

MANAGING ON-FARM ENVIRONMENTAL IMPACT USING EMA

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Summary: There have been many initiatives recently aimed towards delivering policies relating to agricultural sustainability, particularly with respect to minimising environmental impact without compromising profitability. The final objective of these is normally to protect food and environmental quality, and preserve biodiversity and the natural heritage. The agricultural industry is in a time of significant change, and managing change can be difficult not least when trying to ensure awareness, response to new opportunities and compliance with legislation. For changes of this type to be practical and attractive, farmers need considerable guidance on what is inevitably a more labour, resource and time demanding process. The Environmental Management for Agriculture (EMA) software provides one mechanism by which this support can be distributed. It contains a library, decision support tools, databases, planning aids and audits for farm use. It has been available for several years in England and Wales and is now available for Scotland.

INTRODUCTION

UK Government policy is seeking to improve the sustainability of agriculture, by minimising the environmental impacts arising from food production and land management without compromising profitability. As a consequence, there is a need to encourage the optimal use of inputs such as pesticides and fertilisers, ensure energy and water use is efficient and encourage the adoption of Integrated Farming Systems. The final objective is normally to protect the quality of air, soil and water and preserve biodiversity and our natural heritage, whilst producing safe, nutritious food.

Recently, there has been a significant number of initiatives aimed towards the delivery of these policies. For example, in 2003 Crop Protection Management Plans (Voluntary Initiative, 2003) were launched, the Environment Agency is about to begin piloting its whole farm audit and has already launched the Waterwise initiative (Environment Agency, 2002). We have seen demonstration farm projects and networks, a multitude of new documents, websites and training programmes, plus new regulations including, for example, those associated with Nitrate Vulnerable Zones.

There is no doubt that the agricultural industry is in a time of significant change and managing change can be difficult, not least, when, as an individual, there is a need to ensure awareness of how things are changing and their short-, medium- and long-term implications. There is also an ongoing requirement to respond to new opportunities as they arise and comply fully with legislation.

Farmers need considerable guidance and help on what is inevitably a more labour, resource and time demanding process. There are several obstacles hindering success, for example:

- Information is scattered throughout the industry in both hardcopy and electronic forms. There are a variety of different electronic formats that can be used (html, pdf, etc.) which can be internet and/or CD based. They can also be expensive.
- Documents frequently make reference to other documents which may or may not be available from the same source or in the same format.
- Documents and regulations are frequently updated and it is difficult to keep track of which version is the current one. Old documents are often not removed from the Internet and these can be accessed in error. Amendments to regulations tend to refer to the original without reproducing it and so the original is also required.
- Although progress is being made to harmonise software inputs and provide data sharing capacities there is still much work to do. Some inputs are difficult to quantify or expensive data is required. Related software may require similar data but it may be needed in slightly different formats, for example crop growth stages or canopy cover, total rainfall or excess winter rainfall. Another problem is that data input is often not flexible enough to cater for all needs, for example, limitations on the units of measurement can be frustrating.
- There is a need for a huge amount of information to be sourced, gathered, retained, stored and updated for a broad range of subjects.

EMA, the Environmental Management for Agriculture software, has been designed and developed to deal with many of these problems. Its primary function is to assist in the planning and management of farming systems, strategies and programmes in order to help the production of safe and nutritious food, preserve farm profitability and protect the environment.

THE SOFTWARE SYSTEM

EMA has four main modes of action: (1) a library, (2) farm audits (3) decision support tools and (4) planning and management aids. Together they provide a comprehensive package of tools and information to support the farm manager deliver both farm and national policy objectives. Figure 1 provides a schematic of how the system has been designed for use; however, it is also flexible enough for any individual part of it to be useful. The flow around the diagram shows that this is an ongoing process of reassessment and evaluation.

The first stage of developing any environmental management plans is to be aware of where any significant impacts are occurring and to be able to prioritise areas for action. Farm audits are used in the software for this purpose. Once priorities have been established, action plans aimed at improving performance whilst remaining cost-efficient must be developed. In the software section on decisions support tools there are various aids allowing mitigation studies and risk assessments to be carried out or 'what-if' scenarios to be explored. The section on planning and management contains to assess how efficient resources are currently being used and how changes in practices will effect this. Reporting and recording facilities also streamline this area and provide documentation and evidence that progress has been made. The EMA Library has been designed to support these features and is accessible from any part of the software.

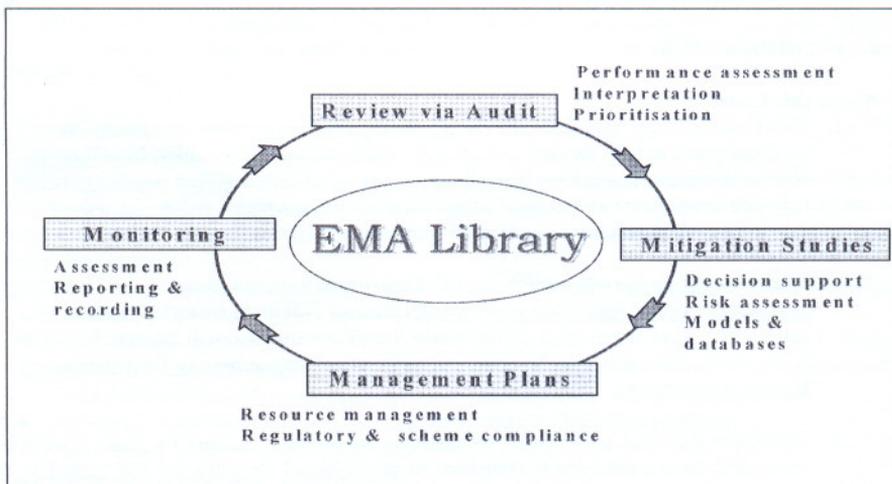


Figure 1. Illustrating the features and flow of the EMA – Environmental Management for Agriculture software.

The EMA Library

Probably the most important source of information for any farmer is literature. Most regulators, policy makers and organisations produce many documents each year, some free of charge, others not. However, as discussed earlier, there are all sorts of problems associated with identifying which document is the most appropriate, tracking it down and obtaining a copy, juggling the variety of different delivery and presentation formats, and then managing that information, filing, storing and updating it.

EMA contains around 150 documents amounting to over 3,500 pages of information covering crop protection, crop production, animal welfare, environmental protection, resource and waste management, land management, codes of practice, notes for guidance, assurance schemes, legislation and regulation. In addition, there are databases of contacts, glossaries and definitions. Each document is electronically linked to any other it references and also to the appropriate entries in databases and glossaries. Figure 2 illustrates this feature. It shows the first two paragraphs of the 1998 Code of Good Agricultural Practice for the Protection of Air (Defra, 1998). Each of the words or phrases highlighted in bold and underlined is an electronic link to the referenced document, a glossary providing a definition or more detailed information.

Scotland-specific documents include several published by the Scottish Executive such as the 'Prevention of Environmental Pollution From Agricultural Activity: a code of good practice' (PEPFAA Code) and its supplements, 'Guidelines for farmers in Nitrate Vulnerable Zones', the Muirburn Code and various documents published by the Scottish Environmental Protection Agency (SEPA). There are also advisory manuals and production guidance notes such as those in the TIBRE handbook.

PART A: GENERAL INFORMATION

1. INTRODUCTION

About this Code

1. This *Code of Good Agricultural Practice for the Protection of Air (Air Code)* is a practical guide to help farmers and growers avoid causing air pollution from **odours**, ammonia and smoke, or from **greenhouse gases** which cause **global warming**. It will help you to minimise and dispose of your wastes in ways which reduce the risk of causing nuisance or annoyance from air pollution.

It is not a **statutory code**. Following this Code will not provide a defence such as **'best practicable means (paragraph 10)** if you cause air pollution. Nor will it protect you from legal action, although it should lessen the chance that this will happen. If you are in any doubt about what the law requires contact the **local authority Environmental Health Department**.

2. This Code does not give advice on noise or air pollution caused by dust. Advice on spray drift from pesticides is contained in the **Code of Practice for the Safe Use of Pesticides on Farms and Holdings**. The Air Code complements advice given in the *Code of Good Agricultural Practice for the Protection of Water (Water Code)* and the *Code of Good Agricultural Practice for the Protection of Soil (Soil Code)*. Copies of all these Codes are available free of charge from **DEFRA** Publications, telephone 0645 556000. This Code is a revised version of the one issued in 1992.

Figure 2. Illustrating the electronic linking of documents within EMA

Documents and information are updated quarterly via the internet. EMA users also have access to the entire EMA library on-line should they prefer. Subscription to the on-line service is free to those purchasing the CD.

Farm Audits

It is important to carry out, on a regular basis, some form of assessment of the strengths and weaknesses in farm and land management practices. There are various ways of doing this, for example modelling the fate and transport of pollutants, carrying out risk assessments, environmental impact assessments or environmental auditing. Which technique is the most appropriate will depend upon the objective and depth of the analysis required. However, it is important to realise that environmental impact and risk will depend upon the local site and there are many parameters affecting these that the farmer cannot change such as soil type and weather patterns. The important issues in this context are to identify best practice and ensure efficiency and regulatory compliance. Within EMA, there are a number of activity related environmental performance audits (pesticide use (Lewis *et al*, 2003), fertiliser requirements, water management etc.) which check for best practice and regulatory compliance. Each audit scores on a similar scale allowing areas to be compared and so prioritised for action. Also provided are text reports detailing the findings, based on audit question responses and benchmarks.

Another advantage of the EMA system is that there are several embedded databases holding data related to soil type and weather data thus avoiding the need for the user to source and format this data.

Decision Support Tools

This operational mode contains a variety of small decision support tools that can either be used in isolation or as an integrated part of a farm environmental management strategy. Many of these are based on paper-based tools in common use throughout the industry. The tools available include:

- Fertiliser recommendation calculators, manure management including 4 Point Plan, fertiliser product databases, lime and sulphur decision support, NVZ guidance.
- Pesticide risk assessments, product identifier, pesticide database, environmental impact data, SOLA information, LERAPS guide, grass weeds identifier, nematode risk assessment.
- Soils database linked to postcode, erosion risk assessment.
- 30 years average weather data, environmental sites, all linked to postcode.
- Biodiversity manager, grassland management.
- Resource management: waste & water.

Planning & Management Aids

Planning for the future is an ongoing management task for farmers. In the past, the primary concern was for food quality and to maximise profits. However, now environmental issues must also be considered. In recent months, various management aids have been introduced to help the farmer develop farm management plans. Many of these have been absorbed into EMA in such a way that their use has been simplified and data requirements minimised.

For example, the software includes Crop Protection Management Plans (CPMPs). These have been developed by a consortium of organisations as part of the 'Voluntary Initiative' (Voluntary Initiative, 2003) to minimise the environmental impacts of pesticides. CPMPs provide essential documentation and a checklist of questions with a simple scoring system to aid the identification of environmental risks. Whilst the system does not end with a plan per se the identification of risks should help the subsequent identification of mitigation measures.

Another management tool gaining in popularity is nutrient balancing. The philosophy behind this approach is that nutrient input from fertilisers (organic and inorganic) and other sources should be in balance with that removed from the system by the crop (Cuttle, 2002). Ideally, this should seek to minimise waste and greatly reduce potential contamination of water via leaching and run-off. Unfortunately, this is not an easy task as data is difficult to come by and is variable in quality. Balances can be done at various levels – region, farm or field, the latter however is very time and data demanding. In addition, to complete a comprehensive farm nutrient management plan other tools are also required to estimate crop nutrient requirements and the nutrient content of manures and soil conditioners. The nutrient balancing tool within EMA is supported by such tools, and data for a wide variety of crops and farm produce is held in databases.

EMA also includes tools for managing resources for any farming system including organic (Tzilivakis & Lewis, 2001), a biodiversity management plan which provides details of site surveying and species monitoring, and a module to develop a water management plan.

Additional tools allow trend analysis of audit results and performance assessments such that benefits and improvements can be tracked over time.

EMA Management

As EMA has been developed with funding from the public purse it is a not-for-profit product. Proceeds from sales are re-invested in the maintenance, updating and further development of the software. User assistance is also available via telephone and email. Updates are available quarterly via the internet, and a new release is issued annually. A steering group comprised of industry and funder representatives advise on commercial and business issues.

DISCUSSION

The system has been designed to be used by consultants and farmers to review environmental performance and to monitor progress. The system is broadly comparable with the aims and objectives of more formal environmental management systems such as ISO14001 and the European Unions EMAS in that it helps identify priority areas for action, encourages continuous improvements and allows monitoring in the light of targets and objectives. More specifically the system is:

- generic in the context of agriculture;
- proactive based upon the principles of anticipation and prevention;
- systematic based upon detailed documented procedures.

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