Enabling environmental action by farmers

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Environmental research provides evidence on impacts of different management activities, but to achieve impact, these activities need adoption in practice. This information sheet summarises some research evidence on how and why farmers adopt various environmental practices. Five short case studies are given as examples of activity being undertaken in a range of different situations.

KEY PRINCIPLES

- Farmers are a heterogeneous group, working in different contexts with different resource constraints, aspirations and values. Generalisations are, therefore, difficult. No one single approach will be appropriate for all circumstances.

- Providing farmers with information may be helpful, but often does not communicate in a way that is salient and enables action. Involving farmers in solving problems is likely to produce a more effective result. Farmers are knowledgeable about the specific circumstances in which they work. Allowing them to participate in addressing issues allows these circumstances to be taken into account.

- Communication has to come from a credible and trusted source for the farmer (e.g., an agronomist might have more influence than an academic). Other farmers who can demonstrate effective practical action are often the most credible communicators.

- Farmers are rarely purely rational economic actors (although economic considerations are important). Economic performance is often tempered by non-economic considerations. Many farmers might be best viewed as profit satisfiers rather than profit maximisers.

- System level factors can be at least as important as individual attitudes in determining action. These factors include, for example: policy, legislation, infrastructure, funding, markets, land tenure, institutions and distribution of benefits.

Farmer perspectives

Farmers' values are important. It is easy for scientists to look for a way to translate scientific knowledge for farmers, rather than really engaging with and understanding farmers' beliefs and values[1] and how scientific knowledge fits in with these perspectives. The following have been found to be important considerations:

- Farmers value their independence[2].
- Opinions of family members and considerations of farm continuity can be important[3].
- The extent of pre-existing environmental values may be important[4].
- Ease of adjustment of existing farming practices is often important[5].

[1] Holloway L (1999) Environment and Planning A 31(11): 2017-2032.
[2] Emery, S.B. & Franks, J.R. (2012) Journal of Rural Studies 28:218-231.
[3] Potter, C. & Lobley, M. (1996) Journal of Agricultural Economics 47: 172-190.
[4] Potter et al. 1991 and Macdonald and Johnson 2000 quoted in Burton *et al*. 2008 ref.12.

Farmers continuously adjust their practice in response to external stimuli (economic, social and political pressures), but may also exhibit risk aversion and there may be inertia to change in the system[6]. Farmers may also be predisposed to be early adopters of innovations or prefer to be late adopters. There is evidence that farmers predisposition to change varies in periodic cycles (e.g., influenced by new generations taking over the farm) rather than remaining static[7]. The effect of demographic factors, such as age, sex and education level have been found to be inconsistent[8].

The evidence suggests that many farmers do not accept that they make a significant contribution to environmental problems (e.g. water quality, greenhouse gas emissions)[9,10]. Neither do they find practices advocated to reduce these problems as credible.

Being a 'good farmer'

Many farmers aspire to be identified as a 'good farmer' as assessed by peers looking at their fields and livestock. Asking farmers to go against these norms will be particularly difficult. Examples of aspirations include:

- 'Tidy' farming with neat hedges[11]
- Straight tram lines; straight ploughing and sowing, demonstrating excellence of driving skills[12]
- Modern machinery[13]
- Quality crops without weeds[14]
- Good physical appearance of animals demonstrating breeding and husbandry skills[15]

Maintaining their professional identity as a farmer is important and requires visible evidence of this professionalism. Many environmental schemes and action to reduce climate change impact suffer because there is no visible evidence of professionalism in these areas[16, 12].

As a general behavioural principle, people tend to want to do the 'right' thing. If payment is offered for doing the 'right' thing, it can displace altruistic motivations, such as those towards environmental stewardship[15].

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[5] Harrison, Burgess & Clark 1998 in Burton *et al*. 2008, ref. 12.
[6] Holloway LE & Ilbery BW (1997) Journal of Rural Studies 13(3): 343-355.
[7] Ingram, J., Gaskell, P., Mills, J., and Short, C. (2013) Land Use Policy 31:267-279.
[8] Burton RJF (2014) Journal of Environmental Management 135: 19-26.
[9] Barnes, A.P., Toma, L., Willcox, J. and Hall, C. (2013) Journal of Rural Studies 32:448-459.
[10] Bruce, A. (2013) Life Sciences, Society and Policy 9 (10) doi: 10.1186/2195‑7819‑9‑10.
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[13] Holloway, L. (2004) Journal of Rural Studies 20(3): 319-330.
[14] Burton, RJF (2004) *Sociologia* Ruralis 44(2): 195-216.
[15] Yarwood, R. & Evans, N. (2006) Environment and Planning A 38(7): 1307-1326.
[16] Moran, D., Lucas, A. and Barnes, A. (2013) Nature Climate Change 3: 611-613.

RESEARCH CASE STUDY: PARABAN – REDUCING DISEASE IN CATTLE

Paraban was a research project, funded by the Scottish Funding Council, to explore ways of reducing the incidence of Johne's, a major, fatal wasting disease in cattle. This is a difficult disease to deal with because animals with the disease often do not exhibit symptoms for several years and the disease organism survives in the environment.

Key features:

- The project allowed meat and milk producers, industry stakeholders, scientists and vets to link up with each other and openly exchange experiences for Johne's control. They shared ideas on how the difficulties encountered in management of the disease may be overcome. The project used 9 beef and dairy demonstration farms run by "champion farmers", who worked with vets and scientists and determined their own individual plans for improvement over a longer time period.
- Extensive data collection from the demonstration farms was undertaken, including regular blood and manure sampling, as well as analysis of soil and material from abattoirs. This enabled monitoring of progress on each farm over the course of the project so that each could be followed and presented as a case study. The data collected also led to further understanding of the disease itself.
- Demonstration farms hosted farm visits and group meetings with people outside the project to discuss results.
- Over the course of the project, communications between farmers and scientists improved as they learned to understand each other better.

Over the three years of the project, blood tests showing positive for Johne's on demonstration farms dropped by 65%. However, the need to continue a long term, strategic approach in order to maintain progress was highlighted.

Further information: http://www.youtube.com/watch?v=eTFJPrSAj0c

Communication

Messages work better if they are specific and apply to an issue that farmers recognise as serious, likely to affect themselves, with a solution that is likely to work and is possible to implement[17]. Providing information once is unlikely to engender change, but too much information can lead to farmers being overwhelmed and feeling helpless rather than empowered to bring about change[18].

Credibility and trust in the communicator are important. Credibility tends to be greater for those who have practical farming experience and good interpersonal skills. Trust involves evaluating

[17] Rogers, EM (1983) Diffusion of innovations. 3rd ed. New York: Free Press.
[18] Murphy, J. (2012) Studies in Agricultural Economics 114: 93-98.

competence/expertise, as well as trustworthiness[19]. There is evidence that trust tends to be embedded in individuals (within organisations), rather than with specific organisations[20], and that continuity of communication from a single person allows that person to gain credibility, rather than dealing with rapidly changing personnel[21]. In some situations, working with groups of farmers has been found to be more effective than one-to-one communication[18]. Working in groups encourages farmers to learn from each other, take part in the process of problem solving and learn about practical solutions. Farmers have been found rely on their own on-farm practice, together with a wider network of practitioners and influencers to make decisions[20].

Farms & landscapes

Environmentalists are increasingly interested in working in ecological units, which often means working across farms (e.g., within a river catchment). This may imply several farmers working together. The difficulty is that private landowners (i.e., farmers) are being asked to produce common or public goods. There is evidence from around the world that farmers are able to work collectively to produce common goods that will benefit them (e.g., managing land to improve water quality in shared boreholes). However, it is more difficult when the goods are public (e.g., water quality for river biodiversity) or captured by other stakeholders (e.g., water quality for public water supplies). In these cases, legislation and/or incentives will often be required so that farmers obtain some benefit for producing goods they don't use directly. Collective action is more likely to be successful if there is a clearly defined resource/user boundary, conflict resolution mechanisms, effective monitoring, enforcement and sanctions[22].

Collaboration is a risky activity for farmers[23]. They don't want to fall out with their neighbours, they don't want to be exposed to potential judgement by their peers as a 'bad farmer' and they don't want to rely on people they consider are not trustworthy[24]. There may be advantages, therefore, to allowing farmers to choose their collaborators and not just require them to work with the farmer next-door.

Collaborative schemes are likely to engender support, if they: offer greater flexibility, involve farmers in the scheme design, are locally specific (e.g., involving a local species or habitat), have clearly defined aims and demonstrable benefits that can be measured (to provide satisfaction and esteem for participating farmers)[19]. For some farmers, it may be preferable if only parts of the farm are included in an environmental scheme, allowing business as usual elsewhere[14]. However, this can result in farmer disengagement with the environmental scheme and fail to engage farmers in bringing about change[24].

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RESEARCH CASE STUDY: RELU SUSTAINABLE UPLANDS PROJECT

The sustainable uplands project, funded by the UK Government through the Rural Economy and Land Use programme (RELU), aimed to combine knowledge from local stakeholders, policy-makers and social and natural scientists to anticipate, monitor and sustainably manage rural change in UK uplands.

Key features:

- The project involved stakeholders, including landowners and tenant farmers, in the development of the project objectives, in steering the project direction and as contributors of knowledge.
- Stakeholders were also involved in site visits and workshops, where a broad range of stakeholders could learn from each other's experiences.
- Information and data were collected on upland vegetation, key biodiversity indicators (birds), land use, and decision-making under a range of future scenarios. The scenarios focused on changes in subsidies and legislation in order to understand how external drivers influence management decisions.
- The data were then analysed, in conjunction with stakeholders, in order to link changing management decisions with vegetation cover and levels of biodiversity.
- The research identified two likely outcomes of changing external drivers: agricultural intensification or the abandonment of agriculture in upland areas.
- The project explored the impact of these two outcomes on biodiversity and ecosystem service provision, i.e. how abandoning agriculture could lead to improvements in ecosystem services if combined with restoration but how it could also lead to deterioration of ecosystem services if land was abandoned altogether.

The project has gone on to focus at a policy level, feeding into evidence gathering for national enquiries and the policy processes for DEFRA's best practice guidelines for payments for Ecosystem Services and the UK Peatland Carbon Code.

Further information: http://sustainableuplands.org/

Farmers in systems

Innovation is more than just adopting specific technology or specific practices. Innovation may involve complex interactions among multiple actors and institutions. Often, what is required is not just uptake of research but a combination of technical, social and institutional change. Therefore, in order to achieve change it may not be enough just to transfer research knowledge and adapt it for use in different circumstances. Social and institutional changes and innovation may be needed also

to enable new practices. This means working with more than just the researcher-farmer interactions and to consider a much wider range of relationships within the food chain[25].

CASE STUDY: SKYLARK – SUSTAINABLE ARABLE FARMING

Initiated in the Netherlands, this programme aims to promote sustainable production of arable crops, such as barley, sugar beet, onions and potatoes. It links farmers, agricultural merchants and food processing industries such as Heineken, McCain and Unilever.

Key features:

- Farmers are in the driving seat and determine their own individual plans for improvement over the next 5-10 years (but have access to an accredited consultant). This is a bottom-up approach that is needed to get full commitment from the farmers. A small membership fee is involved.
- Farmers plan to undertake four actions annually, based around a common set of sustainability metrics, and undertake their own evaluation.
- The sustainability indicators involve the whole rotation.
- There are ten sustainability indicators: nutrients, crop protection, energy, water, soil fertility, soil loss, biodiversity, product value, human capital, local economy.
- Farmers share their knowledge with each other and visit each others' farms, meet together and have access to agricultural specialists on demand.
- Most activities are based around regional groups, managed by one or two farmers supported by a consultant. The role of regional groups of farmers is very important; because they trust each other they can learn from each other and also judge each other within the groups.
- Supply chains are kept transparent by active dialogue between farmers and industry but farmers are not obliged to sell to a member industry.

Starting with a group of 12 farmers and facilitated by Heineken, the initiative has expanded to encompass 400 arable farmers, 7 industry donors and 17 agricultural merchants and industry 'friends'. The intention is to grow to over 5,000 farms.

Further information: http://www.veldleeuwerik.nl/

[25] Klerkx, L., Schut, M., Leeuwis, C., Kilelu, C. (2012) Ad IDS Bulletin 43(5): 53-60.

Uptake of agri-environmental schemes

Adoption of environmental schemes can be affected by[26]:

- Complexity – if the scheme is complex, it's difficult to understand and potentially risky.
- The extent to which the scheme can trialled. If it can be adopted in part of the farm this will encourage adoption.
- Whether the scheme is compatible with other farm and personal objectives.
- The costs of adopting the scheme, the more expensive it is, the less likely it is to be adopted.
- How risky is adoption likely to be? How likely is investment in the action to bring about the desired change?
- If adoption is already considered risky then conflicting information as to the effectiveness of the action is likely to act as even more of a disincentive.
- Whether the scheme involves capital outlay.
- The extent of intellectual time and effort involved.
- The extent to which flexibility in farming practices is reduced – farmers are likely to resist actions that reduce their management flexibility.
- The existence of appropriate physical and social infrastructure.
- The extent to which farmers perceive they are at personal risk from the environmental degradation – e.g. if depictions are over-dramatic, and the farmer does not see this degradation on their own farm, then they are likely to conclude that they are not at risk.
- Eligibility for different agri-environmental schemes varies and may limit participation.

The amount of effort required to participate in an environmental scheme is important. Onerous scheme requirements can act as a disincentive (e.g. complex forms and paperwork, mandatory farm conservation audits)[27]. Regulation can also act as a disincentive to adoption of environmental action, for example Scottish dairy farmers not in Nitrate Vulnerable Zones had higher uptake of voluntary best practice in water management than those in Nitrate Vulnerable Zones[9].

Intriguingly, some data suggests farmers with better mental health are more likely to adopt agri-environmental schemes[28]. Similarly, there is evidence that farmers affected by climate effects like drought, but who have good health are more likely to instigate adaptation strategies, regardless of low incomes[29].

Farmers tend to evaluate consequences to a broad range of criteria (e.g., economic, environmental, social), rather than just one thing that may be key for the environmental activity (e.g., increasing soil organic matter[30]). Non-adopters have been found to underestimate the probability of positive consequences and overestimate negative consequences of such adoption[18]. Working with farmers to understand pros and cons of actions in specific circumstances may be a way of getting better environmental results.

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INDUSTRY CASE STUDY: CARING DAIRY – MORE SUSTAINABLE DAIRY FARMING

Caring Dairy is an industry initiative to support dairy farmers to produce milk in a more sustainable way. It was initiated by Ben & Jerry's in 2003 and now involves over 300 farmers in the Netherlands and USA. It involves providing farmers with a practical framework for understanding, evaluating, and continuously improving the economic, social and environmental sustainability of their dairy operations, based on economic, social and environmental criteria. In Ben & Jerry's terminology: 'Happy Farmer, Happy Cow, Happy Planet'.

The 11 'sustainability indicators' are:

-Soil fertility and health

-Soil loss

-Nutrients

-Biodiversity

-Water

-Energy

-Farm Economics

-Pest management

-Animal Husbandry/Welfare

-Social Human Capital

-Impact on Local Economy

Key features:

- Participation is voluntary.
- Each year farmers complete a performance-based assessment. They receive scores on how they performed and are given a score based on a traffic light system. The reporting system allows farmers to compare their score with those of other farmers in the participating group.
- Farmers must complete all of the assessment and metrics questions, which are on a computer-based system. A group of farmers was involved in originally developing the metrics.
- Farmer must complete two improvement plans per year, giving them a focus on continuous improvement.
- Workshops are provided on various issues, with support from outside specialists. Attendance at three workshops per year, on a theme of the farmer's choice, is required.
- A small price premium is paid for milk.

Further information: http://www.caringdairy.com

Climate change

In common with wider publics, farmers vary on the degree of scepticism regarding human induced climate change. Arable farmers stressed the long timescales involved and difficulty of planning for unpredictable local climatic changes, as well as a certain amount of scepticism regarding the existence of climate change[31]. Dairy farmers in Scotland were also found to be sceptical regarding climate change[32]. Farmers in California perceived climate change impact as being something primarily affecting other people[33]. Even when recognising climate change as important, farmers may be dealing with risks that they perceive as more immediately pressing than climate change[34]. Uptake of scientific information also varies with the extent of positive attitudes to scientific information[35].

Farmers in California were found to be more likely to undertake practices to *adapt* to climate change, since this is seen as a personal threat, rather than *adopt mitigation practices,* which relied on a wider sense of doing good for others. Therefore, farmers may be more likely to adopt mitigation practices, which also have a tangible benefit to the individuals involved (e.g. nitrogen management, using less energy) than those of more general benefit[32]. In contrast, others suggest that a better approach is to develop farmers' natural inclination to see themselves as guardians of the land and support altruistic action. This may mean that actions such as payment for services can become counterproductive in certain circumstances[16].

[31] Holloway, L. 1999. Environment and Planning A 31: 2017-2032.

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INDUSTRY CASE STUDY: REDUCING THE CARBON FOOTPRINT OF EGG PRODUCTION USING THE 'COOL FARM TOOL'

The US company, Costco, is using a carbon assessment tool (the Cool Farm Tool) to reduce greenhouse gas emissions among its organic egg producers. The Cool Farm Tool is a greenhouse gas calculator developed by the University of Aberdeen, Unilever and the Sustainable Food Lab with funding and in-kind technical support from a multi-stakeholder consortium. The Cool Farm Tool can provide immediate results and instant feedback on the implications of different farming practices on greenhouse gas emissions. The tool has been designed to be farmer-oriented and interactive. The Cool Farm Tool limits data requirements to information that farm managers would typically have readily available and allows rapid identification of the main sources of greenhouse gas emissions. The interactive nature of the tool enables farmer engagement around greenhouse gas issues.

Key features:

- The tool allowed ten large organic egg producers to undertake self-assessments of their carbon footprint (following training), giving them immediate results.
- The tool was used to run 'what if' scenarios that allow different management options to be investigated.
- An annual summit of producers (organised by Costco) allows sharing of ideas and experience, as well as comparing results with each other and learning new techniques for reducing carbon footprints.
- Innovative ideas from individual farmers are shared at the summits.
- Changes made by egg producers included altering feed composition to crops demanding less nitrogen fertiliser, reducing transport by identifying local sources of feed and improving manure management practices.
- The Sustainable Food Lab advocates coupling the use of the Cool Farm Tool to assess greenhouse gas emissions with farmer engagement by convening groups of producers to act as an 'innovation incubator'.

After one year of using the Cool Farm Tool, greenhouse gas emissions for the ten Costco organic egg producers were reduced by 14%.

Further information:

The Cool Farm Tool http://www.coolfarmtool.org

The Sustainable Food Lab http://www.sustainablefoodlab.org

Note: This information sheet is based on research evidence primarily from the perspective of advanced economies and focussed on actions related to environmental sustainability. We are grateful to a wide-range of authors whose work we have drawn on here, however, the literature is vast and referenced literature is illustrative rather than comprehensive. Similarly, there are numerous other case studies of knowledge exchange that could have been chosen, including farm schools[36], Campaign for the Farmed Environment and Linking Environment and Farming (LEAF).

Authors: Ann Bruce & Claire Quinn

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