MEASURING ENVIRONMENTAL PERFORMANCE AND VALUE ADDED USING THE AGRI-ENVIRONMENTAL FOOTPRINT INDEX

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Abstract

The Agri-Environmental Footprint project has developed a common methodology for assessing the environmental impact of European agri-environment schemes. The Agri-Environmental Footprint Index (AFI) has been constructed as a customisable approach. It is a farm-level index that aggregates the measurement of agri-environmental indicators. Farm-level impact scores can be aggregated at a regional level to track temporal change and/or to provide comparisons of the success (or otherwise) of an agri-environment scheme. European Union Member States are obliged to monitor and evaluate the environmental, agricultural and socio-economic impacts of their agri-environmental programmes. The evaluation process aims to determine the extent to which policy objectives are being fulfilled, and to identify any changes necessary to bridge the gap between policy aims and outcomes. However, there is little consensus on how to monitor and validate the benefits of agri-environmental schemes (AESs) successfully. Critically, there are no agreed methodologies for tracking the environmental consequences of changing agricultural practices, or the benefits of particular agri-environmental policy measures. This research has lead to the conceptual and practical development of a harmonised assessment system with which to assess the environmental performance of Europe's AESs. The approach is a common, quantifiable, index-based method that will facilitate a direct measurement of the environmental impact of AE policy over time and provide a framework for the assessment of potential outcomes of AES proposals. We have developed an Agri-Environmental Footprint Index (AFI) that is based on multi-criteria analysis methods. It has a universal core index structure and methodology, but is potentially customisable to any agri-environmental context within the EU25. The AFI can be used to measure the change in the environmental performance attributable to an agri-environment scheme by calculating an average AFI score for farms participating in the scheme (AES) and an average AFI score for non-participating farms (non–AES) within the same farming type and geographic area. The comparison of these scores can allow the differentiation between enhancement effects, protection effects or a combination of both environmental protection and enhancement. Here, data is presented based on the application of the AFI in the Chilterns Hills in the UK. The case study involved the collection and analysis of environmentally related data on 20 farms, a number of stakeholder workshops and the calculation of the AFI in each area. Results indicate that the method is capable of measuring environmental performance attributable to agri-environment schemes at farm-level. Conclusions are drawn about the practicalities of applying the index in the UK and the potential for the customisation of the index for use in any agri-environmental context within the EU25.

Key words: Environment, Evaluation, Indicators, Value-added

Background and the need for a common evaluation method

Since the mid 1980's, agricultural policy reform has increasingly incorporated an environmental dimension. The 1992 Common Agricultural Policy (CAP) reforms included provisions for Member States to establish agri-environmental schemes (the Agri-environmental Regulation, Council Regulation No. (EEC) 2078/92). Following Agenda 2000 reform, the Rural Development Regulation (Council Regulation (EC) No. 1257/1999) now combines several policy measures, including the adoption of agri-environmental measures. As a result of these initiatives, large areas of Europe now participate in agri-environmental schemes (AESs), although farmer uptake is variable and there is considerable variation in the scope and aims of the various national schemes (in conformity with the subsidiarity principle). This reflects a wide diversity of agri-environmental priorities and national views on the relative importance of the various components of agri-environmental quality.

Member States are now obliged [Article 16, Regulation (EC) No. 746/96] to implement monitoring and evaluation of the environmental, agricultural and socio-economic impacts of their respective agri-environmental programmes. The evaluation process is intended to identify the extent to which policy objectives are being fulfilled, and to identify any changes necessary to bridge the gap between policy aims and outcomes. However, there is little consensus on how to successfully monitor and validate the benefits of AESs.

A recent summary report on agri-environmental policy evaluation concluded that very few evaluations had actually attempted to measure precise environmental outcomes (CEC 1998). In practice, previous evaluation systems have concentrated on administrative issues such as: statements of the aims of the policy programme, the levels of farmer participation, budgetary considerations, administrative structures, the extent of geographical targeting, obligations of participation and the levels of provision and support from extension services. Measures of participation levels, such as the number and area of participating farmers and land, have been widely used to document the degree of progress made towards the achievement of particular policy objectives. This approach is most often chosen because of the relative ease of recording such information. However, participation in AESs *per se* does not guarantee the actual delivery of environmental protection or improvement.

Commission Regulation EEC/746/96 (paragraph 8.5.5) details the necessary elements for a system to assess the environmental performance of agri-environmental programmes. However, relatively few such systems have actually been established, and there are even fewer published results. In a recent comprehensive review of studies that have attempted to assess the impact of European AESs on biodiversity, Kleijn and Sutherland (2003) identified a total of 62 such studies which were confined to only five of the 27 current EU states and to Switzerland. With the possible exceptions of the UK and the Netherlands, the authors concluded that 'there is a lack of research examining whether agri-environment schemes are effective' and observed that 'in the majority of studies, the research design was inadequate to assess reliably the effectiveness of schemes'. In another recent study, Primdahl *et al*. (2003) conducted interviews with 789 farmers participating in AESs across 22 case-study areas in nine EU Member States and Switzerland and with 211 non-participating farmers. Using 12 agricultural indicators, their study showed that participant farmers undertook more agri-environmental activities expected to maintain or improve environmental quality than non-participants. Similar indirect evidence of environmental benefits was found by Knickel & Schramek (1998) and Knickel (2000).

The above commentary suggests a need to develop improved methods and a harmonised approach to the management of agri-environmental incentive schemes. Such methods must be customisable for the very wide variety of agronomic, environmental and cultural circumstances found across Europe. The required flexibility must allow for a 'context-dependent' development of relevant indicators for the evaluation and validation of particular policy aims. This challenge is set against the background of recent EU

enlargement, with the addition of new accession states that bring with them an even greater diversity of farming types and regional differences in environmental and rural development issues.

The Agri-Environment Footprint Index (AFI) and its potential uses

Against the above backdrop the AE-FOOTPRINT provides a common methodology to assess the environmental performance of agri-environmental schemes (AESs) in the frame of Rural Development Programmes, which can be customised to include locally-specific AES objectives.

The Agri-Environmental Footprint Index (AFI) is a farm level index that aggregates the measurement of agri-environmental indicators. It can be used for a number of purposes:

- to measure the changing environmental impact of individual farms within a particular context (farming type, geographical region) over time;
- to produce a measure of environmental impact that can be aggregated across farms of similar context in a given geographic location;
- to enable comparison of the environmental impact of farms in a given region which do/do not participate in agri-environmental schemes/measures (AES/AEM).

The method is based around the use of Multi Criteria Analysis in policy analysis (see ODPM 2005) and a method that has been used in relation to the evaluation of agri-environment schemes in the past (Park *et al* 2004). The nine steps used in the calculation of the AFI are outlined below:

Step 1: Define the AFI Application: This involves the evaluation of an agri-environment scheme (AES) in a given location

Step 2: Identify the relevant assessment criteria to be used in the Application. A range of criteria are decided upon for use in the evaluation of AES**.** These are classified into an assessment criteria matrix, typically formed of nine sub-divisions, to aid the weighting process.

Step 3: Approve the proposed Assessment Criteria Matrix. Stakeholders are asked to comment upon and agree the assessment criteria. Stakeholders are also asked to weight the relative importance of the nine sub-divisions.

Step 4: Identify appropriate farm level indicators. A range of indicators that can be measured on-farm are compiled in relation to the assessment criteria.

Step 5: Collect farm level data. This may be compiled from existing datasets or involve the on-farm collection of indicator data.

Step 6: Characterise the relationship between indicator values and resulting indicator scores. This involves the creation of a transformation function for each selected indicator to convert absolute measured values onto a standardised scale of scores ranging from 0 to 10.

Step 7: Weight the indicators. This involves weighting the importance of each indicator in relation to the criteria being assessed.

Step 8: Calculate the Index. An AFI score is calculated at the farm level by summing the scores multiplied by the weights for each indicator. Regional level comparisons can then be drawn between the mean AFI score for AES participating versus non-participating farms.

Step 9: Sensitivity analysis. Although the AFI is capable of producing an overall quantitative score for a given application, it is important to recognise that the process itself will produce a rich source of evaluative information. Sensitivity analysis will provide an indication of the robustness of the analysis.

The evaluators are expected to follow this prescribed AFI methodology involving consultation with both stakeholders and a technical panel; the overall outcome being a quantitative index measuring environmental impact at the level of individual farms. A higher AFI score indicates greater, or improving environmental quality and thus reduced negative impact. Farm level impact scores can be aggregated at a regional level to track temporal change and/or to provide comparisons of the success (or otherwise) of the chosen application.

To date the AFI has been applied in 15 case study applications across Europe as a mechanism for testing the methodology. The case study example below tests the use of the AFI in the Chiltern Hills, UK in relation to the application of evaluating the Countryside Stewardship Scheme.

The Chilterns case study

The aim of the case study was to test the methodology for determining whether the environmental footprint of farms participating in the Countryside Stewardship (CS) scheme differs from the footprint of non-participating farms in the Chiltern Hills; which are characterised by rolling chalk hills and woodland.

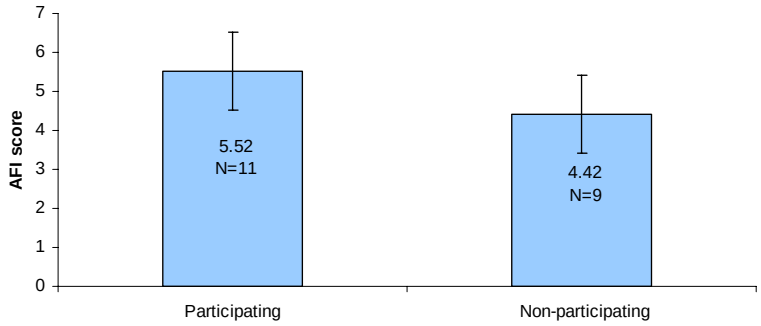
The stated objectives of the Countryside Stewardship Scheme are
- To sustain the beauty and diversity of the landscape
- To improve and extend wildlife habitats
- To conserve archaeological sites and historic features
- To improve opportunities for countryside enjoyment
- To restore neglected land or features

Eight local stakeholders were involved in the AFI process. These included the county archaeologist, a local government representative, a land manager, a representative from the farmers' union, government agency staff, a representative from an environmental NGO and researchers. This group provided local technical knowledge, the weighting of the sub-divisions of criteria and indicators relating to the impact of farming on the environment.

Twenty farms were sampled covering a mixture of arable, dairy, livestock and mixed farms ranging in size from 13 to 1011 ha. Nine of the farms did not participate in the CS scheme, whereas the remaining 11 farms had CS agreements. These agreements varied between farms and offered environmental management dependent on the environmental resource, conditions and features on farm. In the Chilterns many agreements were specifically associated with the management and restoration of chalk grassland and appropriate management of field margins and arable land.

The final AFI scores were calculated by summing the weighted indicator scores for each farm. The mean value AFI score for participating and non-participating farms was calculated and compared.

Figure 1: Comparison of AFI scores for participating and non-participating farms



The mean AFI score for participating farms was significantly higher (P=0.006)[2] than the mean score for non-participating farms (see Fig. 1).

Discussion and Conclusions

The AFI methodology was successfully applied to scheme evaluation in the Chilterns. This testing of the method has shown a difference in the environmental footprint between participating and non-participating farms, although the actual results should be treated with caution. All those involved in the case study believed the AFI methodology was a useful way to draw together the wide ranging outputs of the CS scheme into one evaluation. The consultative process has also had the impact of widening stakeholders' understanding and appreciation of the impacts of the CS scheme in the Chilterns. Similar case studies have been undertaken in 13 other regions of Europe with different geographic and agri-environmental contexts and demonstrated that AFI methodology can be used to calculate a farm-level index which can be aggregated to the regional level.

Application of the index is not without issues including the number and choice of stakeholders, weighting methods, number of indicators and data collection. However, none of these potential problems appear insurmountable and the aim is to produce a manual for applying the AFI method for use by practitioners during 2008.

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[2] The difference between means was tested using the Mann-Whitney U Test.

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