premature yellowing of foliage in patches is the most usual indicator.

Make every attempt to avoid harvest of infected bulbs. Field population of resting spores (sclerotia) can be reduced by hand collection of infected bulbs but this is recommended only for small areas where such action is practical.

EAMU for use of Folicur (tebuconazole) and Signum (boscalid + pyraclostrobin). Both Folicur and Signum if applied early will give some control of field infections.

Fusarium base rot (*Fusarium culmorum f.sp. cepae*)

Basal rot of garlic is caused by *Fusarium culmorum*. Soilborne inoculum infects garlic through the stem plate rather than through roots or storage leaves. Leaves of infected plants may not produce disease symptoms, but can be a source of the disease. Transmission can occur when infested soil or debris is transported on equipment, seed, or runoff water. The fungus can survive indefinitely in the soil. *Fusarium culmorum* can also infect elephant garlic, but not to the same degree as garlic. Onion is not a host. Symptoms include pre-emergence decay of cloves and seedlings. Stem plates and storage leaves may decay in the field during the growing season. Lesions may have a reddish fringe. Disease expression is erratic from year to year and field to field. Post-harvest decay may involve a single clove or the entire bulb.

Cultural Control: Growers commonly rotate garlic with non-host plants to reduce disease pressure. Cereals are a host of garlic strains of *Fusarium culmorum*. Growers also avoid planting in fields with a history of basal rot problems. The primary cultural control of basal rot is curing bulbs properly before storage and storing the garlic at cool temperatures, as *F. culmorum* is favoured by warm conditions. Fields with good drainage and freedom from sub-surface pans (or compaction) will minimise problems. There are no chemical treatments.

Downy mildew (Peronospora destructor)

Downy mildew is a serious foliar disease that commonly requires routine treatment. The disease is readily spread by air-borne spores and encouraged by warm humid conditions, closely following the infection criteria of potato blight.

Maintaining 500m separation between overwinter (most susceptible) and spring crops will minimise cross-infection.

Infected crop debris should be ploughed in as soon as possible after harvest to minimise any carryover.

Use of weather based prediction models is anticipated in the near future.

Treatment should be based on routine monitoring so that infection can be identified at an early stage. Following this, a routine spray programme is necessary to ensure adequate control using currently approved fungicides. It is recommended to alternate chemical groups to avoid the risk of resistant strains developing.

Leaf Blight (*Botrytis squamosa*)

Leaf spot is a disease that affects the foliage in cool wet conditions. It most seriously affects either seedlings of overwintered varieties in the autumn or the foliage of spring-planted varieties, particularly closer to harvest.

This disease will require treatment in occasional seasons only. The risk of infection increases with increasing crop density.

Development work is in progress to predict infection conditions (as with downy mildew).

Treatment is usually combined with downy mildew control in overall fungicide programmes and should be based on routine monitoring. Disease incidence is more tolerable than downy mildew since the disease is less progressive and less likely to cause serious crop loss.

Garlic foliage becomes more susceptible to infection as harvest approaches and as the density of the crop canopy increases. Early infection of the outer leaves can affect skin retention in store.

Leaf blotch (*Cladosporium allii-cepae*)

Leaf blotch is a disease that occurs when the combination of temperature and long periods of leaf wetness allows germination and penetration of the fungus. In such years infection can result in complete defoliation. Symptoms are bleached elliptical eyespots on the leaves that spread parallel to the leaf veins and can destroy entire leaves.

Routine control measures for this disease are not normally necessary.

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Treatment should be based on routine monitoring so that infection can be identified at an early stage. Once identified use of propiconazole should give control.

Neck rot (*Botrytis allii, porri, aclada*)

The fungus organisms that cause neck rot, including Botrytis porri and B. aclada, survive the winter as sclerotia on dead plant parts in the soil and on infected bulbs. Infection occurs through neck tissue or through wounds. In garlic, neck rot is generally a more serious problem than is leaf blight. Symptoms may first appear on the neck of the plant near the soil line in the spring. The fungus moves rapidly into the neck region of the bulbs causing a water-soaked appearance. A gray mold develops on the surface, later producing black sclerotia. Before bulbing, plants may die or recover depending on weather conditions. Bulbs infected late in the season break down and are often infected by other disease organisms.

Cultural Control: Growers avoid excessive nitrogen and irrigation, especially late in the season. They practice good weed control to aid air movement through field and to keep relative humidity low. When harvesting, growers allow tops to mature, then lift or undercut plants to avoid bruising and mechanical injury. Finally, they make sure that the garlic is properly cured before storing.

Avoiding spread from the previous season's crops is important. Where refrigerated stores are being emptied late in the season, when the new season's crop is established (April - June), every effort should be made to minimise wind blow of debris. The new season crop should be planted as far away from cold stores as practical, ideally a minimum of 800m. If appreciable levels of neck rot are identified in store, these lots should be marketed before emergence of the new season's crop.

Chemical Control: Fungicides are not generally used by growers against neck rot, as cultural methods control the disease at this time.

Blue mould (*Penicillium spp*)

Penicillium spp. cause blue moulds to develop on bulbs in store, between the skin and scale tissue. These blue moulds are mostly of a secondary nature but can be associated with a physiological disorder known commonly as watery skin. In such cases scale tissue and inner skins become brown and 'watery'. This favours *Penicillium* which then sporulates freely.

Penicillium is common on stored bulbs but mostly at low levels that do not cause marketing or storage problems.

Potential problems can be minimised by adherence to storage procedures. High humidities in store, irrespective of temperature, will increase incidence and level of *Penicillium* infections.

OTHER BACTERIAL PATHOGENS

A number of bacteria species will cause either foliar dieback in the field or deterioration during storage. Field and store symptoms can be linked but the absence of visual effects in the field may still result in storage problems.

Bacterial diseases are initiated in the field and spread principally by water splash. Wet seasons, are therefore more likely to result in storage losses.

The main pathogens are detailed as follows:

Pseudomonas allicola

This disease can cause serious problems in store since the bulb's scale tissue 'soft' rots completely but the outer skins retain the rotten tissue. Once the crop is moved, the bulbs split and cause loss of quality by down grading of adjacent bulbs. Up to 40% infection has been recorded.

The disease is temperature sensitive and where problems are anticipated, can be minimised by reduced drying temperatures.

Recent work at HRI has resulted in a prediction system based on serological agglutination techniques. It is therefore possible to test bulbs at harvest. This technique is now available as a specific test kit.

Erwinia spp

Erwinia infects over a wide temperature range and tends to affect single scales within a bulb. When cut these bulbs reveal one scale of firm tissue that has turned brown.

Infection of bulbs is linked to the dieback of single leaves in the mature plant. Infection then spreads back to the scale at the base of the affected leaf. Incidence of this disease varies according to season, and levels rarely exceed 2-3%. Infection is normally more prevalent in late harvest drilled crops.

Lactobaccillus spp

These bacteria cause water soaking and an odour characteristic of vinegar. This bulb disease is very temperature sensitive and becomes increasingly active above 30°C. It has not been a problem since adopting the now accepted drying and storage procedures detailed in Section HS.

SECONDARY BACTERIA

A range of secondary bacteria can follow on damaged or previously infected tissue. In wet seasons root death is often followed by soft rotting bacterial infection. It is not unusual in most seasons to find occasional plants which have died with soft rot symptoms but these are not normally associated with storage disorders.

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 'Extensions of Authorisation for Minor Use' page of LIAISON® 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.

NUTRITION

Garlic requires a fertile soil with adequate reserves of the major nutrients nitrogen, phosphate, potash and magnesium. Application of fertiliser (see Appendix) should be on the basis of regular soil analysis, ideally preceding each crop. Soil pH is important and should be in the range 6.5 - 7.0. Garlic is most responsive to phosphate and less responsive to nitrogen than leafy vegetables.

Nitrogen application should be minimised where possible and ideally based on residual nitrogen sampling in conjunction with the 'Well-N' predicition model, developed by HRL. This will ensure adequate nitrogen without excess that could lead to leaching into ground water. Late application from bulbing onwards should be avoided.

Deficiency Risk

Soil Type	Magnesium	Manganese	Copper	Zinc	Iron	Boron
Sand	High	High	High	Moderate	Moderate	Low
Sandy Loam	High	High	Moderate	Moderate	Moderate	Moderate
Silt	Moderate	High	Moderate	Low	Low	Low
Peat	High	High	Moderate	Low	Low	Moderate

IRRIGATION

Adequate soil moisture is usually present for crop establishment of autumn/spring-drilled cloves.

There is a marked growth response to irrigation on all light soils during dry periods. It leads to an increase in leaf number and size, which maximises bulb size and yield.

Late irrigation can produce softer bulbs, increases bacterial incidence and causes bulb staining and should be avoided. Where available, an irrigation scheduling system should be used to ensure efficient use of water resources.

HARVEST AND STORAGE

Maleic hydrazide (MH)

It is accepted, and clarified by HDC-funded trials, that as an aid to the maintenance of quality, it is necessary to apply maleic hydrazide pre-harvest as a growth suppressant at 10% leaf fallover. All sprout suppressant treatments should be justified.

The area treated should be related to the projected marketing dates of the bulbs. Application of MH is not necessary on crops to be marketed prior to the 1st December, in so far as can be judged in advance. Crops should be sprayed according to manufacturer's recommendations, lower rates normally prove adequate for crops in ambient storage.

Scape removal and storage

Some varieties of hardneck garlic will bolt, the flowering shoot (scape) will normally need to be removed in order to allow the bulb to achieve its full potential weight. This operation is normally done by hand.

Scapes are edible and if sold for human consumption all harvest intervals must relate to the harvesting of the scapes.

Storage of the scapes should be at 5-7ºC in cleaned trays or boxes.

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Harvest

Topping of the crop is essential to ensure ease of handling into store and minimising restriction to airflow during the initial and most critical drying phase.

It is a case of individual judgement as to the best harvesting system, depending on soil type, local circumstances and prevailing weather conditions.

Top lifting harvesters are recommended to minimise damage and soil contamination.

All trailers or boxes must be cleaned before they are used to transport loose garlic from the field and the cleaning must be recorded.

The maximum loading height accepted in practice is up to 4m. The maximum quantity that can be loaded at any one time will depend on the airflow specification of the store.

Stores must be cleaned before garlic is stored in bulk and this cleaning must be recorded.

When washing Green garlic only, the water used for washing the harvested crop should be used with conservation as a priority.

Storage

It is an essential prerequisite of garlic production that adequate store loading and storage facilities are available. The use of expert management, correct airflow and temperature in properly designed and constructed stores cannot be overemphasised in minimising storage disorders and maximising quality.

Controlled storage facilities should be capable of achieving temperature and humidity targets set out in the following sections.

Drying (stage 1)

Initial drying (stage 1) to be achieved by a minimum 25°C and a maximum of 32°C. 28°C will be the norm but special circumstances may require a slightly lower temperature (e.g. the incidence of bacterial diseases).

In practice, initial drying requires a minimum airflow of 425m^3/hr tonne with suitable fans and ducting system.

Crop drying can be undertaken in boxes but such systems are generally less efficient due to air leakage and greater difficulty in obtaining uniform airflow. The store design should allow recirculation of air to minimise fuel usage and to maintain humidity. Specification of the humidity regime during initial drying will vary according to condition of crop. A target duct range 50-65% relative humidity (RH) is normally accepted.

An important point in minimising storage problems and achieving quality is that these specifications are combined with a maximum Stage I drying time of 7 days from initial loading of the store. The specifications become more important with later harvests. Some relaxation is acceptable, however, for early crops harvested in ideal conditions and not scheduled for long term storage.

Curing (stage 2)

After initial drying to a 'rustle dry' condition, it is necessary to maintain temperature and control humidity to cure skins and complete the drying in the air spaces between cloves (stage 2).

Stage 2 is accomplished using intermittent ventilation at 25°C with humidity control by sensors amongst the garlic. It is necessary to ventilate when humidity exceeds 75% RH at the top of the stack and continue until humidity is reduced to 65% RH. Airflow specification is 170m^3 /hr tonne. Curing normally takes 1-2 weeks. Once all moisture has been removed from the bulb neck and between the cloves, it is possible to begin temperature reduction.

Cooling (stage 3)

Cooling is accomplished gradually, ensuring that the stored crop does not fall below average ambient temperature (unless refrigeration facilities are available). Automatic control is advised, using a differential setting such that ventilation is initiated when outside temperature is 3°C or more below crop temperature. An override prevents overcooling and more sophisticated stores incorporate automatic vents to mix internal/external air. These also control the duct temperature for cooling and humidity in the earlier stages.

Stores should be insulated such that, when outside conditions are unfavourable, it is possible to close up with the minimum heat loss. Minimum temperature in ambient stores should be 5-8°C dependent on location and average ambient conditions.

Refrigerated storage is ideal since crop temperature is independent of outside conditions. It is possible to cool crops more rapidly after completion of curing and normally switch over to refrigeration at 10-12°C crop temperature.

Refrigeration at -2.5 to -3.5°C is essential for bulbs scheduled to be marketed from February to end of May/ Early June. Controlled Atmosphere is necessary for storage beyond this period. Actual change over date will vary accordingly to season.

Storage disorders

Where attributable to a specific pest or disease, storage disorders are reviewed in the appropriate sections of Pest, Disease and Weed Control. This section covers those factors where specific diseases or pests are not implicated.

Compression damage

This results in deformation of bulbs and hence a more irregular shape.

It is a factor of season, bulb maturity, and sometimes variety rather than height of storage. Compression can occur in box storage as well as bulk storage although generally less so. In either case, affected bulbs can be found from 30cm and below.

Compression damage will be worse if the bulbs are harvested very early and in association with wetter seasons and late maturity. Some bulb deformation can result in the field where bulbs are growing in close proximity to each other. Compression damage is self-correcting to a degree when the pressure is released, whether caused in field or store.

Skin retention

A number of factors affect skin retention and it is essential that 'lots' or batches are handled at the correct temperature and humidity relative to ambient conditions. No firm specification can be given but guidelines to minimise skin loss are as follows:

- correct variety choice
- control of foliar diseases
- correct timing of harvest
- correct drying and storage procedure
- avoiding high temperatures and low humidities prior to grading.

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. This 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 late applications of fungicides and insecticides to the edible part of the crop
- Optimising the use of post-harvest treatments
- Ensuring minimum harvest intervals are followed
- Ensuring that application equipment is applying products correctly

See Appendix for pesticide targets and guidelines on this crop.

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APPENDIX 1: TYPICAL APPLICATION RATES FOR NUTRIENTS (KG/HA)

Nutrient (kg/ha)	Soil Index					
	0	1	2	3	4	4+
Nitrogen - mineral soils						
Spring established	175	125	100	25	0	0
Overwintered*	50	0	0	0	0	0
Phosphate						
All soils	200	150	100	50M	0	0
Potash			150 (2-)			
All soils	250	200	100 (2+)	0	0	0
Magnesium	150	100	0	0	0	0

Notes:

* Seedbed N is only required on mineral soils. Spring topdressing of up to 100kg/ha nitrogen may be required.

Nitrogen index is defined by: previous cropping, or residual mineral nitrogen sampling, which is the preferred option

Nitrogen index as defined by previous crop

Index 0	Index 1	Index 2
Cereals, Sugar Beet, Maize	Beans or beans, potatoes, oilseed rape	Any crop in field receiving large and frequent dressings of FYM or slurry
Vegetables receiving less than 200kg/ha	Vegetables receiving more than 200kg/ha	
Forage crops removed	Forage crops grazed	Lucerne
Leys (1-2 year), grazed or cut and grazed, low nitrogen (1)	Leys (1-2 year), grazed or cut and grazed, high nitrogen (2)	Long leys, grazed or cut and grazed, high nitrogen (2)
Leys (1-2 year), cut only	Long leys, cut only	Permanent pasture, cut only, grazed or cut and grazed
Permanent pasture, poor quality, matted	Long leys, grazed or cut and grazed, low nitrogen (1)	

Notes:

(1) less than 250kg/ha nitrogen per year and low clover content.

(2) more than 250kg/ha nitrogen per year or high clover content.

APPENDIX 2: GUIDELINES ON MINIMISING PESTICIDE RESIDUES

These guidelines have been produced after consultation between crop stakeholders and the Fresh 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.

Active ingredient	Target: pest, weed, disease	Current position	Suggested guidelines
maleic hydrazide	Plant growth regulator	Residues found regularly between the limit of determination and MRL	Growers should not apply maleic hydrazide to garlic bulbs which are destined for marketing prior to 1st December, as internal sprouting is rarely significant prior to this date. Use reduced product rates for crops held in ambient storage

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NOTES

NOTES

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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.

Certification Body	Beef and Lamb	Dairy	Combinable Crops and Sugar Beet	Fresh Produce	Pigs	Poultry
NSF	✔	✔	✔	✔	✔	✔
Kiwa PAI	✔	✔	✔	✔	✔	✔
SAI Global	✔	✔	✔	✔	✔	✔
SFQC	✔	✔	✔	✔		
NIFCC (Northern Ireland)		✔				✔
QWFC (Wales)		✔				

NSF Certification

NSF Certification
Hanborough Business Park
Long Hanborough
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PAI kiwa Partner for progress

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Fresh Produce Scheme

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Fresh Produce Standards