Agriculture

Benchmarking the Environmental Performances of Farms

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Abstract

Background, Aim and Scope. The usual route for improvement of agricultural practice towards sustainability runs via labelling schemes for products or farm practices. In most approaches requirements are set in absolute terms, disregarding the variation in environmental performance of farms. Another approach for promoting sustainable farming concerns the concept of benchmarking, which takes into account competition among farmers. The individual agricultural performance is characterized by quantitative criteria and compared with scores of other relevant farms.

Methods. Therefore, a pilot study has been conducted in the Netherlands concerning benchmarking among arable farmers in the Internet involving crop protection. A voluntary Dutch benchmark initiative in the Internet is described including farmers' perception regarding the tool.

Results. The results show that the benchmark tool in the Internet allows farmers to compare their environmental and economic performance anonymously and securely in a large-scale open-access environment. The pilot group of farmers responded positively to the instrument. An important factor in success is the ease and speed with which data can be entered into the benchmark tool.

Conclusions. A benchmark tool for comparing the environmental performance among farmers can form the basis for agreements between farmers and their costumers. An application involving food industry and retailers is discussed.

Keywords: Benchmarking; certification; environmental performance of farms; labelling

Introduction

Farming is, by nature, an activity which has a large impact on our environment. However, the quality of water, soils, air, biodiversity and landscape have changed dramatically over the last 50 years. Therefore, governments, producers and consumers have tried to reduce the negative impact of farming activities. Besides policy instruments, also market-oriented instruments have been developed for the improvement of agricultural practice towards sustainability (Manhoudt et al. 2003). Within this framework, the usual route runs via labelling schemes for products or the certification of agricultural companies (Udo de Haes & De Snoo 1996, 1997). The product-oriented approach, focuses mainly on the consumer as a driving force for improvement. Product labels on single products in the shop, enables consumers in their purchasing behaviour to steer farming in a more environmentally sound direction. Today, more and more product labels are available (Scheer & Rubik 2005) and based on a standard life cycle assessment (cf. for example Guinee 2002) of a whole product system. In the approach of company certification, a total farm (with several crops, etc.) has to meet certain environmental standards. In this case, the driving force is not directly the consumer, but other companies in the agro-production chain (Udo de Haes & De Snoo 1997). Farmers can only supply to a retailer or food processing industry if they meet the strict environmental standards. The retailers and industry can communicate the company certification in a more general way to consumers, for example as part of their company image (such as ISO/14001, etc.).

Although both approaches have contributed to a larger awareness for environmental issues in society (consumers, producers and other actors in the agro-production chain), there are also some limitations in the set up of these type of instruments today. In most occasions, both approaches focus on strict or absolute cut off criteria: it is not allowed that one use a certain pesticide or use more than a certain amount of artificial fertilizer, etc. The result is that in most cases farmers are 'in' or 'out' of the system, creating two groups of farmers. If you meet the fixed standard it's ok. There is no driving force for further improvement for the farmers over the years or compared to other farmers. Therefore, it can be argued that such systems do not really enhance continuous best practices. Therefore, there is a need for improvement of the existing market-oriented tools.

In this paper, a new approach is being presented: benchmarking of the environmental performances among farmers. In this approach, the variation in environmental performance between individual farmers is taken as a starting point for enhancing sustainable farming. Differences within current agricultural practice are large (De Snoo 2002). However, apart from the self-evident exception of personal income, the comparison between individual farmers and the striving for yearly improvements is lacking. Front-runners with respect to sustainability are not really rewarded, whereas for farmers lying somewhat behind, it is possible to hide. Is it possible to promote the environmental performance of the company as an important and desirable issue for farmers by giving them adequate feedback? Feedback on for farmers' relevant dimensions, in meaningful terms and on the basis of relevant standards (see also Carruthers & Tinning 2003).

At the moment, such tools are being developed as voluntary instruments among farmers. However, implementation within the agro-production chain is also possible. The tool can be used within the frame of environmental certification of farms. Instead of a company certificate based on fixed terms, a more flexible alternative for retailers or food industry might also be possible: to buy only products from the top farmers, for example from the best 50%.

A case study is presented of a project being carried out at Leiden University, Institute of Environmental Sciences (CML) to develop a benchmarking tool for arable farmers growing eight of the Netherlands' principal crops (more details given in Kragten & de Snoo 2003). The tool is applicable for all Dutch arable farmers (small-large, extensive-intensive enterprises, etc.). It has been developed as an Internet tool, anonymous, safe and quick. Since every farmer can compare his own sustainability score with the variation of a group of relevant colleagues, this can be regarded as a multi-micro approach.

1 Case Study: Benchmarking the Environmental Impact of Pesticides

1.1 Background

In the Netherlands, environmental pesticide levels are a serious problem. Pesticides are to be found in every compartment of the environment, with standards regularly being exceeded (www.pesticidesatlas.nl). To achieve the envisaged reduction in pesticide use, as well as emissions to the environment, policy-makers have to date focussed on entire agricultural sectors (Tzilivakis & Lewis 2004), setting targets for arable farmers, bulb growers and other specific groups. At the level of individual farmers, however, there is a wide variation in pesticide use (De Snoo 2002). It is now clear, moreover, that 5% of farmers account for about 25% of the overall potential environmental impact of pesticide use in the Netherlands. With this degree of variation among farmers, it should in principle be feasible to achieve a more dedicated reduction in pesticide use and associated environmental impact. The benchmarking tool presented here uses the variation among individual farmers as a lever for enhancing inter-farm competition with respect to the environmental dimension of sustainability (in terms of the 'Three Ps', Planet), in this case related specifically to crop protection. Because this environmental dimension is inherently tied to the costs of the pesticides used and the crop protection benefits accruing, the economic dimension of sustainability (Profit) is also duly accounted for. Although the social dimension (People) might also be incorporated in a benchmarking system, it is not discussed in the case study.

The key aim in developing this (process) benchmarking tool was that it should allow farmers to compare their performance with that of fellow farmers on several aspects of sustainability (Tzilivakis & Lewis 2004, Wainwright et al 2005). Many farmers currently have no idea of their own performance in this respect, relative to other farmers engaged in similar activities in their locality or region. Do I use more or less pesticide on the same crop? Am I having a similar (potential) impact on the natural environment? Do I rate among the best 5% of Dutch potato growers? If farmers have a more transparent picture of the various sustainability issues associated with their own farm, they may become far more motivated to improve their score on both environmental and economic yardsticks. A benchmarking tool that can act as an incentive for sustainable farming gains considerable added value if farmers can compare their own performance anonymously, with a large sample of other farmers engaged in similar food production operations. The benchmarking tool was therefore developed as an Internet tool.

Below, we provide a general description of the benchmarking methodology employed and also report on the perceptions of a pilot group of farmers who subjected the system to initial testing.

1.2 Design of the benchmarking tool

In the developed benchmark tool, farmers can compare their scores with those of allied farmers engaged in similar operations at both the national and regional level. Regional comparisons are deemed the more relevant, however, since several key factors differing across regions (e.g. soil type, affecting pest presence) may prompt different pest management strategies. Therefore, the Netherlands was divided into 14 regions relevant to farmers based on factors like geology, groundwater, soil type, etc. (see Kragten & De Snoo 2003).

As a first step in the benchmark tool, the farmer can indicate the area on the map where his farm is located. He is also asked for which crop and which indicator he wants to carry out the benchmarking. In the case of crop protection, the benchmarking tool developed incorporates both environmental and economic indicators. With respect to the environment, farmers can assess their performance on two indicators: the amounts of pesticides used (kg active ingredient/ha) and the potential environmental impact of that use (expressed in Environmental Impact Points: EIP/ha cf. Reus et al. 1991). Both indicators were deemed sufficiently relevant to farmers, being already used in several certification schemes for products (De Snoo & Van de Ven 1999). With respect to economic performance, farmers can opt for an input-related indicator: the cost of their pesticide use (euro/ha), or two output-related indicators: crop yield (kg crop/ha) and financial profit (euro/ha), the latter also duly allowing for harvest quality. All the indicators can be used at the crop level, while total pesticide use and costs can also be used at the farm level.

For the next step, to calculate their 'sustainability score', farmers need to provide information about farm pesticide use (type, dosage), application methods (equipment, buffer zone, etc.), percentage soil organic matter, crop yields and financial profit. Most of this information is already familiar to Dutch farmers, many of who register pesticide use for

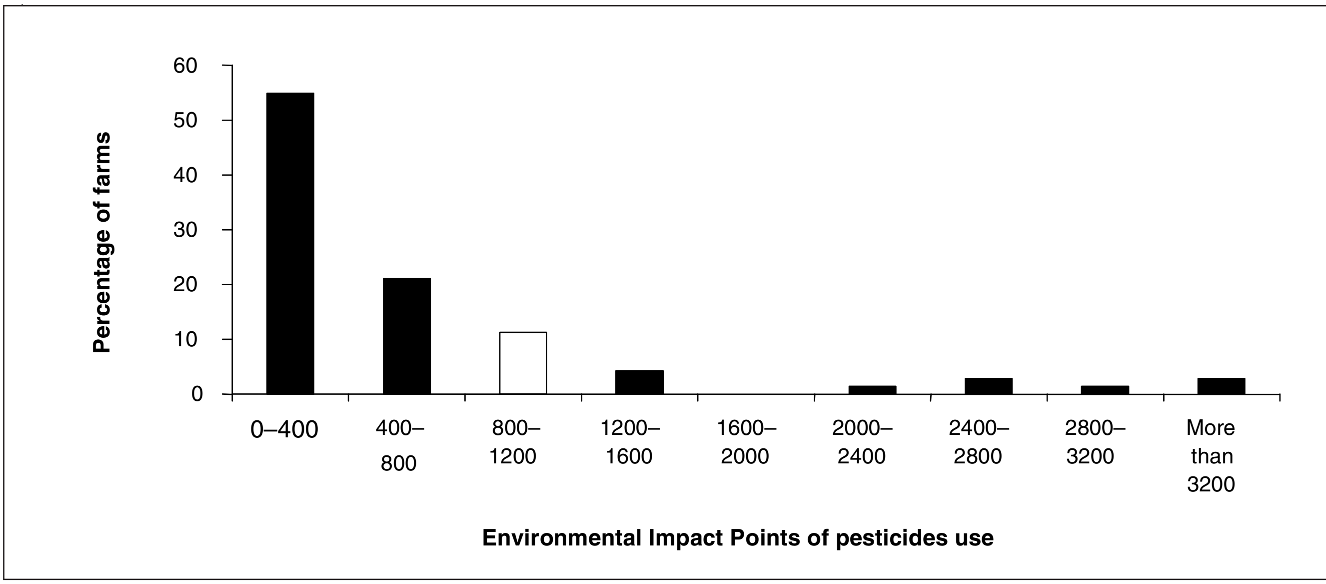

Fig. 1: Farmer's own score (white bar) relative to other, similar farmers in the area. Potential environmental impact of pesticides in Environmental Impact Points (cf. Reus et al. 1991)

retailers or certification purposes (mostly products). The 'sustainability score' of the farmer is in the form of graphics, reporting individual environmental and economic scores in relation to those of other, allied farmers (**Fig. 1**). The set-up is designed to give the farmers detailed insight into their performance on the various indicators. On the environmental side, as a last step, farmers are also informed as to which three pesticides contribute most to their score (greatest environmental impact, etc.). The farmer's responses concerning individual pesticide use (for what weed, pest, disease?) allow tailor-made advice to be given about more sustainable forms of pest management. This advice may relate to use of less toxic pesticides as well as to such issues as (changes in) crop rotation schemes, etc. There is also an opportunity for farmers to consult a 'knowledge database'. Therefore, an advisory tool and the database have been developed as separate modules within the same Internet environment.

1.3 Farmers' perceptions of the benchmarking tool

The tool was tested on a pilot group of 20 arable farmers selected to represent the present structure of Dutch farming. The pilot group was asked to fill out all the data required for benchmarking. The pilot group consisted of three subgroups of farmers. First, there were farmers already registering data on farm pesticide use with a company specialised in 'chain ICT services' like crop registration, tracking & tracing and benchmarking (Group 1). These farmers' data could be easily retrieved from this company's database and transferred directly to our system. Secondly, there were farmers who recorded such information using other management systems (Group 2). Although these systems did not permit direct data transfer to our system, these farmers had rapid access to basic statistics on their pesticide use, reducing the time needed for data entry. Finally, some farmers recorded their pesticide data solely for their own use (Group 3).

The results show that farmers of the pilot group considered the used indicators and the data output of the benchmark tool clear and meaningful. The presented diagrams (such as Fig. 1) were easy to understand by most of the farmers. However, some farmers reported that data entry was too time-consuming, especially farmers of Group 3. This was not the case for farmers already registering or recording data on their pesticide use. Furthermore, the farmers were very satisfied about the way of linking the results of the benchmarking tool with the other sites such as the farm advisory tool and the 'knowledge database'. Most important, the farmers do think the benchmark tool can motivate them to enhance sustainable farming.

2 Discussion

The case study presented focussed on the crop protection issues of arable farming. However, other aspects of sustainability such as nutrient use and on-farm biodiversity (such as the area with semi-natural land, cf. Manhoudt & De Snoo 2003) can be adopted in benchmarking systems. The ultimate aim should be to cover the three dimensions of sustainability: Planet, Profit and People, for example, in the context of company certification. Although our methodology of benchmarking farm performance has been developed for the Dutch situation, it can be readily upgraded to a higher scale level, for instance involving the EU.

Inclusion of an element of inter-farm competition in a benchmark tool in the Internet allows farmers to compare their environmental and economic performance anonymously and securely in a large-scale, open-access environment. Farm businesses appear to have much to gain from the use of Internet technology, particularly given their spatial dispersion and typically small scale in terms of employment and turnover (Warren 2004). And quantitative benchmarking as a tool to improve performances is well know in other kinds of business, as is being illustrated in many contributions in the scientific journal: Benchmarking: An International Journal (www.emeraldinsight.com/info/journals).

Ultimately, it is hoped, this type of approaches can serve as an incentive for farmers to adopt more sustainable methods of food production. This should be a research priority for further investigations: what will be the real environmental benefits of the benchmark approach, also compared to the more traditional approaches such as product labelling and company certification? At the moment, our programme has just been started, so there are no data available yet. Some case studies from the UK, in the meanwhile, show that it is important that negative and positive environmental trends can be linked to farming practices (Tzilivakis & Lewis 2004).

3 Conclusion

In our study, the pilot group of farmers responded positively to the benchmarking tool, indicating that most farmers are interested in comparing their own performance with that of farmers engaged in similar agricultural operations. An important factor in this success is the ease and speed with which data can be entered. If relevant data can be transferred directly from existing registration systems (government, food industry, retailers, management and bookkeeping systems), this is a major advantage. Ready access to background information and advice will help farmers assess their performance (Tzilivakis & Lewis 2004). Over time, furthermore, benchmarking results will be of increasing value to farmers, enabling them to compare their performance over a longer period and assess their progress.

Although, we know a lot of benefits from benchmarking approaches from experiences in industry (Wainwright et al. 2005), there are also some difficult issues. One of the more difficult issues is securing suitable benchmarking partners who are willing to participate in the benchmarking process and the availability of comparable (monitoring) data. (Jenkins & Hine 2003). The benchmarking tool can also be made available to other actors in the agro-food chain, such as the food industry and food retailers. Although they will not have the same, direct access to the system as individual farmers, they can use the tool to help steer agricultural producers towards more sustainable production methods, by setting standards for the group of suppliers: for example, no procurement from farmers scoring at the bottom end. This will provide a strong incentive for individual farmers to improve their environmental performance. Then the informational instrument is changing into a 'voluntary' but essential instrument for farmers to survive on the longer term.

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