AGRICULTURE AND THE ENVIRONMENT: THE GENERATION OF RESPONSIBILITY

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Summary: The agricultural industry is undergoing a period of change and there has been a shift away from production agriculture to the broader concept of environmental management. Environmental improvements are often seen as an unwelcome imposition by farmers required to carry them out. Agricultural students at SAC are encouraged to learn about and appreciate the benefits from good environmental practice and apply their knowledge to what they know best: the farming industry. Raising awareness of the environment is the first step to challenging assumptions and accepted ideas about the environment and it also equips young students to rise to environmental challenges and exploit any opportunities that future change will inevitably present. It would be naive to suggest that all environmental improvements benefit the farming industry but practical suggestions made by the students indicate that there are some significant win-win situations in compliance. Students have made these suggestions after only a short period of awareness raising, it can only be speculated as to how innovative the industry may become if this type of critical analysis was applied across the industry.

INTRODUCTION

The agricultural industry has undergone significant change over recent years. The post war goals of maximum production and self-sufficiency have been replaced by the need for sustainable farming systems. The UK is on the periphery of the European market and has difficulty competing with centralised production. Continued national subsidy for production is no longer an option and, in keeping with EU policy, many farmers are being paid to deliver environmental objectives. Non-intensive agricultural systems deliver a number of eco-services for society including water management, biodiversity and waste services. The Government has encouraged this shift with the introduction of various environmental schemes such as Countryside Premium and Rural Stewardship Schemes which provided compensation for lost production opportunities due to creation of specific habitats or the protection of natural features. This transition has not been smooth, many of the schemes have proven impractical both in the delivery of environmental goals for society and the provision of realistic financial returns.

The previous emphasis on production has produced a farming industry ill-equipped in terms of knowledge and understanding of key environmental issues despite the fact that the main grant opportunities now available depend on farms demonstrating good environmental condition. Farmers have been commonly portrayed as carrying out practices which are bad for the

environment and have consequently reacted with hostility towards environmental changes which they feel have not been fully explained or justified. It often seems that their business interests and investments are given little consideration in the decision making process, and in many cases profits have fallen to unsustainable levels. If farming is to contribute meaningfully to environmental management, farmers need to be treated as partners in the process, not as mavericks requiring tight legislative control.

In order to help farmers of the future deal more ably with environmental changes SAC (Scottish Agricultural College) decided, with some trepidation, to include environmental education within all of the land management programmes including HNC/HND and BSc Agriculture. The aim of this awareness raising regime was to equip farmers of the future with a broader understanding of environmental issues with the long term view of incorporating environmental management into farming enterprises whilst continuing to generate reasonable financial returns. Students attending SAC are likely to become important industry figures in future years, and if the agricultural industry wishes to achieve sustainable growth in the future then it is important that this generation form a positive opinion of environmental matters and recognise the need for change.

This paper is a comment on changes prompted by environmental requirements. It would be a challenge to any farmer, consultant or researcher to compile a list as comprehensive as those represented by the collated thoughts of the student body. Those closest to the problem are the most likely to see solutions but they require basic knowledge of the environment before they can perceive the need. Innovative, informed and integrated problem solving is what agriculture requires of the young farmers who will have to guide the industry through a time of attitudinal, political and economic change. Awareness is required as a precursor to change. Total Quality Management is required to address the challenges of the future, and critical examination of why, how and what we do individually is a useful exercise for us all. The environment provides a reliable benchmark for seeking out inefficiency and poor performance across a range of activities and processes.

MATERIALS AND METHODS

In the first year of the Agriculture programme students undertake a 40 hour module called Environmental Awareness. During the module, students are introduced to a wide variety of environmental matters of concern to society. It is important that the environment is not looked on as separate from human activity and ethical issues; this is facilitated by addressing social, economic and environmental issues using sustainable development as the main theme. During sessions, students work in groups comprising of mixed age and backgrounds, from all of SAC's courses, encouraging the sharing of perspectives and attitudes. The environmental views of students can in this way be informed of the practicalities, knowledge and perspectives of other groups. This is particularly so for agriculture students who tend to form insular social groups. The practical ability and knowledge of the countryside possessed by the majority of agriculture students is of great value to students from other courses. Mixing in this way also diffuses much of the prejudices built up between age, vocational and geographic groups.

Each student produces a personal audit (PAP), part of which focuses on everyday farm practices. Fundamental to this process is the opportunity for students to make connections between their individual actions and associated environmental problems. In simple form,

environmental degradation is a symptom of inefficiency within a system; for example, the module gives students the opportunity to stand back and realise that poor feed conversion is not just a poor outcome for farmers in terms of animal production, it also has a financial cost in terms of grain, labour, fertiliser and production and these may have negative environmental impacts. If the poor conversion rate is addressed then this is a benefit to the farmer and also represents an environmental benefit. The module encourages students to question assumptions they often have about their ability to change practices and improve situations accepted by their fathers, brothers or employers as fact.

RESULTS

The examples of student responses presented are categorised into 5 main areas; machinery, buildings, energy, water and field. Most of the examples are not only a recognition of environmental problems, they also identify inefficient resource use; fertilisers, energy, water or land. The majority of the examples have a financial implication as well as an environmental aspect. This initial environmental information is built upon in year 2 when students take Waste Management and Pollution Control and every effort is made to point out the financial sense of efficient use of animal manures and slurries.

Fourth year students study Land Based Environmental Issues which takes a broader look at the environment and considers diversification opportunities such as renewable energy and composting. Students also consider aspects such as climate change and global production systems. The role of agriculture in flood alleviation and water supply is also a strong theme.
In response to growing environmental awareness agricultural students have increasingly chosen dissertation topics with an environmental theme. Recent studies have included the impact of water charging on the potato industry, food waste composting and bio-diesel plant feasibility. This year there are five out of 10 Honours Agricultural students looking to environmental subject areas for their thesis, topics include spent milk treatment systems, composting and methane production from waste.

The results of these audits have been collated to provide the basis of a practical technical note which farmers can use to improve their environmental management (Tables 1 and 2). When guidance and legislation is produced the requirements are often given out without reference to why improvements are necessary or how much they will cost or benefit the farm. The aspect/impact nature of the PAP is similar to the aspects register used in ISO14001 or EMAS by industry and business both of which are mainstream Environmental Management systems in which participating companies continuously strive to improve environmental performance by setting specific environmental objectives over set timescales and monitoring progress.

DISCUSSION

During this module students are made aware of perspectives outwith agriculture. Many students are aware of what is being asked of their industry but are not sure why. This module provides an opportunity for students to learn how farming interacts with the environment, biodiversity and natural resources. Equally important is the opportunity young agriculturalists are given to show individuals from other sections of the community the regard, knowledge and appreciation that farmers have for the environment. Modern agriculture has been shaped and

Table 1: Short - term suggestions made by first year Agriculture students to reduce the environmental impact of farm practices

Farm Area	Change	Impact
Machinery	Monitor and benchmark fuel use	Reduction in CO_2 emissions; reduces contribution to global warming, reduces contribution to gases leading to an increase in respiratory illness, reduction in finite energy resource use.
	Service regularly	Increased efficiency, reduced use of finite resources. Reduced CO_2 .Reduced soil pollution from oil leaks etc.
	Turn off engine instead of idling	No environmental impact while stationary.
	Check tyre type and pressure	Traction efficiency improved reducing resource CO_2 emissions.
	Learn efficient driving techniques	Reduced resource use, reduced CO_2 emissions.
	Don't over rev (Anon, BOC, 2002)	Reduced resource use, reduced CO_2 emissions. Reduced noise production.
Buildings	Insulate	Reduced CO_2 production, reduced finite resource use. Better crop condition due to tighter temperature control.
	Insulate water heaters/tanks	Reduced risk of water leaks reducing water use.
	Use low energy lighting	Reduced CO_2 production, reduced resource use
	Maintenance	Reduced wastage of feed etc.
Water	Maintain guttering	Reduced dirty water production and spoilage. Less slurry storage requirement. Reduced CO_2 due to less cartage.
	Install water meters	Reduced water use, early indication of leaks and animal health problems.
	Maintain and repair drinkers, pipes and drains	Reduced dirty water production. Reduced water leaks, reducing spoiling of feed, wetting of litter and bedding, reducing ammonia production.
	Use power-washer instead of hose	Reduction in water use and production of dirty water
Energy	Check efficiency of fans in crop stores	Reduction in CO_2 production and finite resource use.
	Use low energy lighting	Reduction in CO_2 production and finite resource use.
Field	Carry out regular soil analysis	Reduction in phosphate and nitrate requirement
	Avoid working too close to streams	Reduced soil erosion, sedimentation and eutrophication due to phosphate loss
	Leave buffer strip in sensitive areas	Increased biodiversity and natural pest control
	Match fertiliser to crop requirement	Reduced fertiliser use, reduced nitrate levels in groundwater and streams.
	Consider weather conditions when using fertilisers	Reduced CO_2 production from nitrate production, reduced nitrous oxide, reducing global warming contribution.
	Ensure ground cover over winter	Reduced erosion, sedimentation and phosphate loss
	Calibrate and maintain fertiliser spreaders	Reduced fertiliser requirement

Table 2: Long term suggestions made by first year Agriculture students to reduce the environmental impact of farm practices

Farm Area	**Change**	**Impact**
Machinery	Match tractor size to farm requirements	Reduction in CO_2 and finite resource use.
	Consider noise and energy use when purchasing equipment	Reduction in CO_2 and finite resource use. Reduced noise nuisance and hearing loss.
	Jointly purchase equipment	Reduced costs and resource use.
Buildings	Check ventilation systems	Reduction in CO_2 and finite resource use.
	Replace inefficient buildings with new less wasteful designs	Better ventilation, energy efficiency, lower ammonia production, reduced wastage, animal health/welfare benefits. Better feed conversion reducing fertiliser, land and energy requirements. Vermin control reducing disease vectors
Water	Trace drains	Reduced pollution to waterways
	Check slurry and silage effluent storage is adequate	Reduced risk of water pollution and more efficient use of nutrients
	Store rain water to reduce mains water requirement	Reduction in water requirements and costs
	Complete a water audit	Identify opportunities for reuse or recirculation
Energy	Investigate deals re electricity supplier	Reduced costs
	Consider renewable energy options	Reduced CO_2 production and finite resource use
	Use natural ventilation systems in crop buildings	Reduction in CO_2 production and finite resource use.
	Complete an energy audit	Enables informed choice of energy options
Field	Examine crop yields to identify poor productive ground and create wildlife areas in them	Increased biodiversity and self-esteem. Increased profits and diversification of income
	Hard surface field entrances	Reduced erosion and sedimentation
	Fence off watercourses to exclude animals	Reduced disease risk, soil erosion and sedimentation. Increased water quality.

and guided by national policy, professional advice and the needs of society. A similar level of resources, support and guidance is required to assist change.

The main finding for the agriculture students was that the results of such an audit could identify potential financial savings and therefore implementation could make good financial sense. In the process they also discovered that the promotion of sound environmental practice would benefit farmers in other ways. Concern about food miles could represent a considerable opportunity to reinvigorate local farming and ensure economic returns. The promotion of farmers markets and local produce is also good for local farming and assurances over the traceability and provenance of food is becoming increasingly sought by discerning consumers. Concern about pesticides and welfare in relatively unregulated countries encourages the purchase of trusted UK produce, due to excellent national quality control measures and compliance by industry. The improvements agriculture has made to address specific environmental issues is seldom heralded by the media due to the timescales involved. The continued production and quality achieved in the face of pesticide withdrawal is a real triumph for the industry but the general public and in some cases even the statutory organisations involved barely acknowledge the feat. In short, agriculture would do well to promote significant achievements rather than present themselves in a negative light by consistently opposing legislation and guidance. Improved biodiversity is recognised by a large proportion of consumers as a desired outcome for crop production. The vastly improved numbers of birds of prey, badgers, otters and several other species is as a direct result of changing land use practices and should be used to promote a Scottish agricultural system which is compliant, informed and responsible.

It would be naive to suggest that there are no environmental problems associated with agriculture, or that every farmer is fully committed to environmental sustainability. The overall picture, however is not as bleak as many would have us believe, and students at SAC are given every opportunity to recognise environmental achievements and critically address problems they encounter when they progress in the industry.

ACKNOWLEDGEMENTS

The authors would like to thank the efforts made by the first year Agricultural students at SAC Aberdeen who gave this exercise serious consideration.

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