

Final Project Report

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Project title

Environmental Auditing for the Hardy Nursery Stock Industry

DEFRA project code

HH1945

Contractor organisation
and location

Agriculture & Environment Research Unit (AERU), Department of
 Environmental Sciences, University of Hertfordshire, College Lane, Hatfield,
 Herts
 AL10 9AB

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£ 9,969

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01/11/01

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Executive summary (maximum 2 sides A4)

Although quite fragmented, comprising of a few large growers and many smaller enterprises, the hardy nursery stock industry supplies garden centre retailers with an astonishing range of plants and is worth around £217million. Often margins are tight and keeping up to date with current technological developments in best practice, science and technology, and legislative requirements etc. can be very difficult.

Isolated from the demands of the food sector, there is an absence of regulator, consumer and retail pressure, leaving the industry without incentive to increase environmental awareness although the Horticultural Development Council have singled out the industry as in serious need of creating a green image. Issues concerning environmental protection and sustainability are generally of low priority as the pressure to maintain high standards of product appearance can often lead to the use of significant quantities of chemical inputs. In addition these enterprises have a high demand for water and energy and generate significant quantities of waste. However, environmental management techniques such as auditing, trend analysis utilising environmental indicators and methods such as risk assessment are rarely used. Furthermore, within the hardy nursery stock industry there is a noticeable absence of support systems to provide simple guidance and advice to encourage, promote and aid the implementation of sustainability mechanisms.

Born out of the need to the raise awareness of growers of the environmental issues and management techniques available, the concept behind the project was to develop an environmental audit and a simple mechanism of support and advice, for the hardy nursery stock sector. A simple check-list type system that is compatible with EMA, LEAF and the forthcoming EUREP GAP protocols used by the retail sector has been developed using the outline of Integrated Crop Management modified to be of particular interest to the hardy nursery stock industry.

The audit is a simple, paper-based self-assessment procedure incorporating performance indices, advice and guidance notes. The audit enables growers to assess themselves on their environmental performance, identifying strengths, weaknesses and priorities for improvement whilst broadening their knowledge and understanding of the issues involved.

The performance indices have been based on environmental performance, standards of practice in respect to legislation etc, and practicality of implementation (if applicable). A performance account is opened for each answer to any one questioning area and a separate score given for perceived environmental impact, the standards of working practice and practicality (if applicable). The final balance of the account produces the overall audit performance score for that questioning area. In effect, a grower will receive bonus points for conduct above and beyond the measures imposed, if the action taken is no more and no less than what is required, no points will be awarded. However, if a grower is not meeting the standards set or is having a detrimental impact on the environment, then a negative score will be accrued. Scores are accumulated across all questions within a section. Once a total score for each section of the audit is calculated it may then be used with the self-assessment and advice sheets to identify problem areas, construct a course of action and prioritise tasks.

The comprehensive guidance notes developed as part of the project aim to provide a platform of knowledge facilitating a wider understanding of the issues raised and topic areas considered within the audit. They contain summaries of related topics, legislation etc., codes of best practice and contact information for various consultants.

The audit package has been piloted with several nurseries and horticultural enterprises with mixed results. Most seem surprised at the necessary depth of information required to make the assessment, perhaps this is symptomatic of the lack of environmental awareness within these organisations. None of the organisations scored particularly highly however only one of the six assessed fell into the 'poor' category for several sections. The majority of these organisations also appreciated that there were significant financial gains to be realised simply from the more efficient use of inputs and improved waste management. The audit was broadly welcomed.

These organisations were also able to identify various ways in which the audit and delivery package could be improved further. For example tiering of the audit providing various entrance levels to the audit and an electronic version that would automatically calculate scores and bandings. Although these suggestions are seen as valid they were beyond the scope of the current project.

Scientific report (maximum 20 sides A4)**Introduction**

Environmental auditing and impact assessment methods are now well established in the UK's agricultural industry via the LEAF audit¹ and the EMA² Software. The drive for this has mainly come from consumer demand for safe, quality food that is grown under environmentally sound conditions. Traceability demands from retailers and regulators are adding to the pressure on food growers to keep detailed records to demonstrate that environmental issues are taken into consideration in their decision making.

Isolated from the demands of the food industry, within the Hardy Nursery Stock sector there is an absence of regulator, consumer and retail pressure, leaving the industry without incentive to increase environmental awareness. This being despite the Horticultural Development Council³ (HDC) having singled out the industry as in serious need of creating a green image. Issues concerning environmental protection and sustainability are generally of low priority as the pressure to maintain high standards of product appearance can often lead to the use of significant quantities of chemical inputs. In addition these enterprises have a high demand for water and energy and generate significant quantities of waste. However, environmental management techniques such as auditing, trend analysis utilising environmental indicators and methods such as risk assessment are rarely used. Furthermore, within the hardy nursery stock industry there is a noticeable absence of support systems to provide simple guidance and advice to encourage, promote and aid the implementation of sustainability mechanisms the only notable processes being technology transfer activities from HDC and 'HorTIPS' which is an electronic technology transfer initiative aimed at improving the flow of information from research to growers.

The horticulture industry in England & Wales has a farm gate value⁴ of around £2 billion per annum produced from less than 173,000 hectares of land, within this the Nursery Stock industry overall is quite significant in its self being worth around 18% of the total horticultural production (£379million), of which around £217million is associated with hardy plants. Although quite fragmented, comprising of a few large growers and many smaller enterprises, the hardy nursery stock industry supplies garden centre retailers with an astonishing range of plants. Often margins are tight and keeping up to date with current technological developments in best practice, science and technology, and legislative requirements etc. can be very difficult. Consequently, the hardy nursery stocks sector's contribution towards many areas of environmental impact may well be significant.

The Project Concept

Born out of the need to the raise awareness of growers to the environmental issues and management techniques available, the concept behind the project was to develop an environmental audit and a simple mechanism of support and advice, for the hardy nursery stock sector based upon groundwork previously carried out at the University of Hertfordshire⁵.

The aim was to develop a self-assessment procedure that incorporated simple numerical performances indices which growers may use to identify their strengths and weaknesses in performance in order to highlight priorities for improvement programmes.

The audit would include basic support literature comprising of comprehensive guidance notes, developed as part of the project, to provide a platform of knowledge facilitating a wider understanding of the issues raised and topic areas considered within the audit. These would contain summaries of related topics, legislation etc., codes of best practice and contact information for various consultants.

Once developed the package would be piloted with several horticultural organisations to:

- test the developed scoring system;
- assess the structure and format;
- consider the scope and depth of the issues covered; and the
- comprehensiveness and appropriateness of the information provided.

Outcomes

A simple check-list type audit format that is compatible with the EMA software package², LEAF management audit¹ and the forthcoming EUREP⁶ GAP protocols used by the retail sector has been developed using the outline of Integrated Crop Management modified to be of particular interest to the hardy nursery stock industry. The audit is a simple paper based self-assessment procedure incorporating performance indices, advice and guidance notes. The audit enables growers to assess themselves on their environmental performance, identifying strengths, weaknesses and priorities for improvement whilst broadening their knowledge and understanding of the issues involved.

Structure:

The package has four main parts:

1. *Introductory leaflet*

This is essentially a single, colour A4 sheet providing basic background and introductory text to the project and the audit. A copy of the introductory leaflet can be found as Appendix I to this report.

2. *The basic audit questionnaire*

The information upon which the audit has been based was sourced from a comprehensive literature review and from discussions with various organisations and individuals having expertise in the discipline.

The paper-based questionnaire is broken down into nine main sections with some sections having further sub-divisions.

1. Site - this is principally concerned with identifying the main activities on the site and the amount of public access.
2. Organisation, planning and management - this section addresses the amount of record keeping undertaken, the provision of management plans, the amount of health and safety training undertaken by staff, site maintenance practices and the awareness of general legislative requirements and the relevant codes of practice.
3. Varieties and rootstocks - this section is concerned with regarding varietal choice, rootstock selection and in-house propagation management.
4. Soil/Substrate management and crop nutrition - this particular section is very comprehensive covering soil management (soil mapping, nutrient testing, sterilisation, erosion management), use of other growing media, fertiliser strategies (planning, identifying requirements, applications, advice provision, fertiliser storage, organic manures and composting).
5. Crop protection - again this section goes into considerable depth and includes sub-sections on BASIS, IPM techniques, choice of chemicals, *when to spray* decision making, spray preparatory techniques, application methods, storage and waste disposal and infection prevention.
6. Resource management - this section is mainly concerned with the efficient use of energy and water for irrigation. It includes an assessment of long-term energy and water policies, efficiency auditing, and techniques for energy and water consumption minimisation.
7. Waste and pollution management - this part of the audit addresses waste management planning, composting, recycling and general pollution prevention (air, water and soil).
8. Wildlife and landscape - this part of the audit is divided into two sub-sections. The first looks at how unproductive areas of land are managed particularly with respect to encouraging a wide and enhanced biodiversity, conservation planning and habitat management. The second is concerned with wildlife and landscape around the site such as any SSSIs, County wildlife sites or similar areas where fauna and flora may require additional protection. It also looks at the management of water features, hedges, margins and other boundaries.
9. Monitoring and auditing - this final section assesses any other activities on the site that may contribute positively (or negatively) towards environmental protection for example by raising staff awareness of important issues, training or monitoring of wildlife populations and diversity.

Each section is comprised of a number of questions that seek to identify the organisations attitude to environmental protection relevant to the section. Each question has been phrased in order to avoid leading the

user towards a particular response and to permit one of three responses: yes, no or not applicable. A copy of the basic audit can be found as Appendix II to this report.

3. Guidance document for scoring responses, banding performance and self assessment

Scores were awarded to each question for perceived environmental impact, the standards of working practice and practicality (if applicable) using the 'Delphi Method'. The Delphi method is a means of systematically collecting and progressively refining information provided by a group of selected experts. Delphi is characterised by response anonymity, controlled feedback and summary of group responses. Anonymity reduces the effect of dominant individuals while controlled feedback (e.g. conducting the exercise in a sequence of rounds between which a summary of the previous round is communicated to the participants) reduces the range of answers and focuses on group consensus. This process ensures that the less informed responses gravitate towards the more informed responses on each successive round of discussions.

The scores were designed such that a grower would receive bonus points for conduct above and beyond the measures imposed, if the action taken is no more and no less than what is legally required, no points will be awarded. However, if a grower is not meeting the standards set or is having a detrimental impact on the environment, then a negative score will be accrued.

Scores are totalled for each section to arrive at performance indices which, consequently, are based on environmental performance, standards of practice in respect to legislation etc, and practicality of implementation (if applicable). Once a total score for each section of the audit is calculated it may then be used with the self-assessment and advice sheet to identify the overall performance banding, problem areas, construct a course of action and prioritise tasks.

Information on how to accrue scores, derive performance bandings and interpret the results is held in a separate document. This document also contains background information regarding the using the entire package as a self-monitoring system. A copy of this document can be found as Appendix III to this report.

4. A set of comprehensive guidance notes

The guidance notes aim to provide a platform of knowledge facilitating a wider understanding of the issues raised and topic areas considered within the audit. They contain summaries of related topics, legislation etc., Codes of Best Practice and contact information for various consultants. Listed below are examples of specific notes within each section.

1. Site
 - Public Rights of way legislation
 - Summary of the Wildlife and Countryside Act 1981
2. Organisation, planning and management
 - Accident and emergence procedures
 - Various legislative instruments
 - Various codes of Good Agricultural Practice (DEFA, EA)
 - Risk assessments (LERAPS, COSHH etc.)
3. Varieties and rootstocks
 - Crop husbandry
 - ICM
 - Plant Health Directive
4. Soil/Substrate management and crop nutrition
 - Pollutant leaching
 - Nutrient management
 - Soil compaction
 - Soil erosion
 - Soil fertility
 - Soil structure and classification
5. Crop protection
 - Control of Pesticides Regulations 1986

- Environmental Protection Act 1985
- IPM
- Micro-organisms
- Pesticide approvals and specific off-labels
- 6. Resource management
 - Alternative energy sources
 - Energy conservation
 - Energy management
 - Monitoring energy consumption
 - Transpiration
 - Water management planning
 - Water Resources Act 1991
- 7. Waste and pollution management
 - Buffer zones
 - The Waste Framework Directive 1975, amended 1991
 - Summary of various waste management regulations
 - Waste management planning
- 8. Wildlife and landscape
 - Biodiversity
 - Hedge management
 - Ponds and watercourses
 - SSSI's
 - Wildlife and Countryside Act 1981
 - Wildlife havens
 - Windbreaks
- 9. Monitoring and auditing
 - Indicator species
 - Useful contacts

A copy of the guidance notes can be found as Appendix IV to this report.

Results of the piloting exercise

The audit package has been piloted with several nurseries and horticultural enterprises with mixed results. These are summarised in Table I below.

Section	Org I	Org II	Org III	Org IV	Org V	Org VI
1	Acceptable	Acceptable	Good	Good	Acceptable	Poor
2	Good	Good	Good	Acceptable	Acceptable	Good
3	Acceptable	Acceptable	Acceptable	Good	Acceptable	Acceptable
4	Acceptable	Acceptable	Poor	Acceptable	Acceptable	Acceptable
5	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable / Poor	Poor
6	Acceptable	Good	Acceptable	Acceptable	Acceptable	Poor
7	Poor	Good	Acceptable	Acceptable	Acceptable	Acceptable
8	Acceptable	Acceptable	Acceptable	Poor	Poor	Poor
9	Poor	Poor	Acceptable	Poor	Acceptable	Poor

The key points are summarised below.

- None of the organisations scored highly in all areas. Only one of the six enterprises was assessed as giving a 'poor' performance in areas where public concern is perceived as high e.g. crop protection, resource management and wildlife and landscape. Few of the organisations looked at were doing any thing above and beyond basic requirements particularly with respect to additional monitoring or auditing (section 9).

- All organisations scored the highest in section 2 (organisation, planning and management) perhaps because of the need for sound business management skills and greater availability of information available specifically with respect to health and safety and legislation. Within this section the sub-section on record keeping consistently produced the weaker score.
- Most users seem surprised at the necessary depth of information required with in the audit to make the assessment, perhaps this being symptomatic of the lack of environmental awareness. However, the majority of these organisations also appreciated that there were significant financial gains to be realised simply from the more efficient use of inputs and improved waste management but were unaware of where they could get assistance.
- The scoring system appeared to give reasonable results and users were able to identify which areas were causing the biggest impact on scores thus helping them identify their weak areas. However, users also found the scoring system a little too time consuming and requiring too much concentration due to the depth of the audit. It was suggested that if the information was tiered, it could offer various entrance levels e.g. (a) simple introduction i.e. the very basic legal requirements, (b) acceptable practice and (c) best practice. This could make the audit attractive to a wider audience.
- The audit concept was broadly welcomed but the organisations piloting the system were also able to identify various ways in which the audit and delivery package could be improved further. For example an electronic version which would automatically calculate scores and bandings. More material was requested with the guidance. Although these notes although it was agreed that vast amounts of information in a paper format could be off-putting. Whilst these suggestions are seen as valid they were beyond the scope of the current project.

Conclusions

This project has significantly progressed the groundwork undertaken by the University of Hertfordshire on auditing within the hardy nursery stock sector of the agricultural industry. It has developed the first self-assessment environmental auditing system seen by this sector and has the potential to raise awareness of environmental issues. Whilst it is useable in its current format the piloting programme has identified ways in which the audit could be enhanced further however, this was beyond the scope of the current project and would require additional support.

Delivery and Technology Transfer

- The audit is available as a series of PDF documents, free-of-charge to any interested person via the AERU website (www.herts.ac.uk/natsci/Env/aeru/aeruhome.htm, then follow link to the Project page). A limited number of copies are available in hardcopy form from AERU direct.
- HDC have been made aware of the audit.
- BASIS have also shown an interest and been given a copy of the audit for information.
- A poster⁸ was presented at the SCI conference 'Managing the environmental affects of agriculture' in Warwick March 25-26 2002.

Further Work Requirements

The following additional improvements to the audit were identified during the piloting phase:

- Further piloting and evaluation
- Tiering of the audit to provide different entrance levels (introductory, sound practice, best practice)
- Further development of the guidance notes
- Electronic presentation with automatic scoring and banding
- There is potential for linking this work with HortTIPS.

References

- 1 Blake, A. (1994), *LEAF audit: a step in the right direction*. *Farmers Weekly*. 2 September
- 2 Lewis, KA and Bardon, KS (1998) A Computer Based Informal Environmental Management System for agriculture, *Environmental Modelling & Software*, 13, 123-137
- 3 Anon (2001) *Investigating a growing future*. Horticulture Development Council
- 4 DEFRA (2002) *National Statistics: Summary of UK Food and Farming*.
- 5 Hall AM, Slaney L and Stevenson R (1998) A feasibility study of the use of Integrated Crop Management for outdoor ornamentals, *BCPC Conference Proceedings - Pests and Diseases 1998*, 7b-3, 619-624
- 6 Anon (2000) What is Eurep?, <http://www.cmi-plc.com/eurep.htm>
- 7 Linstone HA and Turoff M (1975) *The Delphi Method: Techniques and Applications*. Addison Wesley Publishing Co. Reading, MA.
- 8 Calvert A, Hall AM and Lewis KA (2002) *Environmental Auditing of the Hardy Nursery Stock Sector*. Poster presentation at the SCI Conference 'Managing the Environmental Impact of Agriculture', Warwick, Mar 25-26.

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