

Protected Cropping Green Paper



**Standards consultation
May 2010**

Executive Summary

Growing crops in a glasshouse or polytunnel is one way to provide more healthy local food by increasing productivity and extending the UK growing season. But if these 'protected cropping' systems are to make a contribution to the resilience of our food supply it is important to ensure that they are managed as sustainably as possible.

A number of organic growers produce crops under cover, and organic protected cropping in the UK ranges from small individual polytunnels up to large specialised heated glasshouses. The current organic standards applied in the UK and in Europe were designed primarily for growing outside, and producing crops under a protective structure differs in a number of ways. For example, the temperature is higher and can be further increased through heating; pests can be controlled more effectively with predators; and, as it is expensive to construct a glasshouse, growers tend to focus on producing a small range of high value salad crops. This consultation paper is the first step in the development of specific organic standards for crops grown in glasshouses or polytunnels.

The consultation seeks opinion from both the industry and the public to examine to what extent protected cropping practices encompass or deviate from organic principles. The aim is to develop robust standards for growing in the UK and abroad, while ensuring these systems are in line with organic values, consumer expectation and practical constraints. The key issues within the consultation are around fertility, soil, pest and disease control, water and energy use.

The Soil Association will hold two rounds of consultation on organic protected cropping. In the first round we intend to have an open discussion over a period of 60 days to inform a draft standards proposal that we will consult on in the second round of 30 days. We aim to consult all those with an interest in the Soil Association Organic Standards and invite responses to the questions within this paper before the closing date of 9th July. At all stages in the consultation you can find out what is happening and how to submit your comments here:

www.soilassociation.org/consultation.aspx

1.0 Introduction

1.1 What are the objectives of the consultation?

- To gather the necessary information to develop robust protected cropping standards for the UK.
- To ensure these systems are in line with organic principles, consumer expectation, practical constraints and industry needs.
- To seek the views of all those with an interest in the standards including consumers, the trade, retailers, certification bodies, NGOs and others.
- To take account of the views of all involved in protected cropping ranging from unheated tunnels to long-season heated crops.
- To ensure that everyone who wants to contribute has the opportunity to do so.
- To ensure that all the main issues of both principles and practice are considered.
- To identify areas where further work is required, e.g. research or training.

1.2 Why develop standards?

Soil Association Organic Standards enable sustainable agriculture principles to be put into practice. Their implementation through certification gives purchasers trust and confidence in organic production by maintaining the integrity of the system. Standards enable and empower both purchasers and producers to support sustainable practice in the marketplace, and so help to expand organic farming. They are constantly updated to respond to changes in the environment and come as close to consumers' aspirations as is reasonably and practically possible.

Currently, the Soil Association does not have organic standards specifically for protected cropping, though there are many Soil Association certified growers that produce crops under cover under existing standards. There are aspects of protected cropping that differ significantly from field scale production so additional standards are needed.

Our objectives of developing specific standards for protected cropping are:

- To agree an interpretation of organic principles for protected cropping that agrees with the EU organic regulation and meets consumer expectations and practical constraints.
- To give clearer guidance to new and existing licensees on what is and is not acceptable.
- To ensure the inspection and certification of protected cropping systems is both effective and practical.
- To establish a consistent and transparent approach to equivalence.
- To encourage best practice.
- To provide us with a strong foundation from which to influence UK and EU standard setting on protected cropping.

It has been suggested that some practices within long-season protected cropping deviate from organic farming principles to such a degree that there could never be a truly organic way of doing it. These issues need to be discussed in an open-minded way. Large scale protected cropping can have a range of environmental impacts, for instance through the demand for heat and irrigation or the production of plastic film for tunnels. On the other hand, unheated or renewably powered heated protected cropping systems can potentially cut carbon emissions. They can reduce the

quantity of vegetables imported by extending the local growing season. These systems can also be very productive and thereby increase local food availability. For a discussion of the environmental issues around protected cropping and imported produce, see Annex 1.

One of the benefits of developing standards for protected cropping is to create a more sustainable model to influence the sector for the benefit of both organic and non-organic growers. For example, productive organic protected cropping systems which maintain and build soil fertility through compost and manure applications rather than using soluble fossil-fuel-based fertilisers; which use close monitoring of soil ecology for disease control; and increasingly take responsibility for sourcing or producing renewable energy, could be an asset to the sector and help the industry meet environmental targets. The cost of not engaging with the protected cropping sector by developing organic standards is the inability to influence it for the better. For a summary of the key differences between organic and non-organic glasshouse production, see Annex 2.

In parallel to protected cropping standards development, the Soil Association works hard to educate consumers and public and private sector organisations on the importance of eating seasonably.

1.3 How are organic standards developed?

The basic standards for organic food production and processing are set out in the European organic regulation and by law these standards must be met in order to label a product as organic in the European Union (EU). The regulation framework is decided upon by the agricultural ministers of each EU nation, and the implementing rules are developed by the EU Commission, in conjunction with each nation's ministry officials and various stakeholder groups. Thus, every EU country has the opportunity to feed into the organic regulation.

In the past it was possible for the UK to develop national standards that were higher than the EU organic regulation, but the new regulation now prevents this. Therefore, Defra currently implements only the basic EU regulation and has no UK standards setting function. (See Annex 3 for further information).

Private standards setting bodies, however, can develop their own organic standards, provided that they comply with the legal requirements of the EU regulation. The standards set by the International Federation of Organic Agricultural Movements (IFOAM) are an example of this. The Soil Association maintains its own organic standards that are higher than those required by law in some areas, and cover types of production not yet covered by the EU regulation, such as textiles and environmental conservation. We feel this is important to uphold integrity in organic systems, to respond to new developments and to keep the standards in the hands of the organic movement.

To achieve this, standard setting must encompass high standards of governance and be accountable to those with an interest in the standards. The Soil Association has established a Standards Board under independent chairmanship with a balance of lay and industry representation. The Standards Board is responsible for making recommendations for new and changed standards, after proper consultation with interested parties. We have formal standards-setting procedures and terms of reference and copies are available on request.

1.4 What is protected cropping?

Protected cropping is the term used to encompass crop growing under protective structures such as glasshouses, permanent polytunnels and temporary polytunnels (also known as Spanish tunnels). Protected cropping has distinct characteristics from growing crops outside. Growing in an enclosed space creates different conditions and allows for manipulation of these conditions. For example:

- The temperature is higher and can be further increased through heating.
- The air can be enriched with carbon dioxide to increase productivity.
- Pests can be controlled more effectively with biological control.
- The soil can be cleared of weeds with longer lasting effect.

The permanent structures and equipment involve significant capital investment and maintenance costs. In the UK, producers generally focus on producing relatively high-value, mainstream crops such as tomatoes, peppers, salads and cucumbers. The different practices and costs of protected cropping create a unique organic system. It has therefore long been identified as an area which needs specific standards.

1.5 Current organic standards governing protected cropping

There are no rules or guidelines specifically for protected cropping in the EU regulations on organic farming and the IFOAM Basic Standards do not mention protected cropping either. As a result, organic principles are not consistently or transparently interpreted for glasshouse and polytunnel systems across Europe.

It has been challenging in the past to get European wide agreement on organic standards for protected cropping due to climatic and cultural differences. There has been interest in setting specific standards for organic protected cropping for at least ten years on both a European and national level. The European Commission is planning to start drafting implementing rules for organic protected cropping in the second half of 2010. IFOAM EU Group is also currently working on this issue.

2.0 Scale and nature of UK organic protected cropping

Organic protected cropping in the UK ranges from individual polytunnels sited on mixed farms up to stand-alone specialised units with several hectares of glass. The difference in scale and farm integration has an impact on the nature of the growing system. Large glasshouses on sites without animals will typically bring in fertility from off-site in the form of manure or organic fertiliser pellets, and will not employ a fertility-building rotation. The large investment involved in the glasshouses means that growers will try to maximise their returns by cropping as intensively as possible, perhaps supplementing growth with heat and CO₂, and growing a narrow range of high value crops. These growers often supply the supermarkets with a single crop type for most of the year. At the other end of the scale, an unheated polytunnel on a mixed farm may use compost and manure made on the farm for fertility. The lower investment (and, typically, more local market) leaves greater room for flexibility and often a much wider range of crops are grown. Some growers may sow a

green manure between crops and employ a basic rotation. 277 Soil Association growers are registered for organic greenhouse crops, though only a handful of these are using heat. The total area of organic heated glasshouse production in the UK is around 30ha. However, the sector is characterised by variety - no two protected cropping systems will be identical. Here are two case studies that illustrate the different approaches taken by two large glasshouse systems.

2.1 Case studies

Wight Salads

Wight Salads are the UK's largest organic tomato grower, with an organic glasshouse growing area of 10ha in the Isle of Wight and 9ha in Portugal. They produce long-season tomato crops for the major supermarkets in climate controlled glasshouses.

Tomato varieties are sourced for customer demand and seedlings are produced on their behalf by a propagator to be planted out in the glasshouses in December. Bumblebees are used to aid pollination. Fruiting begins in February and runs until the end of October, though the main volume is available between May and September. Plants are cleared in November and there is a break of 4 weeks before the next year's tomato plants go in. During this period, compost is applied and necessary maintenance work is undertaken.

Tomatoes are currently grown continuously without rotation as this provides the most profitable returns on the significant investment made in the glasshouses (approx £1million per ha). Without the benefit of a rotation, disease is controlled through close attention to soil biology and ecology, and Wight Salads believe that many soil problems can be anticipated and corrected with well timed application of carefully made compost. The company has recently built a large composting facility on-site which supplies the majority of the crop nutrients from prunings, waste produce, spent plants and horse manure from local stables.

In terms of fertility, nitrogen is supplied by the compost and supplemented with vegetable-based fertiliser pellets. While their phosphorus levels have always been good, potassium levels are a significant problem for their soils as demand from tomato crops is high. They would like the standards to recognise the level of plant offtake in the glasshouse system and allow them to add more potassium as necessary, primarily from organic sources.

Biological control is the main method of insect pest control. The most serious problems they encounter are mealy bug, macrolophus, leaf miner and *Tuta absoluta*. Staff are trained in early identification of crop pest and disease problems, though it is acknowledged that sometimes it is better to wait out an infestation and let the ecosystem respond rather than rush in with permitted control products.

In order to maximise the efficiency of the system, all glasshouses environments are monitored and controlled by computer which will adjust the environment to achieve optimum temperature, humidity, irrigation and CO₂ levels. Artificial lighting is not used, but white plastic sheeting is spread on the ground to get maximum reflective light levels in the glasshouse, which improves plant growth significantly in the winter period.

All glasshouse rainwater runoff is harvested in newly built reservoirs with a total capacity of 60 million litres and Wight Salads have a gas powered CHP plant onsite that was installed in 2000. This supplies (waste) heat and CO₂ for the glasshouses, while the power company retains the electricity for local consumption. However Wight Salads are very eager to move away from fossil fuel and have a team exploring renewable alternatives. These are currently being costed and researched with a view to being energy self sufficient in the near future through new carbon neutral technology unique to this area of the Isle of Wight. As a large organic grower, Wight Salads are investing heavily in more sustainable use of their key inputs: energy, water and organic fertilisers.

Wild Country Organics

Wild Country Organics have 2 ha of glass in Cambridgeshire. They produce organic crops for 12 months of the year, but do not use heating, lighting or CO₂. Peppers, tomatoes, cucumbers, salad leaves, chard, spinach, brassicas and strawberries are grown for sale to box schemes, farmers markets and a supermarket. Plants are supplied by a propagator, and are planted and harvested to a tight growing schedule to maximise production over the year.

Wild Country Organics aims to practice a simple rotation, however they do not have any breaks built into the growing system. Due to the big capital investment involved, they need to use the glass as much as possible.

They have never had a problem with soil-borne diseases, or any tomato or brassica diseases, and attribute this to the soil type and pH (pH 7.8-8.0) and varietal choice. They choose tomato varieties with good vigour and use tomatoes and aubergines grafted onto resistant rootstocks, which further increases plant vigour over the long growing season. They believe that after 13 years of organic production their system is stable. In their opinion, soil type and pH should be considered when applying organic standards as this can affect soil borne disease load as much as any other factor.

Fertility is supplied through a bought-in fertiliser, vegetable-based pellets, composted weeds and healthy plants, and some PAS 100 compost. There is very little manure in the area and pesticide contamination of manure is a worry. Some horse manure is brought in. They do not believe that a fertility-building period would make any real contribution to soil nutrients due to the massive export of nutrients in harvested crops and plant trimmings - the crops take off more than five times the amount of nitrogen that could be fixed in a rotation. They feel that organic glasshouse production must remain soil-based but does require significant nutrient supplement from approved organic sources, to maintain yield, quality and taste in the harvested crop.

Pest issues are addressed through biological control. A small amount of insecticidal soap is used but never pyrethrum and rarely sulphur. They do not expect to use these products in the future as they find them ineffectual, possibly causing more harm than good to the plants and predator/prey balance in the greenhouse. The company believes that customers would rather no products to be applied to their crops and prefers to accept that they will lose crops occasionally. They feel that this approach makes economic sense as, while a mild problem may make

plants look unsightly, it is better to let them be if they are still producing good quality fruit.

Plastic is used as ground cover and each sheet is recycled at least once. Drip irrigation is used and a borehole supplies the irrigation water, though some rainwater is harvested in run-off from the glasshouses. They hope to build a reservoir for better use of rainwater and are interested in combining this with aquaculture in the future.

3.0 Organic principles

Organic is a 'whole system' approach to farming and food production. It recognises the close interrelationships between all parts of the production system from the soil to the consumer.

The Soil Association has established a comprehensive set of organic principles that guide our work and our standards. Of these, the following are applicable to growing:

Agricultural principles

- To produce food of high quality in sufficient quantity.
- To work within natural systems and cycles throughout all levels from the soil to plants and animals.
- To maintain the long term fertility and biological activity of soils.
- To respect regional, environmental, climatic and geographic differences and (appropriate) practices that have evolved in response to them.

Environmental principles

- To foster biodiversity and protect sensitive habitats and landscape features.
- To maximise use of renewable resources and recycling.
- To minimise pollution and waste.

From these principles the practices that form the foundations of organic growing have been established:

- encouraging biological cycles involving micro-organisms, soil fauna, plants and animals
- sustainable crop rotations
- recycling of nutrients using composted manure and vegetable waste
- cultivation techniques that enhance and protect the soil and its life
- avoiding soluble mineral fertilizers, and
- avoiding agrochemical pesticides.

The following section will examine to what extent protected cropping practices encompass or deviate from these foundations, and examine how well they meet the principles behind them.

4.0 The issues

4.1 Rotations

"The fertility and biological activity of the soil shall be maintained and increased by multiannual crop rotation including legumes and other green manure crops, and by the application of livestock manure or organic material, both preferably composted, from organic production."

European regulation EC 834/2007 Article 12 Paragraph 1 (b)

Commonly an outdoor vegetable rotation would leave a break of four years or more between growing the same species of crop. This is a key method of pest and disease control within organic farming, and ensures that the soil does not become depleted in particular nutrients as a crop is not extracting the same nutrients from the soil year on year. However, due to high costs, heated glasshouse systems concentrate on growing a narrow range of high value crop species. The majority of crops belong to *Solanaceae* and *Cucurbitaceae* families so rotations have little value as a way of controlling pests and disease. The situation is similar across Europe. At present the Soil Association standards state that protected cropping systems do not have to rotate crops

In unheated systems the costs involved are lower and growers typically produce a wider range of crops. While fertility building rotations still present economic problems for the grower, it may be possible for them to grow a break crop, for example growing salad leaves in the winter followed by an unheated crop of tomatoes in late Spring and Summer.

Developing practices that improve the level of rotation in glasshouse systems must pay close attention to technical and financial constraints. Achieving the benefits of rotations on the soil and plant health could be done through other means. A possible way of better reflecting the principle of crop rotation is through innovations in intercropping or rotating small areas within the glasshouse at any one time creating diversity in time and space.

- Should the Soil Association standards require protected cropping systems to rotate crops?
- What would be the benefits?
- If so what is possible/preferable given the constraints of the system?
- Should standards allow growers to not rotate under some circumstances?
- Or should standards allow other means of diversification in space and time such as intercropping or under-sowing?

4.2 Other means of pest, weed and disease control

Arguably, the characteristics of glasshouse growing make it possible to control pests, weeds and diseases through means other than crop rotation.

The enclosed environment of a glasshouse or polytunnel means that biological control is particularly effective in dealing with pest species. Growers have the same small range of six pesticides available to them as field growers, though use tends to be even more as last resort and only if biological control breaks down irreparably. As such, pests can be adequately controlled under current standards. There are a few pest issues specific to glasshouse crops e.g. woodlice infestation due to the large volumes of compost that are used.

The closed sides of most UK glasshouses and polytunnels also mean that weed control is typically simpler than it is outdoors – once weed plants have been removed there is less chance of seeds re-establishing themselves by blowing in on the wind. Handpulling, rotovation and soil preparation prior to planting are the main methods of weed control.

Soil Association standards allow 'pre-emergence and post-emergence flame-weeding' (standard 4.10.3) but not 'steam or thermal pasteurisation

or sterilisation of the soil for weed control' (standard 4.10.5). However, the new EU regulation now allows 'thermal processes' for weed control. This potentially widens the number of methods available to organic growers across the EU to include such processes as solarisation, steam sterilization and hot foam.

Steam or boiling water is used by some glasshouse growers to kill pathogens in the soil. A common approach some certifiers take is to allow sterilisation twice in a six year period but not in consecutive years. The rationale behind not allowing soil sterilisation within Soil Association standards (except as a one-off practice) is that it indiscriminately destroys the flora and fauna that make up the soil ecosystem, killing beneficial as well as undesirable micro-organisms. Some people argue that this is only temporary and soil micro-organisms quickly repopulate the soil following sterilisation.

Solarisation is an alternative method to steam sterilisation that is used in warmer countries. Manure and water are applied to the soil and it is then covered with plastic – the heat of the sun effectively steams the soil under the plastic.

A new form of thermal control is available that applies heat specifically to weed plants in the form of a non-toxic biodegradable hot foam. This uses significantly less energy than flame weeding. The hot water produces the heat while the foam keeps the heat on the unwanted plants. It disappears soon after application but stays long enough to keep the heat next to the leaves to take them beyond their permanent wilting point – around 10 -20 seconds. We have looked into the mode of action of this product and it does appear that the mode of action is from the heat and not from the actual foam itself.

- Should any of these methods be permitted for use in protected cropping systems?
- Should the standards require other methods to ensure that the soil is healthy and pests and disease are kept to a minimum?
- For example, variety selection, compost addition, application of microbes, intercropping, grafting etc.?

4.3 Fertility

Organic production systems work to maintain and increase the long-term fertility and biological activity of soils. They rely primarily on nutrients derived from the organic matter and minerals in the soil.

Rotations are a fundamental source of fertility within organic farming, which enable farmers to fix nitrogen and recycle nutrients throughout the system, minimising losses of nitrogen (N), phosphorous (P) and potassium (K).

In organic systems nitrogen is supplied from the atmosphere through biological fixation by leguminous plants and their symbiotic association with *Rhizobia* bacteria. Growing legumes as part of a rotation, either as a crop or a green manure, puts nitrogen into the soil for the next crop. In addition, a forage legume such as clover can provide feed for cattle or sheep, and the N, P and K in the plants eaten by the livestock can be recycled back to the soil through application of their manure. Adding

composted plant waste to the soil also ensures that nutrients taken up and stored in plant tissue are recycled back to the soil to maintain fertility.

The Soil Association standards state that one should only use mineral fertilisers and supplementary nutrients to supplement and not replace methods of nutrient recycling mentioned above. The requirements for nutrient management and compost production are laid out in sections 4.7 and 4.8 of the Soil Association standards.

Protected cropping deviates from the principles of rotation-derived fertility and on-farm nutrient cycling by varying degrees, depending on the type of system. Structures sited on a mixed farm can come closest to this principle, with fertility supplied in the form of composted manure and crop residues produced on the holding. However that is not to say that they are always part of a truly organic mixed rotation, as fertility-building legumes are rarely planted, and the land inside the tunnel or glasshouse would not be grazed by livestock. At the other extreme, there are large scale heated glasshouses which are not integrated into a farm in any way - there are no livestock onsite, fertility is sourced from bought-in organic plant feeds and pellets, and woodchip compost is purchased to avoid any risk of disease associated with composting their own spent plants. This total reliance on bought-in inputs has a significant impact on the resilience of the system.

The nutrient demand for crops grown under cover is high and the level of nitrogen usually applied (170-250 kg of nitrogen per hectare per year, in the form of approved organic fertilisers) to organic crops in the field is generally not considered sufficient. The Icelandic certification body Tún and Defra's Advisory Committee on Organic Standards (ACOS) propose a limit of 600 kg of nitrogen per hectare per year but a maximum of 170 kg may come from manure. The ACOS proposed standard goes further to suggest a progressive increase in the percentage of organically derived nutrients over time.

It has been suggested that there is a need to look at the nutrient balance. One suggestion is that rather than setting a limit, nitrogen should not be applied at levels where loss of nitrogen is more than twice the amount being taken up by the crop. Different N levels are required for different systems. Processes are greatly accelerated in the almost tropical environment of a heated glasshouse, which has a big impact on N demand. Requirements also vary between plants. For example, tomatoes need a lot of N and K, while salad crops do not need as much, so it is important they are not allowed the same amount as tomatoes.

- Should allowance be based on plant demand?
- Is there a reliable way of measuring this?
- Should nutrient allowance vary between heated and unheated systems?

Potassium levels are also a significant issue within protected cropping. The way in which demand is assessed at present within the standards was developed for field crops and is not appropriate for the glasshouse environment. Permission to use sulphate of potash is currently only given if the soil index is below 2 and clay content is less than 20%. But while this may not be the case at the start of the season, the accelerated growing conditions under glass mean that the situation may change further into the year. Protected cropping growers would benefit from the

flexibility to add it as need arises. This is particularly the case for tomato growers.

- Should the standards be amended to allow growers greater flexibility to add potassium?
- If so, how should need be assessed?

4.4 Soil

In 1967, the first Soil Association standards were drawn up. They stated that the basis for the success of any organic enterprise is the creation and sustenance of a living soil. "The use of, or abstinence from, any particular practice should be judged by its effect on the well-being of the micro-organic life of the soil, on which the health of the consumer ultimately depends." The Soil Association was founded on the principle that "our health is directly connected to the food we eat and, ultimately, the health of the soil."

Official definitions of soil say that a soil's characteristics and therefore its nature and ecology are determined by the parent material or bedrock. Soil is dynamic, affected by a range of biological, climatic and mineral factors. In these definitions, contact with the earth's surface is a fundamental for creating soil. There is no exact boundary between the soil and the parent material but a series of horizons that form a transition from bedrock to soil.

The European regulation EC 834/2007 states:

Article 5 (a) – The maintenance and enhancement of soil life and natural soil fertility, soil stability and soil biodiversity preventing and combating soil compaction and soil erosion, and the nourishing of plants primarily through the soil ecosystem.

Article 12 Paragraph 1. (a) – Organic plant production shall use tillage and cultivation practices that maintain or increase soil organic matter, enhance soil stability and soil biodiversity, and prevent soil compaction and soil erosion.

In Iceland the Tún standards state "protected cropping must be carried out in a living soil of a stable ecosystem."

Across Europe the interpretation of the regulation is very different with most countries expecting protected cropping operations to grow in the soil. However, in Denmark, Sweden and Finland the national organic regulators are allowing operators to grow in containers or bags. An argument for this approach from the Danish Minister for Food, Agriculture and Fisheries is that the growth substrate is "comparable with and considered as an organic soil."

At a practical level, the interpretation has made it possible for operations with concrete floors to sell certified organic produce. There are several reasons why it might be in a grower's interest to do this. The grower may have a glasshouse with a concrete floor or one with polluted or compacted soil. Alternatively, it is a way to avoid soil borne diseases and pests without the need for soil sterilisation– grafting onto resistant rootstock is not felt to be sufficiently effective in some countries and root knot nematodes are a particular problem in the Netherlands. At a financial level growing in bags or containers does not necessarily mean an advantage in day to day running costs. However, there is a significant

commercial advantage to growing out of the soil because the systems do not go through a conversion period and the grower can dip in and out of organic growing according to market fluctuations. In contrast, for land growing annual and biannual crops the conversion period is a minimum period of two years.

- Are the principles in the EU organic regulation borne out through protected cropping systems that grow in substrates?

4.5 Heating

One major criticism of heated glasshouse operations in recent years has been the amount of energy they use. Relatively large amounts of energy are used to heat glasshouses to lengthen the amount of time the crop can be grown.

The most robust approach to tackling this issue would be to look at the full climate change impact of a product's life cycle. However, there are still significant uncertainties on how to accurately assess the carbon footprint of organic agricultural products. Sources of the main greenhouse gases from agriculture, nitrous oxide and methane, are not well understood. In particular, the soil can be a major source or sink of greenhouse gas depending on practices and location.

As such, addressing greenhouse gas emissions from organic farming overall is a major challenge and to do this robustly through standards will require a dedicated consultation. The remit of the protected cropping consultation is to develop standards for practical and technical elements of growing. Therefore it is not the place for a wider debate on the climate change impact of organic farming methods.

That said, the use of energy as a major input within protected cropping systems gives opportunities to reduce CO₂ emissions from one part of the system. Standards proposals in this area will have to take account of the cost of refitting operations with low-carbon technology. First steps might be to ask businesses to measure the amount of energy they use across the operation and switch to a renewable energy provider.

- Should growers using heat be required to measure, and progressively reduce the amount of energy they use for this purpose?
- Should the standards ban the use of fossil energy for the heating of glasshouses?
- Should use of renewable energy sources be encouraged through education?

4.6 Lighting

Propagators are the only UK organic protected cropping systems that use lighting on a significant scale. Propagators often supply seedlings to be planted out in glasshouses in early Spring and in order to allow the plant to develop sufficiently quickly, the short winter days are supplemented with artificial lighting. The issues are similar to those around heating.

There are already standards for cleaning of buildings and equipment. Clean glass can make a difference to light levels in the glasshouse.

- Should standards require glass to be cleaned sufficiently so that light levels are optimised?

4.7 Carbon dioxide enrichment

Once light and temperature are optimum, carbon dioxide is the limiting factor for productivity. CO₂ could be considered a plant nutrient that is directly taken up by the plant, just as other plant nutrients such as nitrogen and phosphorous. In a closed glasshouse environment, CO₂ levels can become depleted to concentrations lower than those found in the outside air as the plants photosynthesise.

The Icelandic Tún standards and ACOS draft proposals all allow enrichment with CO₂ if it is a by product of another process. This could be by recycling CO₂ that is released from heating or composting on the operation. These standards do not allow fossil fuels burnt solely to produce CO₂.

- Is it acceptable to enrich the air with CO₂ to prevent depletion or increase productivity?
- If yes, should there be requirements for how the CO₂ has been produced?

4.8 Water use

Water use and run-off from protected cropping systems are markedly different from field crops. Crops are entirely dependent on irrigation and the high nutrient demand of crops means run-off can potentially have high levels of nitrogen. In many cases there is potential for more efficient use of rainwater that runs off buildings, which could reduce reliance on extraction.

The Soil Association has already developed standards for responsible water use (4.16). The standards reflect and in places go further than the EU Water Framework Directive. The standards cover managing soil and water, managing surface water, storage and abstraction, and irrigation. For example, by 2012 all our licensees using irrigation will be required to draw up and implement a water management plan to minimise their impact on local water resources. This will cover issues such as crop choice and water availability as well as plans for re-using and reducing water input. This covers much of the water use in protected cropping systems, except the following question:

- Should the Soil Association consider ways of encouraging licensees to use rainwater run-off from permanent structures?

4.9 Buildings/structures

Poorly sited polytunnels have come under criticism for spoiling the landscape and putting pressure on local infrastructure and nearby communities by the need for often large numbers of seasonal staff. The Soil Association believes that polytunnels should not be a problem if local councils and farmers are aware of the negative impacts of badly sited polytunnels or unacceptably large developments.

In 2006 the high court ruled that polytunnels at Tuesley Farm in Surrey need planning permission. This set a precedent that supported the Soil Association's thinking that requiring planning permission would ensure the local community is consulted and there is proper planning of the impacts on local infrastructure.

- Is it within the scope of standards developed for protected cropping to look at where glasshouses and permanent polytunnels are sited?

4.10 Equivalence

Through our equivalence programme we certify imported products and ingredients already certified to other organic standards. This re-certification allows licence holders to use the Soil Association symbol on such products, providing they meet all our additional product requirements and are compliant with all national legislation. We will check each product against key standards areas we consider most important to the integrity of the Soil Association organic symbol.

The differences in interpretation of the organic principles mean developing standards for protected cropping in the UK could create a difficult situation for agreeing equivalence between Soil Association standards and those of other certifiers. When we draft standards following the first consultation we will need to make decisions about whether major differences in approach outside of the UK should be considered equivalence barriers.

5.0 How the consultation will be run

There are several contentious issues that are enhanced by significant investment in structures, technologies and processes. An open and thorough consultation will therefore be important to ensure that all views are considered when drafting the standards.

We will hold two rounds of consultation. In the first round we intend to have an open discussion to inform a draft standards proposal that we will consult on in the second round.

We aim to consult all those with an interest in the Soil Association Organic Standards. The first round of consultation will run for 60 days, closing on 9th July. Responses we receive will be summarised and will be made public.

At all stages in the consultation you can find out what is happening and how to submit your comments here:

- On-line at www.soilassociation.org/consultation.aspx
- by e-mailing consultation@soilassociation.org
- calling 0117 314 5000
- or writing to Consultations, Soil Association, South Plaza, Marlborough Street, Bristol, BS1 3NX

Glossary

Advisory Committee on Organic Standards (ACOS) – a non-executive, non-departmental public body which advises ministers on matters relation to organic standards.

Composting – the controlled biological decomposition of organic matter in the presence of air to form a humus-like material. Control methods can be intensive or extensive and include various forms of mixing and aerating to achieve high temperatures in the material and ensure even decomposition.

Conversion period – the time under organic management that it takes for non-organic land, crops or livestock to convert to organic production.

Defra – Department for Environment, Food and Rural Affairs.

Ecosystem - a biological community of interacting organisms and their physical environment.

Graft - To unite (a shoot or bud) with a growing plant by insertion or attachment.

Intercropping - A form of multiple cropping in which two or more crops simultaneously occupy the same growing space.

International Federation of Organic Agricultural Movements (IFOAM) – a global federation of organic organisations working to promote organic food and farming internationally. It sets basic organic standards and its subsidiary, IOAS, has an accreditation system for certification bodies that wish to adopt its standards.

Mineral fertilisers – nutrients of mineral origin such as limestone and rock phosphate.

Organic status – the organic certification, or otherwise, of a product, enterprise or operation.

Rootstock - The lower portion of a root and its corresponding growth buds, used for plant propagation.

Substrate – a material upon, in or through which organisms can grow.

Supplementary nutrients – nutrient inputs to complement the farm's own nutrient cycles and to correct imbalances and deficiencies.

Under-sowing – to sow one crop into another existing crop, for instance a grass or clover mixture into a cereal crop.

Annex 1

Environmental impacts of UK heated glasshouse production and imported produce

There are approximately 350 hectares of heated glasshouses for food crop production in the UK, of which around 8% are organic. The main three crops grown under glass in Britain are tomatoes, cucumbers and peppers, but the tomato is the most significant in terms of both production and imports. The retail value of British tomato production is around £150 million and British production accounts for about a quarter of the tomatoes sold in the UK through the year (up to a half in the summer). The rest are imported - the UK imports over 300,000 tonnes of fresh tomatoes each year.¹ The top six countries we import tomatoes from are: Spain (accounting for 76%), Italy, the Netherlands, Morocco, Turkey and Portugal.² With the exception of the Netherlands, these will have been grown unheated under plastic and there is some debate over whether it is more environmentally friendly to import these than to grow tomatoes in heated glasshouses in Britain. Defra reported in 2005 that imported tomatoes from Spain grown under plastic tunnels had a carbon footprint more than three times lower than long season tomatoes grown in the UK in gas-heated glasshouses.³ However, while there is no doubt that heated glasshouse production requires a huge amount of energy, there are several reasons to believe that the environmental balance might not be quite so strongly in favour of imports.

Firstly, an increasing number of growers are investing in lower carbon systems. While it is not possible to move southern Spain any closer to the UK, there exists a range of developing options to reduce the carbon footprint of glasshouses. Combined heat and power (CHP) is the most popular innovation currently being used. This involves taking the waste heat and CO₂ from electricity generation at a power plant and pumping it into the glasshouse, while the electricity is used to supply the local community. The capture and use of the heat and CO₂ increases the overall efficiency of the fossil fuel burned to more than 75%, compared to around 40% from conventional electricity generation. Other growers have installed systems based on renewable energy such as woodchips, geothermal heat and solar power. The biggest Soil Association organic heated glasshouse growers are not burning fossil fuel exclusively to heat their crops – most growers use either CHP or woodchip boilers. Also, it should be noted that the majority of smaller organic growers do not use heat at all. Just under a quarter of the non-organic glasshouse sector is using CHP, though the remainder are still using gas- or oil-powered heating systems.⁴ More details on the carbon reduction options available can be found in the Soil Association briefing paper, 'A Growers Guide to Energy use in Glasshouse Production'.

A second issue is the embedded water that we import with tomatoes and similar produce grown abroad. While the warmer, drier climate of countries further south enables them to grow tomatoes unheated, it can also present significant problems in supplying the water needed for such large scale horticultural operations. The water used to produce a product is known as virtual water and despite being a relatively wet country, the UK is the world's sixth biggest net importer of virtual water. For every cubic metre of virtual water we consume in home-grown agricultural products, we import 1.6 cubic metres of virtual water in the form of agricultural products from overseas.⁵ This makes the UK very dependent on the exploitation of other countries' water resources. Given climate change predictions of reduced rainfall in many key exporting regions, this situation has significant ethical implications and may adversely affect the resilience of our food supply. In many regions around the world, water is

abstracted from rivers until they run dry, and ancient aquifers are being mined for water, causing water tables to fall lower and lower each year.

To continue with the example of tomatoes, a case study from WWF reports that total water use for tomato production in the UK is 0.8 million m³/yr, while our imports use 13.9 million m³/yr.⁶ As the largest provider of tomatoes to the UK, Spain represents 76% of this water footprint. Tomato cultivation covers over 60,000 ha in Spain and the main production regions are also among the most significant in Spain in terms of conflicts between agriculture and the conservation of rivers and water resources.⁷ On average, producing one tomato in Spain (assuming it to be equal to 100g) evaporates about 7.5 litres of water, and pollutes nearly 0.7 litres of freshwater, totalling 8.2 litres per tomato.⁸

A third point is that most comparative studies do not take into account the energy required to produce the protective structures. A Spanish study showed that the manufacture of the plastic tunnels required more energy than the tomato production itself.⁹ While the initial outlay of energy to manufacture a glasshouse will be greater than that required for a polytunnel, the lifespan of the protective structure is important in terms of the embedded energy per kilo of tomatoes produced in it. A glasshouse can last fifty years, whereas plastic tunnels are typically replaced every three years, thus distributing the manufacturing energy burden over a far smaller quantity of tomatoes than those grown under glass. It can also take up to five times the area of polythene in Spain to grow the same quantity of tomatoes in a British glasshouse, due to the higher yield obtained under controlled conditions.¹⁰

It should also be noted that UK imports are not only from warmer countries - we import 20% of Holland's total salad crop that will have been grown using the same amount of energy as those in the UK, but with transport emissions on top.¹¹

Annex 2

Key differences between organic and non-organic heated protected cropping

In terms of UK heated glasshouse production, there are several key differences between the common organic and non-organic growing methods.

Most non-organic glasshouse crops are grown hydroponically in rockwool, an inert fibre spun from molton rock and set with a binding agent. This provides a substance to anchor the plant roots, and the rockwool substrate is kept saturated with a chemical solution of synthetic fertiliser that is taken up directly into the crop. Many growers now re-circulate the solution around the glasshouse to minimize the release of excess nutrients to the environment, though if disease is present in any of the plants, the solution must be disposed of and the system flushed. While the rockwool can be sterilized and reused, most growers replace it each growing season as it tends to deteriorate after too much use. Disposal of used substrate can present environmental problems as the substance does not biodegrade and cannot be burned. It is possible to reprocess used product, but in reality a vast quantity of horticultural rockwool is disposed of in landfill at the end of each season. In terms of pest control, the enclosed environment of the glasshouse enables growers to deal with pests largely through biological control, though when the pest population gets beyond the control of the predators, pesticides will be used. Similarly, fungal problems can be controlled more easily in the glasshouse environment with good management, but chemical fungicides will be used to control problems.

Organic crops are grown in the soil and nourished by the fertility built up through the soil ecosystem. This fertility comes from composted plant cuttings, manure and other organic fertilisers, as opposed to fossil fuel based fertilisers. Without the option to simply throw away the growing medium each season, or flush the system when there is a disease problem, organic growers invest in building and maintaining a healthy, living soil. Like their non-organic counterparts, organic growers rely on biological control to deal with pests, but on the rare occasions that this breaks down, they can apply for permission to use the very small number of pesticides authorised for organic systems. Waste is kept to a minimum as spent plants are composted to nourish future crops.

Annex 3

How are organic standards developed?

The basic standards for organic food production and processing are set out in the European Organic Regulation and by law these standards must be met in order to label a product as organic in the EU. The regulation is in two main parts: the framework Council regulation 834/2007 which sets the overall legislation; and its implementing rules, the Commission regulation 889/2008.

The Council regulation is decided upon by the council of agricultural ministers, made up of one minister from each EU country with a rotating presidency. They negotiate on proposals received from the Commission to find a framework regulation that is acceptable to both bodies and also to the EU Parliament which, following the Lisbon Treaty, is now a co-decision maker.

The implementing rules are developed by the EU Commission, assisted by the Standing Committee on Organic Farming (SCOF) which is comprised of ministry officials from each country. There is also a collection of advisory groups that fulfil the Commission's obligations on stakeholder engagement. The Commission can only amend the regulation if a proposal has the support of a qualified majority of member states in SCOF.

The EU organic regulation requires that each member state has a 'competent authority' to manage organic regulation in their country. In the UK, this is the Department for the Environment, Food and Rural Affairs (Defra) and they implement the work in two ways. Firstly, they have set up the Advisory Committee on Organic Standards (ACOS) which advises Defra on organic issues within the UK, as well as on the regulation. Defra are not obliged to take the advice given by ACOS and may vote in the opposite way in their interactions with SCOF. Secondly, Defra gave the United Kingdom Accreditation Service (UKAS) the responsibility to oversee and accredit organic certification bodies in UK.

In the past it was possible for the UK to develop national standards that were higher than the EU organic regulation, but the new regulation now prevents this. Therefore, Defra currently implements only the basic EU regulation and has no UK standards setting function.

¹ British Tomato Growers Association, www.britishtomatoes.co.uk

² *UK Water Footprint: The impact of the UK's food and fibre consumption on global water resources (Volume 1)*, WWF, August 2008

³ *The Validity of Food Miles as an Indicator of Sustainable Development*, Defra 2005
<http://statistics.defra.gov.uk/esg/reports/foodmiles/default.asp>

⁴ British Tomato Growers Association, www.britishtomatoes.co.uk

⁵ *UK Water Footprint: The impact of the UK's food and fibre consumption on global water resources (Volume 1)*, WWF, August 2008

⁶ *UK Water Footprint: The impact of the UK's food and fibre consumption on global water resources (Volume 1)*, WWF, August 2008

⁷ Beaufoy, G. (2005). *The tomato report: Assessment of tomato horticulture in the Mediterranean (policy, environmental impact, trade)*. Madrid, WWF.

⁸ Chapagain, A. K. and S. Orr (2009) An improved water footprint methodology linking global consumption to local water resources: A case of Spanish tomatoes. *Journal of Environmental Management*, 90, 1219-1228

⁹ Antón, A.; Castells, F.; Montero, JI.; Muñoz, P. 2005. LCA and Tomato Production In Mediterranean Greenhouses. *Int. J. Agricultural Resources Governance and Ecology*, (2) 4: 102-112

¹⁰ British Tomato Growers Association, www.britishtomatoes.co.uk

¹¹ *Fruit and Vegetables & UK Greenhouse Gas Emissions: Exploring the relationship*, Food Climate Research Network, 2006



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