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SID 5 Research Project Final Report

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Project identification

1. Defra Project code: FO0419 (FFG0911)
2. Project title: Effective Approaches to Environmental Labelling of Food Products
3. Contractor organisation(s): University of Hertfordshire
4. Total Defra project costs (agreed fixed price): £ 68,011
5. Project: start date..... 25/01/2010
   end date..... 24/07/2010

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Executive Summary

7. The executive summary must not exceed 2 sides in total of A4 and should be understandable to the intelligent non-scientist. It should cover the main objectives, methods and findings of the research, together with any other significant events and options for new work.

The environmental impacts of food production are complex and accumulate throughout a supply chain from primary production to processing, packing, distribution, retail and end use (consumption and waste management). The potential environmental effects are numerous and can have a range of direct and indirect impacts, both positive and negative. There are a number of drivers that can help reduce these impacts including legislative instruments, retail marketing and consumer choices and demand. One driver that has received attention in recent years is the use of product labels, whereby the environmental 'credentials' of a product are communicated to the consumer. This may be on a single issue, e.g. its carbon footprint or on multiple issues (omni-labelling). However, the science and practice of using labels to drive changes in consumer and industry behaviour is complex. There are many issues to resolve including their scientific credibility and robustness, and how consumers understand and use them in practice. Consequently, in response to the above issues and a number of policy drivers, this project was commissioned by Defra. The project was undertaken by the Agriculture and Environment Research Unit (AERU) at the University of Hertfordshire, in collaboration with the Policy Studies Institute (PSI) and the Food Ethics Council (FEC).

The objectives of the project were to:

- Provide a current view on the use of environmental labels on food (and other) products based on a review of existing literature on industry impacts, effects on consumers and the scientific basis of environmental labelling.
- Identify the key issues and challenges associated with assessing, integrating and communicating environmental impacts within the context of what is required for a scientifically credible and robust labelling scheme.
- Identify the effectiveness, benefits and burdens of labelling as a mechanism for raising awareness of environmental issues and driving behavioural change , through a consultation exercise with industry and consumer behaviour experts including interviews, a one-day workshop and the use of a multi-criteria mapping (MCM) process.
- Identify guidelines for a credible and robust label that is effective and practical for consumers and

industry via the development of a framework for practical and effective environmental labelling of food products.

- Consolidate the findings of the research and make recommendations on the feasibility of an environmental labelling scheme for food currently and in the future.

The literature review showed that the amount of work that is ongoing regarding environmental labelling (also referred to as eco-labelling within this report) is very considerable and interest is growing worldwide. The amount focussing on eco-labelling for food products is also growing but it is relatively small compared to other industry sectors, and especially with respect to outcome-based labels and communicating multiple environmental issues on products. The low number of food eco-labels is due to a number of factors including the diversity of food products and production systems; the complexities of determining environmental impacts, issues involved in communicating environmental information to consumers via product labels including issues of trust, preferences and motivations, and the lack of evidence showing that labels can help deliver environmental benefits. The majority of existing food eco-labels are based on the promotion of best-practice and do not quantify emissions or impacts, primarily for reasons of practicality and cost. Therefore, they do not make claims that any direct, product-specific, environmental benefits have been achieved. Many new schemes and initiatives are following a practice-based approach though there are exceptions, such as Earthsure in the USA, which uses an outcome-based approach.

The analysis of the key issues associated with measuring, assessing and communicating environmental impacts considered issues relating to how environmental impacts are communicated. For the majority of impact categories, measurement and assessment techniques suffered from a range of problems including their subjectivity, lack of transparency, uncertainty, unjustified assumptions, data deficiencies, and lack of validation. A considerable amount of scientific development and debate towards achieving standardised techniques for measuring and assessing environmental impacts is required before a robust outcome-based omni-label for food could be a reality (even for food with more simple production chains, such as fresh produce, meat, eggs and milk).

The consultation exercise with industry and consumer behaviour experts explored the effectiveness of labelling as a mechanism for raising awareness of environmental issues and driving behavioural change (amongst consumers and industry). It also enabled an assessment to be undertaken of the key benefits and burdens to both consumers and industry of potential labelling schemes. One conclusion arising from this work was that if the primary goal of a labelling scheme is to change industry behaviour across the sector, then labelling would have a limited role to play compared with other policy options, including regulation. By implication, government's role in relation to labelling might be limited to facilitating and co-ordinating schemes emerging from the private and third sectors and/or co-ordinating efforts at the EU level. An alternative is that the primary objective is to change consumer purchasing behaviour where labelling might be seen as a means of engaging consumers with environmental or sustainability messages. If this was the objective, then a balance would need to be struck between sufficiently addressing environmental issues yet not being so burdensome that it was unworkable. A practice-based approach was widely considered legitimate by the experts in pursuing the objective to change consumer behaviour, but this objective was considered a less effective means of achieving substantial environmental improvements than if the scheme objective was to change industry behaviour. It was also agreed that given current levels of public environmental awareness and concern, environmental labels will not be used by all consumers during food purchasing.

The project findings were consolidated into a framework for effective and practical environmental labelling for food products. The purpose of this framework is to provide a basis for identifying opportunities to improve existing (or designing new) labelling initiatives from the perspective of practicality and effectiveness. The framework consists of 14 guidelines that together seek to ensure that any labelling scheme developed has clear objectives, that the drivers and mechanisms by which those objectives are delivered are understood, that the scheme is practical and cost effective and, finally, that aims and outcomes are clearly communicated in a manner that is best suited for its intended audience. The framework has been illustrated using four different labelling schemes as examples to demonstrate how the guidelines can be applied.

Our principal conclusion from the work that has been undertaken in this project is that we do not believe that the science is sufficiently robust to develop an outcome-based, environmentally broad, omni-label at this time. Additionally, the costs that such a scheme may incur could be unacceptably high in relation to the potential benefits that could be realised, particularly since there is lack of evidence on how effective labels are as a tool to stimulate change. There will continue to be a role for environmental labelling alongside other initiatives to improve the sustainability of food production and consumption. For example, within industry, food chain information, including environmental impact data, can be valuable to help manage issues and identify areas for improvement, and for consumers, labelling can educate and empower them to make informed choices through provision of information in relation to food. However, efforts to reduce the environmental impacts of food should not focus primarily on labelling as this is unlikely to deliver desired outcomes on its own. Labelling should be part of an integrated suite of initiatives, including government regulation and industry schemes, designed to bring about the delivery of desired outcomes. There are a number of existing initiatives with respect to labelling both within industry and more internationally, such as within the EU. Therefore, the main role for government in relation to environmental labelling should be to harmonise and improve existing schemes rather than develop a new outcome-based omni-label. On this basis, we have formulated a number of recommendations for potential ways forward. These have been split between those that apply to businesses and third sector organisations involved in labelling and those that apply to government, though a number would in practice involve these sectors working together:

Businesses and third sector organisations:

1. The framework developed in this study should be used to identify potential improvements in existing schemes or to develop new schemes, helping to ensure that schemes are practical, effective and honest and can withstand scrutiny by consumers and trading standards.
2. If the primary objective is to improve environmental performance within the industry, labelling schemes should be linked to actual environmental performance and outcome-based measurement.
3. Monitor the effects of schemes against their performance objectives and make the findings publicly available to facilitate research and scrutiny and share best and successful practice.
4. Ensure schemes are sufficiently flexible to reflect site-specific needs and priorities within the performance metrics used.
5. When designing and implementing schemes, consider multiple environmental impacts and wider sustainability issues such as economic and social considerations (Guideline O1) and undertake impact assessments to identify any potential positive or negative impacts (e.g. unemployment).
6. Participate and engage in initiatives that support consumer understanding of environmental labelling, for example by promoting awareness of specific impact categories.
7. Participate and engage in initiatives to harmonise methods, standards, metrics and communication used in environmental labelling.

Government:

8. Work to improve environmental labelling, through supporting scientific development and debate towards achieving standardised techniques for measuring and assessing environmental impacts.
9. Work with schemes to ensure labelling is always presented in context with respect to other initiatives that are in place to tackle impacts arising from food production.
10. Play a leading role within UK, EU and international initiatives to harmonise approaches to labelling, seeking to co-ordinate and facilitate action by businesses and other stakeholders.
11. Explore with stakeholders the potential for government to assist in co-ordinating efforts to pilot improved environmental labels that address key limitations identified in this research.
12. Explore with stakeholders the potential for financing co-ordinated research and harmonisation.

A number of the recommendations involve industry and government working together (Recommendations 6, 7, 8, 9, 10, 11 and 12). One approach to these would be to undertake one or more collaborative pilot projects to explore key scientific and socio-economic challenges associated with understanding and communicating the impacts of food products using environmental labels. This work

would identify a product that has a relatively small and contained production chain (from farm to fork) which has the potential to be studied in detail, for example, local fresh produce; exploring what outcome-based metrics can be measured and the site-specific nature of any impacts; identifying the practicality and costs of undertaking the measures, including any socio-economic impacts; identifying other initiatives that are in place which also tackle the same issues; and communicating the information liberated from the study on an experimental label. Over a period of time a number of impact categories could potentially be addressed, which would be a step forward to improving the science required for omni-labelling, which this study has identified as lacking. It will also provide a much clearer picture on how effective and what influence labelling as a tool can have with respect enabling progress towards more sustainable production and consumption in relation to other initiatives such as government regulation.

Project Report to Defra

8. As a guide this report should be no longer than 20 sides of A4. This report is to provide Defra with details of the outputs of the research project for internal purposes; to meet the terms of the contract; and to allow Defra to publish details of the outputs to meet Environmental Information Regulation or Freedom of Information obligations. This short report to Defra does not preclude contractors from also seeking to publish a full, formal scientific report/paper in an appropriate scientific or other journal/publication. Indeed, Defra actively encourages such publications as part of the contract terms. The report to Defra should include:

- the scientific objectives as set out in the contract;
- the extent to which the objectives set out in the contract have been met;
- details of methods used and the results obtained, including statistical analysis (if appropriate);
- a discussion of the results and their reliability;
- the main implications of the findings;
- possible future work; and
- any action resulting from the research (e.g. IP, Knowledge Transfer).

Contents

1.0. Background

The environmental impacts of food production are complex and accumulate throughout a supply chain from primary production, processing, packing, distribution, retail to end use (consumption and waste management). The potential environmental effects are numerous and can have a range of direct and indirect impacts, both positive and negative. The effects/impacts include greenhouse gas emissions and climate change, damage to wildlife habitats and biodiversity, pollution of water, soil and air and consequent degradation of the quality of these media, landscape degradation, the production of waste and its consequent disposal and the consumption of non-renewable or scarce resources. There are a number of drivers that can help reduce these impacts including legislative instruments, retail marketing and consumer choices and demand. One driver that has received attention in recent years is the use of product labels, whereby the environmental 'credentials' of a product are communicated to the consumer. This may be on a single issue (e.g. its carbon footprint) or on multiple issues. In relation to the latter, the concept of omni-labelling has emerged. Omni-labels seek to convey information on a range of different environmental impacts (and ethical issues), integrating these into a single, easy to understand format. However, the science and practice of using labels to drive changes in consumer and industry behaviour is complex. There are many issues to resolve including their scientific credibility and robustness, and consumer perception of what such labels actually mean and how they are used.

This project was commissioned by Defra to the Agriculture and Environment Research Unit (AERU) at the University of Hertfordshire, in collaboration with the Policy Studies Institute (PSI) and the Food Ethics Council (FEC) to investigate the current use of environmental labels (also referred to as eco-labels within this report) in food and the scope and value of developing wider environmental omni-labels. The project had the following objectives:

1. Provide a current view on the use of environmental labels on food (and other) products based on a review of existing literature on industry impacts, effects on consumers and the scientific basis of environmental labelling.
2. Identify the key issues and challenges associated with assessing, integrating and communicating environmental impacts within the context of a product label.
3. Identify the effectiveness, benefits and burdens of labelling as a mechanism for raising awareness of environmental issues and driving behavioural change (consumers and industry).
4. Identify guidelines for a credible and robust label that is effective and practical for consumers and industry via the development of a framework for practical and effective environmental labelling of food products.
5. Consolidate the findings of the research into a set of key requirements for an environmental labelling scheme for food and make recommendations on the feasibility of such a scheme currently and in the future.

The project considered three main themes of environment, consumers and industry, which ran through the project's five main approaches (see below). The project involved evaluating and assessing large amounts of information relating to environmental labelling and generated a large amount of information. This report focuses on drawing out the main conclusions and findings. Each of the approaches and their respective findings are described in full detail in associated Appendices A, B, C and D, with summaries of each task presented in this report.

2.0. Overview of the methodology

The methodology adopted was based on three themes of environment, industry and consumers and included five main approaches:

1. Review of literature and food labelling (from here on referred to as "the literature review");
2. Analysis of environmental impacts and their integration and communication (from here on referred to as "the analysis of environmental impacts");
3. Assessment of labelling in the context of consumer and industry behaviour, and the costs and benefits to industry (from here on referred to as "the consultation exercise");
4. Development of a framework for practical and effective environmental labelling (from here on referred to as "the framework");
5. Recommendations and reporting (from here on referred to as "the recommendations").

As well as delivering outputs of their own (see Appendices A, B and C), the findings of the literature review, the analysis of environmental impacts and the consultation exercise provided the knowledge upon which the framework for environmental labelling schemes for food (Appendix D) was developed and which, consequently led to the identification of our recommendations.

3.0. The findings

3.1. Literature review

A comprehensive literature and data review was undertaken to consider the main aspects related to environmental labelling:

- The scientific basis of environmental labelling on food products;
- How labelling can be used as a policy tool to influence consumer behaviour;
- How labelling can affect industry behaviour and the impact such schemes may have on industry in terms of the costs and benefits;
- A review of existing labelling schemes for both food and non-food products. This included examining the different types of labels that exist, their role in the context of consumer and industry behaviour, and patterns of consumption;
- Other ongoing global initiatives and developments including revisions to the EU eco-label, the European Food Sustainable Consumption and Production Round Table, some specific activities in France, Sweden, Japan and New Zealand, the Global Eco-labelling Network and other initiatives such as some of the labelling ideas produced by Sustain UK.

The full review together with the associated bibliography is included in Appendix A of this report. 70 labelling schemes were examined and about 20 of these related to food products. A selection of the schemes reviewed is shown in Table 1.

Table 1. A selection of labelling schemes included in the review				
Scheme, Country (year started)	**Type[1]**	**Food**	**Issues[3]**	**Notes on use and uptake**
Casino Carbon Index, France (2008)	II	Yes	Single	100 products
Genetech Free, Germany	II	Yes	Single	Unknown
CarboNZero, New Zealand (2001)	III	Yes	Single	Working with over 200 companies
Earthsure, USA (2000)	III	Yes	Multiple	Unknown
Carbon Reduction Label, UK (2007)	III	Yes	Single	25 products
CarbonCounted, Canada	III	Yes	Single	Unknown
IFOAM Organic Production, Global (1972)	IV	Yes	N.A.	Accredits organic certifiers in over 100 countries
Fairtrade, Global (1997)	IV	Yes	N.A.	Certified producer organisations in 58 countries, representing over 1.2 million farmers and workers
Marine Stewardship Council, UK (1999)	IV	Yes	N.A.	1,200 processors and traders have undergone certification
Soil Association, UK (1946/1973)	IV	Yes	N.A.	Responsible for certifying over 80% of all organic products sold in the country
Dolphin Friendly / Dolphin Safe / Salmon Safe, Canada, Europe, USA (1990)	IV	Yes	N.A.	Certified produce now distributed in over 200 stores in USA
LEAF Marque, UK and Global (1991)	IV	Yes	N.A.	810 growers in 47 countries, 273685 ha, 18% of UK fruit and vegetables
KRAV, Sweden (1985)	IV	Yes	N.A.	4.1% of Sweden's agricultural area
SMK, Netherlands[2]	IV	Yes	N.A.	Unknown
SMK, Netherlands (1992)	I	No	Multiple	150 major organisations are certified
EU Eco-Label Award Scheme, EU (1992)	I	No	Multiple	At the beginning of 2010, more than 1000 EU Ecolabel licences were awarded
The Blue Angel, Germany (1978)	I	No	Multiple	~10,000 products and services in 80 product categories
The Nordic Swan, Nordic countries (1989)	I	No	Multiple	65 different product groups
Bra Miljöval, Scandinavia (1988)	I	No	Multiple	Covers 12 product areas
Umweltzeichen Bäume, Austria (1990)	I	No	Multiple	Around 200 products
Environmental Choice, Canada (1988)	I	No	Multiple	13 product and service categories
NF Environment, France (1991)	I	No	Multiple	Unknown
Green Seal, USA (1989)	I	No	Multiple	40 major product categories covered
Thai Green, Thailand (1993)	I	No	Multiple	45 product categories, 380 products across 61 companies
Vitality Leaf, Russia (2001)	I	No	Multiple	Unknown
AENOR Medio Ambiente, Spain (1994)	I	No	Multiple	450 products in 12 product groups
Eco Mark, Japan	I	No	Multiple	45 product categories
Environmental Choice, New Zealand & Australia (1990)	I	No	Multiple	2000 products
Kela Eco-Label, Republic of Korea	I	No	Multiple	Unknown
Environmentally Friendly, Croatia (1993)	I	No	Multiple	Unknown
Green Label, Singapore (1992)	I	No	Multiple	135 products
TCO Certified, Europe/Global (1992)	I	No	Multiple	1500 products, 10 product categories
EPEAT, USA (2005)	I	No	Multiple	Used in 40 countries worldwide
GreenGuard, USA (2001)	I	No	Multiple	Unknown
EU Energy (1992)	II	No	Single	EU regulatory requirement for white goods

Table 1. A selection of labelling schemes included in the review				
Scheme, Country (year started)	**Type[1]**	**Food**	**Issues[3]**	**Notes on use and uptake**
WELS Scheme, Australia and New Zealand (2006)	II	No	Single	Unknown
Energy star, USA, Australia, Canada, Japan, New Zealand, Taiwan and the European Union (1992)	III	No	Single	60 product categories
WaterSense, USA (2006)	III	No	Single	1500 partners and 2000 labelled plumbing fixture models
Forest Stewardship Council, Global (1993)	IV	No	N.A.	Unknown
PEFC, Global (1999)	IV	No	N.A.	210 million hectares of certified forests
OK Power, Germany (2000)	IV	No	N.A.	Unknown
100% Energia verde, Italy	IV	No	N.A.	6 producers and 93 other clients have obtained the label
SmartWood, Global (1989)	IV	No	N.A.	800 operations and 25 million acres worldwide
Chlorine-Free, USA (1997)	IV	No	N.A.	27 products and companies

Notes:

1. **Type I**: LCA Eco-labels (DIN EN ISO 14024): Type I labels are normally voluntary, multi-criteria based, third party verified schemes that award a licence to use the scheme label/logo for specific products or services that meet prescribed standards based on a life cycle assessment approach including, for example, energy and water consumption, emissions, disposal, etc. The standards and scheme criteria are usually developed through the involvement of stakeholders and awarded after an independent process of verification.
   Type II: Self-declared environmental claims (DIN EN ISO 14021): This type of label is the most widely used to provide environmental information to consumers and other stakeholders. According to the official ISO definition, they are not awarded or verified by an independent authority but usually developed internally by companies and tend to take the form of a declaration, a logo, a commercial, etc. For example: 'made from x% Recycled materials', 'Biodegradable', 'Recyclable' or 'Free from chlorine'.
   Type III: Environmental impact labels (DIN EN ISO 14025): Type III labels are one of the most detailed forms of providing environmental information and, like Type I, are based on life cycle impacts. These types of labels are product specific and do not normally assess or weight the environmental performance of the products they describe but only the raw data, such as the quantity of emissions, is provided. Their evaluation is left to the consumer. Many of the carbon labels fall into this category whereby the amount of CO_2 eq. emitted (as g/unit) is provided on the label.
   Type IV: Environmental impact labels (No ISO standard): Type IV labels go beyond the ISO Type II definition and do undergo a form of independent verification by a third party but do not rely on a life cycle assessment approach or actual measurements. These labels are generally based on a set of 'best practice' criteria or standards that are used to differentiate the product from main stream products, usually on the basis of the reputation of the organisation issuing the label. For example, the Forest Stewardship Council certifies that labelled products are from forests managed to a specific set of protocols. An auditing process is undertaken to verify compliance and add credibility but a life cycle assessment of practices and their environmental impact is not undertaken.
2. **SMK** operates as a Type IV for food products, but Type I for all other products.
3. **Single** means that only one impact area is covered by the label.
   Multiple means that two or more impacts areas are covered by the label.
   N.A. means that the impact areas covered by the label are unknown, not available or not applicable.

The review showed that the amount of work that is ongoing regarding environmental labelling is very considerable and interest is growing worldwide. The amount of work focussing on food products is also growing but is relatively small compared to other industry sectors, especially with respect to Type I, II and III labels and communicating multiple environmental issues. The lack of Type I, II and III food eco-labels can be explained by a number of factors including the diversity of products and production systems; the complexities of determining environmental impacts; issues involved in communicating environmental information to consumers via product labels and the use of labels by consumers, including matters of trust, preferences and motivations; and the lack of evidence showing that labels can help deliver environmental benefits (as it is difficult to differentiate the influence of labels amongst many other drivers, such as regulatory or other market influences).

The majority of food eco-labels that are currently in use are based on the promotion of industry best-practice (see Table 1) and do not quantify product-specific emissions or impacts. This practice-based approach relies on links between farming practices and environmental benefits. The achievement of environmental benefits will depend upon the stringency of the scheme standards and on site specific parameters. However, the link between specific practices and the delivery of environmental benefits may be complex, indirect and, in some

cases, not fully understood. As such, the labels that are placed on food products from farms achieving certification under these schemes do not directly imply that environmental benefits have been achieved. This approach is generally less costly and more practical than an outcome-based approach, and can be appropriate where the objectives of a scheme do not rely on measuring product-specific impacts or communicating these to consumers. Indeed, in communicating environmental performance to consumers, it is important that the limitations of any scheme are respected and perhaps more importantly not exaggerated. For example, it is not appropriate to claim on the basis of on a carbon neutral label that a product has "no negative impact on the environment", e.g. the statement shown in Box 1 comes from a 'carbon neutral' bottle of olive oil (the name of product and organisation have been removed for reasons of anonymity, given this is a direct criticism of their label). A key part of credibility is honesty, which can be lost by misleading or exaggerated claims.

Box 1. Statement on a label on a 'carbon neutral' bottle of olive oil

"**Carbon Neutral Olive Oil**

Climate Change is a reality that demands a higher level of responsibility from all of us. *Product Name*, recognising the importance of this issue, has minimised its impact on the climate by completing a unique initiative to offset the carbon emissions of its olive oil products in co-operation with *Organisation Name*. This way, our *Product Name* olive oils have become **Carbon Neutral**, meaning that they have no negative impact on the environment."

While many of the new schemes and initiatives being introduced are also following a practice-based approach there are exceptions, such as Earthsure in the USA, which is based on Life Cycle Assessment and utilises Environmental Product Declarations (see Section 2.1.4 in Appendix A).

The proliferation of existing labels has also resulted in a drive for greater harmonisation and normalisation between eco-labels to help reduce confusion both within industry and by consumers. For example, revision of the EU Eco-label is including measures to encourage harmonisation with other environmental label schemes. As such, any new schemes or frameworks may need to examine how they fit in relation to other schemes to ensure they are harmonised.

Finally, the credibility and transparency of an environmental label to consumers and industry is crucial. Many of the labelling schemes considered in the review document rely on Life Cycle Assessment (LCA) (for non-food products) as a technique to underpin the scheme or on practice-based measures (for food products). LCA is generally recognised as one of the most credible approaches available for quantifying environmental performance. From the literature one could be forgiven for thinking that the underlying measurement and assessment techniques are therefore fully robust and well-established. However, in reality they are far from perfect (see the analysis of environmental impacts) and consequently the lack of adequate techniques often results in important impact areas being excluded from labelling schemes. This is a critical issue, as the absence of any significant impacts from an environmental label could not only be misleading to consumers, but could also externalise that impact from the market and thus require Government intervention to address it.

3.2. Analysis of environmental impacts and their integration and communication

The objective of this project's analysis of environmental impacts was to identify the key issues and challenges associated with assessing, integrating and communicating environmental impacts within the context of a product label. When an environmental labelling scheme makes product-specific or a wider claim about environmental performance, it should be underpinned by robust and appropriate techniques for measuring, attributing, aggregating and communicating environmental impacts. This is important not only for consumer confidence in the label, but also to ensure that the production chain is driven in a sustainable direction. If the evidence underpinning a label is incorrect or the labelling system itself is flawed, this could result in an incorrect perception of the environmental impact of a product. Consequently this can mislead to the extent that

consumer purchasing decisions are made on the basis of flawed information, the label becomes meaningless and/or environmental issues are not properly addressed. This project identified environmental impact categories, sub-impacts and effects; the techniques available to measure and assess the impacts; the types of data and information available; the techniques available to communicate the impact and any meaningful baselines to place impacts in context.

A key theme throughout this analysis was the aggregation of information and data. Environmental assessments inherently involve large amounts of data that needs to be analysed, assessed and presented in a form to aid the original purpose of the assessment, which is usually to support decision making in one form or another. This typically involves taking all the information and data associated with the environmental effects of a product over its lifecycle and, through a process of analysis and aggregation, distilling the findings into a small set of impact areas or categories.

A full description of the work undertaken and its findings together with the associated bibliography is included in Appendix B of this report. For completeness, a brief description of the work is given below together with a summary of the key findings.

A key aspect of any environmental label is to determine which impacts should or could be covered. Some of the key issues such a label should include are greenhouse gases, energy use, waste, biodiversity, air and water quality impacts and water use, and there are potentially many more. The first section of Appendix B introduces the range of impact areas which may need to be considered by an environmental label and different impact assessment techniques and approaches, each of which has their own process steps and phases. However, generally, any impact assessment process can be split into the following sections or stages:

1. Stressors: These are the actual recorded, observed, calculated or modelled effects associated, in this instance, with the full life-cycle of a food product. They can include quantitative data such emissions of pollutants and toxic substances, which would form part of the inventory phase of an LCA (LCI results), but can also include qualitative information.
2. Effects or mid-point impact categories: These are identifiable, and usually quantifiable, effects associated with the measurements (from stage 1) and usually involves some aggregation. For example, converting emissions of different greenhouse gases into a common measure of Global Warming Potential (GWP) using carbon dioxide equivalents. This often referred to as a process of impact characterisation.
3. Damage or endpoint impact categories: These are the end consequences of the effects identified in Stage 2 and this process aims to place the effect on a scale of damage caused, for example in terms of biodiversity this might be the Potentially Disappeared Fraction of a species or group of species as a consequence of an ecotoxicity effect identified in Stage 2, due to an emission of a toxic substance identified in Stage 1. This process may involve some further aggregation, for example combining all biodiversity impacts in stage 2 (e.g. ecotoxicity, eutrophication, acidification, etc.) in a single damage category of ecosystem health. This is often referred to damage characterisation.
4. Normalisation: This stage aims to place the impacts in context with respect to the contribution that the impact of the product has in relation the entire impact being observed. Normalisation can be applied to the outputs of either Stages 2 or 3. For example, emissions of greenhouse gases for a product could be compared to the total emissions of greenhouse gases for a region, e.g. Europe, and/or can be further normalised by examining this data on a per head of population – so in terms of a food product its GWP could be expressed as a percentage of the total GWP for an average person in Europe per year.

Many environmental assessments do not go beyond Stage 2 and those which do tend to be academic or experimental and not used in practical decision making. This is because there are inherent difficulties associated with damage characterisation and normalisation. There is a lack of established techniques and data which in combination with additional aggregation and the site-specific nature of many impacts can make the assessment less transparent and more uncertain. However, being able to place any impacts in context, e.g. with meaningful baselines, and communicating those impacts, is important within the context of an environmental label for food.

Section 2 of Appendix B covers the common Stages of 1 and 2 and explores the measurement, assessment and characterisation techniques available. The following impact areas are considered in the report:

- Air quality
- Biodiversity
- Climate change
- Landscape and heritage
- Noise, odours and dust
- Resource depletion
- Stratospheric ozone depletion
- Waste management
- Water quality
- Soil quality

For each of these impact areas the background to the issues is summarised and the stressors and impact categories identified. The techniques available to measure and assess the stressors and impacts are then explored. This includes identifying the source of data that is used to describe the effects of a product during its lifecycle.

Section 3 of Appendix B considers how environmental damage may be assessed and explores the scientific credibility of some of the more common approaches such as the 'distance to target' approach, the 'damage function' approach, environmental valuation techniques, panel and scoring methods and also discusses the metrics and aggregation techniques employed within the different approaches such as the Disability Adjusted Life Years (DALYs), Toxicity Equivalent Potentials (TEP) and Human Toxicity Potential (HTP) that are used to communicate human health-related impacts. Other aggregation techniques discussed include methods for evaluating and communicating ecological risks such as Toxicity Exposure Ratios, Potentially Disappeared Fraction (PDFs) and Potentially Affected Fraction (PAFs) and, with respect to Natural Resources, how availability, scarcity and depletion may be measured and communicated. Section 3 also discusses issues relating to normalisation, data uncertainty and transparency. Finally a number of example techniques and models are considered including the Ecoscarcity method, the Dutch and Swedish Environmental Theme (ET) approach, the Environmental Priority Strategy technique, the EcoIndicator99 model and the USETox model.

The work undertaken in the analysis of environmental impacts has shown that extensive research, development and application has been undertaken globally on Life Cycle Assessment and the methodology is vitally important to both government and industry. However, despite this, both the LCA mid-term impact assessment stages and the final damage assessment and/or normalisation processes have a great number of both practical and theoretical problems still to be resolved if they are to be successfully used in the context of an environmental label. These include:

- With the exception of greenhouse gas emissions (BSI, 2008) there is a severe lack of scientifically credible techniques that have been tested, standardised and accepted by the scientific community.
- Methods that are in common use for damage assessment, characterisation and normalisation are prone to subjectivity, uncertainty and unjustified assumptions.
- The work undertaken has concluded that the use of LCA techniques within the context of an environmental label should be limited to the mid-point phase as, although desirable, damage characterisation is currently undeveloped.
- Communication of multiple environmental impacts that are scientifically complex on an environmental label would be very difficult and require aggregation and considerable simplification. Aggregation techniques themselves are highly complex and, whilst they have been used in academic applications, they are insufficiently tested and validated and have not been widely accepted by the scientific community to enable them to be used with confidence on an environmental label. Composite impacts are not transparent and there is the risk of losing data resolution.
- There is a lack of appropriate data available. In many instances the data necessary to measure and/or calculate mid-point impacts and/or damage cannot be measured easily, reliably or cost effectively. They are also subject to large uncertainties. Data availability should improve over time (based on a combination of improvements in science and techniques and increasing consumer, industry and regulatory pressures, e.g. as has been observed with carbon labelling) and thus enable calculation of more impacts and with a greater degree of certainty.
- Data sets are not harmonised in terms of their spatial or temporal characteristics. Environmental issues significant in one location may not be so important in a different location.

The technical issues outlined above, in combination with cost issues, are part of the reason why many existing labels for food (see section 3.1) are practice-based. There are some which are more outcome-based but which focus on single issues, such as carbon, where the techniques are more established. It may be possible to create

an 'omni-label' using a combination of practice and outcome-based metrics, where practice-based metrics are used when outcome-based metrics are not viable. For example, outcome-based metrics for biodiversity are currently relatively undeveloped, so using membership of Entry Level or Higher Level Stewardship (ELS or HLS) as a metric for biodiversity may be an option. However, such measures are not equivalent to direct, product-specific measures of outcome. So although this may be 'possible' to do, it is scientifically unsound and would therefore be detrimental to credibility. There would also be a danger of misleading consumers if surrogate measures were to be presented alongside (or in combination with) outcome-based metrics within the context of an omni-label, as the fundamentally different approaches to the environmental assessment for different impact categories would not be apparent without detailed explanations.

Our opinion is that a considerable amount of scientific development and debate towards achieving standardised techniques for measuring and assessing environmental impacts would be required before an outcome-based and product-specific omni-label for food could become a reality, particularly if it was to be used for a statutory application. However, it may be possible to begin with some simple measures for a voluntary application particularly if the scheme and its associated label were designed to be flexible and expandable (see recommendations). Carbon labelling is perhaps a good example where this is already taking place, with the development of standards, such as PAS 2050 (BSI, 2008), and there may be scope to develop similar approaches for other impacts areas, such as water use. Additionally, there is a clear role for government in regulating and standardising the metrics that are used within eco-labelling schemes. In so doing this would help ensure that measurement techniques used by different labels are harmonised, thus facilitating more reliable and credible product comparisons by consumers.

3.3. Assessment of labelling in the context of consumer and industry behaviour and the costs and benefits to industry (consultation exercise)

The aims of this task were first to identify the effectiveness of labelling as a mechanism for raising consumer awareness of environmental issues and driving behavioural change, and second, to identify the key benefits and burdens to the agricultural and food industries of existing and potential new labelling schemes. These share the common goal of exploring how different groups of people could respond to environmental labels and the variables most likely to influence that response. They are also interrelated, as consumer responses could affect the costs and benefits of labelling to industry, while industry behaviour in relation to labelling will affect the choices available to consumers. We have therefore addressed these with a single task.

Understanding how consumers would respond to labelling is clearly crucial to understanding its effectiveness as a mechanism for raising awareness and driving behavioural change. Previous research has proven that merely asking consumers how they respond to labelling, even in in-depth interviews, is an ineffective means of gauging 'real world' consumer responses. Given the resources available for this project, the most cost-effective way of exploring the potential impact of labels on consumer behaviour was to gather opinion from a diversity of food marketing and consumer behaviour experts, and to involve these stakeholders when considering the impact of labelling on industry.

The methodology used in this part of the project centred on interviews and a workshop to explore the experiences and views of experts and practitioners in industry and consumer behaviour. Thirty people took part in interviews based on an approach called Multicriteria Mapping (MCM), which uses a deliberative software tool to identify and rank stakeholder perceptions of a range of policy options. MCM elicits the factors that stakeholders regard as important in influencing their preferred policy choices. One of the strengths of the MCM analysis is that it makes explicit the variation in how different experts and stakeholders weight a diversity of evaluation criteria. Twenty-eight stakeholders and experts, including some who had been interviewed, took part in a deliberative workshop designed to: feedback to all participants on the preliminary findings from the MCM interviews and to provide attendees with an opportunity to add, refine and challenge these; and consider key questions emerging from the interviews and how they might relate to scheme attributes and consumer or industry behaviour.

A full description of the work undertaken and its findings can be found in Appendix C of this report. However a short summary has been provided here.

3.3.1. Consumer and industry behaviour

The interviews and the workshop offered insights into the effectiveness of labelling as a means of enabling businesses and consumers to change behaviour in ways that reduce their impact on the environment. A key theme was that changing industry and consumer behaviour are distinct objectives: the policy options that work best for one will not necessarily work best for the other. Clarity on the objectives and the role envisaged for labelling is therefore crucial for identifying the best approach.

Changing industry behaviour was seen as the more important goal in contributing to substantial, direct and large scale improvements in environmental impact. However, a tension would be faced in using labelling to pursue this goal. While increasing the scope and supply chain coverage, and focusing on measurable outcomes of a scheme, would all contribute to its effectiveness in environmental terms, those same features would militate against its feasibility (because greater resources would be required for performance metrics) and increase the risk of unintended consequences. For example, cold storage (which may be viewed negatively from an environmental perspective due to its energy and refrigerant use) can buffer food businesses against supply and demand fluctuations and can therefore potentially reduce food waste, and so there is a trade-off to consider between two environmental issues.

It was therefore suggested, by workshop and interview participants, that changing industry behaviour across the sector was the primary goal, then labelling would have a limited role to play, compared with other policy options, such as regulation. An alternative objective is to change consumer behaviour and empower consumers to make informed choices through provision of information in relation to food purchasing or more broadly. Labelling might be seen as a means of engaging consumers with environmental or sustainability messages. If this was the objective, then a balance would need to be struck between a scheme bearing a sufficient relationship to environmental impacts that it was meaningful and trustworthy, yet not being so burdensome as to be unworkable. A practice-based approach was widely considered legitimate (by industry and consumer experts) for changing consumer behaviour, but changing consumer behaviour was considered less relevant to making substantial environmental improvements than changing industry behaviour. This reflected the experts' opinions that interventions in supply chains (e.g. 'choice editing') are more reliable than consumer-facing interventions in contributing to substantial, direct and large scale improvements in environmental impact.

Stakeholders from a range of perspectives recognised that labels only appeal to a small consumer segment, the size of which depends on the type of label. More complex labels were seen as likely to appeal to those who are very engaged with environmental issues, whereas simpler labels can have broader appeal but would not necessarily enable the most engaged consumers to make the informed choices that they would like. A contrast was drawn between consumers who just want reassurance that minimum standards have been met and those who want to be able to make decisions about trade-offs.

3.3.2. Costs and benefits of labelling

The primary potential benefits of labelling lie in it improving environmental performance. The secondary potential benefits include economic rewards for participating sectors and for businesses that supply services to support labelling, such as environmental auditing.

Participants in this work considered the potential costs of labelling to include the up-front costs in research and scheme design, ongoing costs of implementation, participation and enforcement, and opportunity costs. The main areas of ongoing cost identified in the research were: auditing; accreditation; infrastructure; repackaging; and enforcement.

These ongoing costs associated with labelling itself were distinguished from the ongoing costs that might accrue to the supply chain or consumers in improving their environmental impact, driven by labelling. While it would be appropriate to seek to reduce the direct costs of labelling, increases in the price of food that arose from

internalising environmental externalities (by passing on higher production costs to the consumer) might be regarded as a positive outcome of labelling.

The opportunity costs of labelling include the restrictions that labelling might impose on: the flexibility of businesses' supply chains, for example to cope with disruption; and market access for small businesses. A particular concern was that labelling would carry disproportionate costs for smaller businesses, though measures were suggested to address this including:

- Providing financial assistance for smaller businesses.
- Designing a scheme to be practice-based not outcome-based (or a mixture) to make it easier for small business to take part. Practice-based standards and auditing levels could be proportionate to the size of the business or scale of production involved.
- Ensuring the compliance processes utilised or complemented the existing processes for data collection and management used by small businesses, or dramatically improved resource efficiencies such that the cost of participation was offset by significant savings.
- Market incentives for taking part, for example gaining extra revenue from 'premium products', though this would not work for a very widespread voluntary or mandatory scheme.

During the consultation, and in the original project specification, an issue was raised with respect to the potential impact on and benefit to importers and exporters of food from a labelling scheme. It was suggested that since the UK would be just one of many markets for major multinational companies, they would be unlikely to join a voluntary scheme implemented by the UK. Meanwhile, when UK manufacturers make products they do not necessarily know whether they are going to a domestic or export market, which can present difficulties in managing the need for labelling on some products but not others. There were also some concerns about the effect of labels on UK competitiveness in export markets. However, the consultation responses from participants engaged in exports did not highlight these as major concerns.

3.4. Development of a framework for practical and effective environmental labelling

The objective of the work undertaken in this task was to identify guidelines for a credible and robust label that is effective and practical for consumers and industry via the development of a framework for practical and effective environmental labelling of food products. The literature review, analysis of environmental impacts and consultation exercise identified the issues involved with respect to scientific and technical approaches to environmental labelling, the potential of such a label as a driver for change both in terms of the behaviour of consumers and stakeholders in the supply chain, and the likely costs and benefits to the industry. This task aimed to distil and integrate the key findings from the previous project work into a logical and systematic framework to generate a set of guidelines that any labelling scheme for food should aim or aspire to follow. In so doing this would provide a framework for a practical and effective labelling scheme for food. The findings are very diverse, covering environmental, social and economic aspects, so distilling them into a common framework and set of guidelines has not been an easy task, especially as many aspects are interrelated. However, a generic framework has been developed and is described in full in Appendix D and is summarised below.

The purpose of the framework is to provide a basis for identifying opportunities to improve existing (or designing new) labelling initiatives from the perspective of practicality and effectiveness. The guidelines within the framework can be used by those examining labelling schemes (in industry, the third sector or government) to make an assessment of the scheme with respect to its practicality and effectiveness in order to determine, for example, how a scheme might be improved. Alternatively it can be used at the design stage of a new scheme to help ensure that the scheme is designed in such a way that it is cost-effective.

The framework consists of fourteen guidelines across 4 groups as shown in Table 2. Each guideline in Table 2 is explained in detail in Appendix D. There are numerous interrelationships between the guidelines (see Figure 2 in Appendix D) so the assessment process often involves considering a number of guidelines simultaneously when examining a particular scheme with respect to one or more of the guidelines listed in Table 2.

Table 2: Overview of guidelines for practical and effective environmental labelling of food	
Guideline	**Title**
Objectives and purpose	
O1	The objectives and purpose of the scheme need to be clear and transparent.
O2	The impact categories covered by the scheme or label need to be clearly stated.
O3	The performance metrics need to be clearly identified.
Mechanisms and drivers	
M1	The mechanisms by which the objectives will be achieved need to be clearly identified and understood.
M2	The labelling scheme should complement other initiatives that tackle the same issues and clearly identify any additional benefits specifically provided by the scheme.
M3	The role of practice-based and outcome-based targets and drivers and their relationship with the achievement of scheme objectives needs to be clearly understood.
Practicalities	
P1	Use the best available techniques for measuring and assessing impacts that are robust and credible.
P2	Aggregation of impact data should respect the limits of the established techniques that are available, to remain meaningful.
P3	The cost of establishing, administering, managing and participating in the labelling scheme needs to be equitable and commensurate with any potential benefits.
P4	The burden on industry with respect to scheme application, administration, bureaucracy, verification and inspections needs to be equitable and commensurate with any potential benefits.
Communication	
C1	Communication should be tailored for different target audiences.
C2	Communication of impacts should be based on data that has been credibly and transparently aggregated.
C3	Methods of communicating impacts on a label should be as simple as possible.
C4	The boundaries of what the label covers needs to be clearly communicated.

Each of the guidelines have been described in detail in Appendix D and have also been illustrated using as examples from four schemes, based on publicly available information and information that was supplied by the schemes during the literature review. It should be noted that scheme administrators were not specifically consulted regarding the guidelines as it was not considered necessary for the purposes of this study. The schemes were selected to provide a range of different approaches in different countries, in order to test the capacity of the framework to explore the advantages and disadvantages of different approaches. The four schemes are:

- Stichting Milieukeur (Netherlands)
- Earthsure (USA)
- Indice Carbone (France)
- LEAF Marque (UK)

These examples show how the framework clearly sets out the differences between the outcome and practice-based schemes and does to some extent look more favourably upon those that have a more outcome-based approach. This is because the framework is endeavouring to highlight schemes that are practical, effective, robust and credible. Practice-based schemes do well in relation to practicality, but they do not perform so well with respect to effectiveness in relation to achieving outcomes (as this is largely unknown) and consequently this raises doubt over credibility and robustness, although this can be improved to some extent through independent verification and administration. Therefore, overall, the framework highlights how the practice-based schemes could be improved to the extent that they can demonstrate they are effectively delivering outcomes, and outcome-based schemes need to be made more practical and less costly, so that any outcomes delivered are commensurate with the cost of delivery.

4.0. Conclusions and Recommendations

4.1. Introduction

The objective of the final task of the project was to draw upon the findings of the previous tasks to draft recommendations on the feasibility of developing environmental labelling for food products in the UK, and more specifically labelling that follows the guidelines set out in the framework. Section 4.2 draws out some of the key conclusions that have emerged from the project and Section 4.3 presents a number of recommendations for practical and effective labelling for food products.

4.2. Conclusions

The literature review created a bed of knowledge regarding the approaches currently adopted for the environmental labelling of products from environmental, consumer and industry perspectives. The review also showed that the amount of work that is ongoing regarding environmental labelling is very considerable and interest is growing worldwide, but the focus on food products is relatively small, especially with respect to Type I, II and III labels and communicating multiple environmental issues on products. The reasons for this have been discussed under the literature review above and in the conclusions of Appendix A. The work undertaken in the analysis of environmental impacts, the consultation exercise and the framework built on the knowledge gathered in the literature review to develop further insights into the application of environmental labelling to food products. The work has involved detailed analyses from scientific, environmental, consumer and industry perspectives, whilst also developing a more integrated perspective to develop guidelines for practical and effective environmental labelling of food products. A number of conclusions can be drawn out of this work and these are presented below.

1. In order for any labelling scheme to be practical and effective, a number of guidelines should be followed. The guidelines, described on Table 2, encompass objectives and purpose, mechanisms and drivers, practicalities and communication.
2. Most current environmental labelling schemes for food products are practice-based. A practice-based approach is considered legitimate and effective for changing consumer behaviour but cannot directly demonstrate environmental improvements. Outcome-based approaches would provide greater technical credibility to the label and enable consumers to better understand product-specific environmental impacts. However, in many instances, the science for outcome-based approaches is not sufficiently developed to be robust. Such an approach may also be very expensive and impractical. As a consequence it may not currently be possible for outcome-based approaches to meet all the practical requirements for effective labelling (Guidelines P1, P2, P3 and P4) and consequently this could present barriers to widespread implementation of outcome-based schemes.
3. Current levels of public environmental awareness and concern mean that environmental labels will not be used by all consumers during food purchasing.
4. Sustainability is about striking a balance between environmental, social and economic issues, so labels addressing multiple impacts within all of these areas are likely to be more effective at contributing towards sustainability objectives than single-issue labels. In practice, however, this requires technical information on impacts to be aggregated, and current methods for doing so are subject to significant limitations (Guideline P2). Even if progress is made in improving and standardising aggregation techniques, it is envisaged that this will present persistent challenges, simply because of the nature of aggregating complex information into simpler formats.
5. Inasmuch as labels are expected to influence consumer purchasing decisions, they need to enable product comparisons (Guideline C4). Generally, this would be for comparing 'like with like', e.g. comparing one variety of apple with another variety, but in theory such comparisons could also be extended to more diverse comparisons, e.g. comparing beef to soya protein or perhaps processed/multi-ingredient foods, such as ready meals. This would be possible provided that the underlying techniques utilised are robust and common to all products. However, different boundaries and techniques for measurement and assessment means that this not generally possible at present. If standard techniques for measuring and assessing

impacts are developed, this will become less of an obstacle. Since differentiation is one of the commercial drivers for environmental labelling, standardisation is likely to require co-ordination by government.

6. The effectiveness and role of labelling as means to bring about changes in industry and consumer behaviour that benefit the environment is subject to significant uncertainty. This is due to a lack of monitoring or research identifying labelling being the key cause of improvements in environmental performance compared to other initiatives tackling the same issues in the same industry, such as government regulation or voluntary schemes. Labelling schemes should include such monitoring if they are to be considered credible (Guideline M2).

The work undertaken in the literature review, analysis of environmental impacts, consultation exercise and the framework suggests that labelling can be an effective means of influencing the behaviour of some consumers and can help to encourage producers and manufacturers to reduce their environmental impact. However, the mechanisms by which environmental labelling works are complex and subject to multi-faceted and interrelated problems (see Figure 2 of Appendix D). Some of these limitations can be addressed by businesses and third sector organisations involved in labelling, some would require government to take action, while others are intrinsic to labelling and are likely to persist. The recommendations below outline some appropriate ways forward for both industry and government. In deciding the appropriate role of the public sector in environmental labelling, government should consider not only its unique opportunities to enable improvements, but also the place of labelling compared with other policy options, including regulation. While well-developed environmental labelling can be expected to support consumer awareness of environmental issues and advance best practice in industry, it should not be expected to achieve substantial improvements in performance across the sector on its own. We have sought to take this into account in formulating the recommendations below.

4.3. Recommendations

Our principal conclusion from the work that has been undertaken in this project is that we do not believe that the science is sufficiently robust to develop an outcome-based, environmentally broad, omni-label at this time. Additionally, the costs that such a scheme may incur could be unacceptably high in relation to the potential benefits that could be realised. The evidence on how effective labels are as a tool to stimulate change is also lacking. There will continue to be a role for environmental labelling alongside other initiatives to improve the sustainability of food production and consumption. For example, within industry, food chain information, including environmental impact data, can be valuable to help manage issues and identify areas for improvement. With respect to consumers, labelling can educate and empower consumers to make informed choices through provision of information in relation to food. However, efforts to reduce the environmental impacts of food should not focus primarily on labelling as this is unlikely to deliver desired outcomes on its own. Labelling should be part of an integrated suite of initiatives, including government regulation and industry schemes, designed to bring about the delivery of desired outcomes. There are a number of existing initiatives with respect to labelling both within industry and more internationally, such as within the EU. Therefore, the main role for government in relation to environmental labelling should be to harmonise and improve existing schemes rather than develop a new outcome-based omni-label. On this basis, we have formulated a number of recommendations for potential ways forward. These have been split between those that apply to businesses and third sector organisations involved in labelling and those that apply to government.

Table 3 provides a number of recommendations that have emerged from this research project that we consider would be constructive towards making credible, positive contributions to improving environmental impacts through labelling. Table 3 is split into two parts: (i) recommendations that are relevant to businesses and third sector organisations seeking to manage or develop schemes; and (ii) recommendations for government. Table 3 also highlights where recommendations relate back to some of the guidelines for practical and effective labelling outlined in Section 3.4.

Table 3: Recommendations
Businesses and third sector organisations
1. The framework developed in this study should be used to identify potential improvements in existing schemes or to develop new schemes, helping to ensure that schemes are practical, effective and honest and can withstand scrutiny by consumers and trading standards.
2. If the primary objective is to improve environmental performance within the industry, labelling schemes should be linked to actual environmental performance and outcome-based measurement (Guideline M3).
3. Monitor the effects of schemes against their performance objectives and make the findings publicly available to facilitate research and scrutiny and share best and successful practice.
4. Ensure schemes are sufficiently flexible to reflect site-specific needs and priorities within the performance metrics used (Guidelines O3 and P1).
5. When designing and implementing schemes, consider multiple environmental impacts and wider sustainability issues such as economic and social considerations (Guideline O1) and undertake impact assessments to identify any potential positive or negative impacts (e.g. unemployment).
6. Participate and engage in initiatives that support consumer understanding of environmental labelling, for example by promoting awareness of specific impact categories (Guidelines C1 to C4).
7. Participate and engage in initiatives to harmonise methods, standards, metrics and communication used in environmental labelling (Guidelines O3, P1, P2 and C3).
Government
8. Work to improve environmental labelling, support scientific development and debate towards achieving standardised techniques for measuring and assessing environmental impacts (Guidelines O3, P1 and P2).
9. Work with schemes to ensure labelling is always presented in context with respect to other initiatives that are in place to tackle impacts arising from food production (Guideline M2).
10. Play a leading role within UK, EU and international initiatives to harmonise approaches to labelling, seeking to co-ordinate and facilitate action by businesses and other stakeholders.
11. Explore with stakeholders the potential for government to assist in co-ordinating efforts to pilot improved environmental labels that address key limitations identified in this research.
12. Explore with stakeholders the potential for financing co-ordinated research and harmonisation.

Each of the recommendations in Table 3 is described further below.

1. The guidelines within the framework (see Section 3.4) highlight aspects that need to be considered in any environmental labelling scheme that will help ensure that the scheme is practical, effective, credible and robust. It will also help ensure that any environmental labelling of food is honest to the extent that it can withstand scrutiny by consumers and trading standards. These can be applied to existing schemes in order to identify areas for improvement, or be used within the design of a new scheme. A key aspect of this framework is that the guidelines are interrelated (see Figure 2 in Appendix D) and so judgements made in relation to any guideline are often governed by other features of the scheme. For example, if the objective of the scheme is to promote 'green credentials' and not demonstrate improvements to the environment, then the lack of outcome-based metrics will not impact the effectiveness of the scheme – its effectiveness will be judged by consumer recognition of the green image of the brand. However, if there are clear objectives to bring about direct environmental improvements, then these need to be demonstrated using outcome-based performance metrics.

2. Tangible and measureable improvements in the environment need to be observed. It is not satisfactory to wholly rely on the implementation of best practice as an indicator of performance. We need to know that best practice is resulting in the environmental outcomes that society desires and this can only be done by measuring such outcomes. In some instances, outcomes can be observed, such as the benefits from ELS and

HLS, but then attributing these benefits to a specific product in a credible and robust way is not easy. For example, the implementation of ELS or HLS on a farm is a positive action with respect to biodiversity, but it does not demonstrate benefits to biodiversity and wildlife in a manner that can be attributed to a product via a label. It may be possible, via traceability, to indicate on a label if product has come from a farm participating in ELS or HLS, but it would be very difficult to quantify or allocate any specific benefit to the product. Additionally, as discussed in point 4 below, benefits are likely to be very site specific, especially with respect to biodiversity.

3. For many schemes it is not very clear how well they are performing in relation to their objectives. In the past commercial confidentiality has been a barrier to making scheme standards and performance publicly available. However, in an age of greater corporate social responsibility this barrier appears to be diminishing and commercial reasons for non-disclosure are no longer acceptable. If a private sector scheme is failing to meet its objectives, a company may be reluctant to 'advertise' that fact. Nevertheless, greater transparency should aid improved effectiveness and also support harmonisation across the industry for the public good.

4. Environmental impacts are often site-specific, e.g. the water impact of a product may be greater when produced in a water scarce region, even when it uses the same amount of water as a product produced in an area where water availability is not a key concern. In many respects this is a process of normalisation, where impacts are placed in context of where they occur (see section 3.3.1 of Appendix B for a full description of techniques available). The problem with site specific impact assessments is that they require data on impacts to be placed in context at the point at which they occur, which is not conducive to many aggregation processes, such as those used in LCA, where, for example, emissions or usage data are summed up over the life cycle of a product and then normalised. Site specific assessments are possible, but often require different, and bespoke, assessment processes and techniques than those currently used within LCA. The difficulty this then presents is one of standardisation. LCA, although limited, does provide a standard framework and some standard techniques, which can be commonly applied to different products. Bespoke site-specific assessments are generally non-standard and consequently this conflicts with the objective of using a common approach for all products. Thus the key will be to develop standard site-specific assessment techniques, which would form part of the work required in Recommendation 8 below.

5. To achieve sustainable production and consumption it is essential that all three pillars of sustainability (environmental, social and economic) are taken in account and also that one aspect of environmental benefit is not pursued at the expense of another and/or there are no unintentional consequences. It is not sustainable to have a product that performs well in relation to greenhouse gas emissions, but which is highly damaging to water quality or biodiversity (for example). Similarly a product which performs well on all environmental issues, but which is produced in a socio-economically unacceptable way (e.g. through exploitation of workers), is also unsustainable. An acceptable balance between multiple objectives needs to be struck. As such any new scheme is designed it should be subject to a full impact assessment in order to determine any potential synergies or burdens with respect to positive and negative impacts on other environmental, social and economic issues. This issue also ties in with Guidelines O2 and C4 with respect to what impact categories a label covers and limitations/boundaries of the scheme being communicated to the consumer, so that consumers are aware of whether they are making informed choices based on full or partial information.

6. The effectiveness of environmental labels intended to educate and empower consumers to make informed choices can be expected to benefit from consumer understanding of the strengths and limitations of labelling, and environmental impacts to which labels relate. Participation in, or cooperation with, any such education initiatives would be a positive action.

7. Differentiation in labelling methods, standards, metrics and communication places a barrier in the way of being able to compare products, both for industry and consumers. There is also evidence to show that consumers do not appreciate these differences and so may be misled, i.e. consumers may not realise that differences in environmental performance between two or more products could be due to different assessment methods and not down to actual differences in environmental impact. If products cannot be compared simply because different techniques have been used, then this damages the credibility of all labels and reduces their effectiveness. So efforts should be made to harmonise approaches where possible.

8. The development of standard and consistent metrics is essential to aid the credibility of environmental labelling. As described in Recommendation 7 above, standard metrics are required and should be pursued jointly by both industry and government. Standardisation of metrics is a clear regulatory role that government can perform to ensure common measures of environmental impact in the market. The metrics for all impact areas could be improved within the context of labelling. This includes those that are perhaps relatively well established (such as greenhouse gas emissions) and others where techniques are severely lacking, such as biodiversity and soil quality. This work should also support Recommendation 4, to ensure that metrics reflect site-specific needs and priorities.

9. Actions to support improvements in environmental labelling need to be placed in context, by highlighting the benefits and limitations of labelling, building awareness of these among consumers, and explicitly stating the other government and industry actions (Guideline M2) being pursued in order to improve performance across the sector (to address and eliminate poor practice). Also, a finding of this project is that there is lack of evidence on how effective labelling as a technique is as a tool to improve environmental standards compared to other initiatives that are in place to tackle specific issues. Therefore, there is scope for further research to be undertaken to examine the effectiveness of labelling in comparison to other initiatives in order to help determine the effort and resources that should be spent on labelling in relation to any benefits it can potentially deliver.

10. The government should fully engage with any initiatives to harmonise approaches to labelling, especially at the European level, in order to ensure that the progress made to date in the UK is fully represented in this process. This will ensure that the UK industry and government are well placed to steer harmonisation on the most suitable direction to meet both public and private interests. Government can also act as a facilitator in this process by bringing different, and potentially competing, industry stakeholders together.

11. The creation and development of pilot initiatives can be very useful for exploring many of the issues identified in this project. This project has shown that there is still a lot of work to do in order to develop credible, robust, practical and effective labelling. As such there is a need for further research and piloting of ideas to explore what does or does not work. The government can assist industry in this respect, probably as part of broader work to harmonise the metrics used (Recommendation 8) and labelling more generally (Recommendation 10). However, any such piloting work needs to be explicit that this would not develop into a statutory scheme as this could create a barrier to participation.

12. A key aspect of all labelling work is the cost of its development, harmonisation and administration. Therefore solutions need to be explored to secure long term funding for this activity. This process should involve all stakeholders including government, industry and consumer representatives, in order to find a sustainable financial solution.

There are a number of inherent links between government policy, regulation and monitoring, industry initiatives and auditing, consumer communication and behaviour. Consequently, a number of the recommendations involve industry and government working together (Recommendations 6, 7, 8, 9, 10, 11 and 12). There are also a number of inherent relationships between different aspects of labelling, as illustrated in the framework for practical and effective labelling. Therefore there needs to be a synergy between all these activities in order to ensure that the fundamental challenges of sustainable production and consumption are properly addressed. One approach to these would be to undertake one or more collaborative pilot projects, perhaps in conjunction with a retailer, to explore the key scientific and socio-economic challenges associated with understanding and communicating the impacts of food products using environmental labels. This work would identify a product that has a relatively small and contained production chain (from farm to fork) which has the potential to be studied in detail, for example, local fresh produce. There would then be four themes of study:

1. **Metrics**: Work to understand how different impacts of food production can be measured.
2. **Communication**: Work to understand how these impacts can be communicated to consumers on a label.
3. **Costs**: Work to establish the practicality and costs of developing and implementing the label.
4. **Effectiveness**: Work to establish the effectiveness of labelling in comparison other initiatives.

Table 4 provides more details on the type of work/projects that could be undertaken under each of the themes.

Table 4: Potential projects
1. Metrics
• Explore what outcome-based metrics can be measured and how, and if, these relate to any practice-based metrics, with the aim of complementing any work that is undertaken to establish standard techniques (Recommendation 8). This may include exploring how any existing environmental indicators could be used.
• Establish the site-specific specific nature of any impacts (Recommendation 4).
2. Communication
• The information liberated from the study of the production chain can then be used on some experimental labels (Recommendation 11) of the produce in order to explore how different impacts can be communicated to consumers (Recommendation 6).
• Explore how site-specific impacts can be communicated on a label.
3. Costs
• Identify the cost of using outcome-based metrics in comparison to practice based.
• If undertaken in collaboration with industry, the practicality and costs of undertaking the measures can also be established, including any socio-economic impacts (Recommendation 5).
• All of the above can also be undertaken in relation to any initiatives to harmonise approaches to labelling (Recommendation 10) and the longer term financing of labelling (Recommendation 12).
4. Effectiveness
• Establish consumer understanding and attitudes toward the labels that are devised and tested, and determine changes in purchasing behaviour.
• Establish industry understanding and attitudes toward the labels that are devised and tested, and determine what changes the industry would implement as a consequence of the label.
• Explore the other initiatives that are in place which also tackle the same issues and determine their influence (Recommendation 9). This would support the process of determining the influence of the label in relation to any observed benefits (Recommendation 3).

We would propose such a project (or suite of projects) could start with 2 or 3 issues that have relatively well established measurement/assessment techniques, such as greenhouse gas emissions/carbon labelling, water use, waste generation and resource depletion. Over a period of time more impact categories could potentially be addressed, which would be a step forward to improving the much needed science and techniques for omni-labelling, which this study has identified as lacking. It will also provide a much clearer picture on how effective and what influence labelling as a tool can have with respect enabling progress towards more sustainable production and consumption in relation to other initiatives such as government regulation.

References to published material

9. This section should be used to record links (hypertext links where possible) or references to other published material generated by, or relating to this project.

Full bibliographies are given in the four Appendices to this report.