

Negotiating Change: the importance of knowledge networks in mitigating diffuse pollution

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Introduction:

Diffuse pollution from agriculture has increasingly been recognised as one of the main threats to water quality in rural Western Europe. Due to its diffuse nature, this form of pollution is less amenable to traditional regulatory approaches, requiring new collective and collaborative approaches. There continues to be considerable research on pollutant sources, pathways and options for mitigation, to underpin programmes of measures required un-

der the Water Framework Directive (e.g. Haygarth, 2003). There is also considerable research on the need for stakeholder involvement in developing water management and water resource plans (e.g. Falkenmark et al., 2004). There is also increasing recognition of the need to integrate biophysical, economic and socio-cultural research to fully understand the systemic nature of water management systems (e.g. MacLeod et al., 2007; Ison et al., 2007).

Research to understand and influence land managers', particularly farmers', behaviour is needed to encourage actions to prevent or mitigate pollution to water bodies. However, there is little research that focuses on the socio-cultural aspects of how stakeholders interpret, translate and respond to measures designed to mitigate diffuse pollution (e.g. Robinson, 2006). Within the agricultural and rural sociological literature, there is a growing body of work (e.g. Burton and Wilson, 1996; Morris, 1994) that draws our attention to the importance of (a) how there are different agri-cultures and (b) how farmer decision making is a complex multi-criteria process strongly influenced by the judgments of their peers. But these insights are yet to be adequately integrated into the focus on mitigation of diffuse pollution to water.

The shift from traditional to interactive agricultural extension practices highlights how knowledge emerges through social interaction and negotiation and is constructed through learning and experience (e.g. Roling and Wagemakers, 2000). It is the active interpretation and filtering of information, by individuals or collective groups, that translates it into knowledge. Therefore, the capacity to tap into, use and develop knowledge resources is as important as the quality of, and access to, information itself. Reviews of decision support tools reinforce insights from psychology which suggest that transparency, relevance and credibility are crucial to uptake. This reinforces the importance of understanding the processes by which information is interpreted, evaluated and translated into practice (e.g. Matthews et al., 2006).

There is an increasing interest in contested knowledge claims within environmental policy and management. Issues of power, legitimacy, authority and respect underpin the interpretation and reception of any policy (Fischer, 2003). There has been an increasing acknowledgement of the need to combine technical scientific knowledge with other forms of knowledge – traditional/indigenous and local/experiential for example, within the debates surrounding new approaches to science (e.g. mode II science, Gibbons et al., 1994; sustainability science, Kates et al., 2001).

Therefore, mitigating diffuse pollution will require using knowledge held by multiple actors – scientists, farmers, policy makers, industry representatives and extension officers.

This paper uses the concept of knowledge networks to explore how behavioural change can be negotiated. The phrase ‘knowledge networks’ highlights the importance of *collective* exchange of information. This is one of the key functions of social networks between farmers, albeit practised strategically so that misinformation may be as common as information (e.g. Sutherland, forthcoming). The phrase ‘knowledge networks’ also acknowledges the importance of social learning, whereby deliberation with peers can stimulate shifts in individual worldviews and group norms, leading to sustained changes in practices and actions (Sinclair and Diduck, 2001).

This paper highlights the practices of co-production of knowledge between policy makers, extension agents and farmers regarding the mitigation of diffuse pollution. It focuses on an evaluation of UK based case studies, highlighting the way in which knowledge networks are utilised in the provision of advice, recipients’ capacity to change behaviour and their willingness to change behaviour.

Case Studies:

The paper is based on research in progress on the provision of advice to promote long-term positive behavioural change within the UK. The project used a case study approach to collect data with respect to soils, water and waste (manure). As well as dealing with different media, the case studies were selected to reflect a variety of spatial resolutions (from national initiatives through to targeted local initiatives).

The five case studies were:

A: West Country Rivers Trust (South-West England)

The project was initially driven by concerns regarding a declining fishery attributed to diffuse agricultural pollution and aims to protect and improve water quality whilst educating the public about water management.

B: Birds Eye Pea Growers (East England)

This ongoing project was set up by the processors, working closely with an environmental NGO, to ensure growers adopted sustainable farming stan-

dards, using farmer discussion groups promoted through a forum of eight representative farmers.

C: Soil Management Initiative (Arable in England and Wales)

The SMI is an independent organisation and was created to develop and transfer knowledge about soil management systems that improve crop production and protect of the environment. It is ongoing but less active than it was.

D: Farm Waste Management Plans (South West England)

The project focused on awareness-raising of the risk of pollution from dirty water, slurry and manure; how to store farm waste; and how, where and when to best spread farm waste to land by developing a nutrient budget and spreading plan. It ran during the late 1990s.

E: National Trust Farming Forward project (Midlands)

This project was set up to secure a better future for land-use businesses that sustain a wide range of public benefits whilst taking advantage of new opportunities such as local food marketing tourism and environmental enhancement.

Therefore, only two case studies (A & D) were explicitly targeted at mitigating aquatic diffuse pollution, although issues of diffuse pollution also arose in the other case studies. Within each case study, we collected data using semi-structured interviews with individual farmers and farming families. We also interviewed the promoters of the scheme and stakeholders to give alternative perspectives. In total, almost 80 interviews were carried out. Three focus groups were held to discuss the issues collectively, rather than individually, and these data were compared with the data from the interviews.

The farms ranged from 20 hectares to over 1,500 hectares in size, and there was a range of fully owned through a mixture of short-term leasehold, tenanted and owned to long term tenancies within the sample. Farmers were all male, although we did complete several household interviews that included other family members, sometimes children and sometimes partners. The farmer's ages ranged from late twenties to late sixties. Another important distinction, particularly marked in case studies A&D, was the divergence in farming strategies between those becoming more extensive and/or considering exiting farming and those who were intensifying and/or expanding their holdings.

The data are being analysed using both qualitative analysis of the transcripts (interviews and focus groups) and quantitative analyses of descriptive data. The analytical framework was adopted from a synthesis of the literature review (Burton et al., 2006) and the themes arising from the data. These early analyses indicated that there were three key areas to focus on: how advice was provided, to whom, by whom; what farmers said about whether they were able to follow this advice and what farmers said about whether they were willing to take this advice. This draft analysis was shared with a workshop run for national policy makers in July 2007 and adjusted in light of these comments.

Findings:

Provision of Advice

Advice was provided in written and verbal form. The written form was a one-way flow of information through the use of websites, newsletters, articles in the press, and information sheets. There is a difference between advice that is sought by the farmer (through web searches, scanning the farming press) and information that comes through the post uninvited. Most farmers struggled to deal with the volume of information sent to them and the promoters were concerned that this makes it likely for their advisory messages to get lost in 'junk mail'. Despite their dislike of paperwork, most of our interviewees would scan their mail and would pay most attention to the information relating to regulation and financial incentives. Good practice was described as having a clear, colourful and concise summary, backed up by layers of increasingly complex and technical information to take account of the different types of farmer (hi-tech business or low-tech traditionalist).

The verbal form occurred in face to face situations. These ranged from collective (formal workshops to informal farmer discussion groups) to individual (formal farm visits to chats over the neighbour's fence) approaches. Formal collective events tend to self-select the most interested and innovative farmers so these are in danger of "preaching to the converted". There was a continuum of those who engaged in group meetings to those who actively avoided such approaches. As with written material, some felt that there are too many events resulting in farmers being "over-

loaded”. The interviewees’ notions of a good practice for this kind of event relates to timing (maximum two hours); subject matter (relevant, understandable, focused – “not wishy washy”), locality (nearby) and incentivised (helps farmers understand legislation, get a preview of business opportunities, provide points for accreditation). The provision of good quality catering definitely helped!

A number of interviewees had experienced one to one farm visits. These were popular as they provided advice in the context of their particular enterprise. Although the A and D case studies highlighted the attraction of having free farm visits, some interviewees were willing to pay for farm visits. Others speculated that the money spent on mail outs would be better invested in a network of farm advisors who would “sit down for half an hour and explain to the farmer what the environmental issues are rather than sending leaflet which they didn’t read”. However, these interviewees implied this should not divert funds from capital grants.

Farmers evaluate both the messenger and the message. For example, a number of interviewees disagreed with the information provided in the press or advice based on academic research when it did not make sense in the context of their farm or was judged to be ‘impractical’. Our data suggests that who provides the advice is crucial to how it is digested by the audience. Advisors have to have a “*good* farming background” (our emphasis) – using ex-farmers can backfire if they are perceived by their peers to be ‘failed’ or ‘poor’ farmers. Farmers evaluate the individuals upon a cocktail of factors including their affability and humour, their familiarity and expertise with farming systems, their display of common sense and their ability to relate technical information to the particular farm setting(s).

Our data also suggests the importance of farmers perceiving that the organisation supplying the advice does not have an ‘agenda’ or at least, if it does, that the agenda has a good fit with the farmer’s own agenda for their enterprise. For example, some consultants and commercial reps are trusted, but this is a result of strong social relationships built up over time. Other farmers were suspicious that this kind of ‘advice’ was effectively advertising for their products. Equally, environmental organisations need to pursue demonstrate they understand farming – one interviewee called for “someone who wouldn’t necessarily launch into ‘you want to save this beetle’ but would try to understand a bit more about their business and their situation”. Most importantly, some interviewees felt there was considerable duplication in the provision of advice and this perception of agencies “wasting money” affects the credibility of the advice source.

However, who should give what advice is very dependent on the topic – for example, academic researchers are more appropriate than peers, if the farmer wants information based on research results. There is a great deal of variation in sources of advice in terms of how often they are used and for what kinds of decisions. For example, bank managers were consulted for strategic farm business decisions, but NGOs were more likely to be used for environmental management decisions. However, even within the same case study there was a variation from farmers often using a source to others never using that source. The results reiterate the difficulty of providing guidance on which intermediaries to use for advice provision.

Capacity to Change

Once advice has been sought and/or received, the farmer will embark on a process of decision making regarding whether to change their practice. There are many inter-related aspects that facilitate or constrain behavioural change. Characteristics of the enterprise, such as the size, topography, climate and soil composition of the farm, the type of tenure and access to finance to put in infrastructure or systems are important facets impacting on the ability to change behaviour. However, this section focuses on other facets that have direct links to knowledge networks - human capital; labour and time.

As highlighted in the section above, the skills and expertise of farm advisors are important. Technical qualifications were seen as desirable when combined with practical experience but many advisory staff “were not plugged into” the practicalities of farming. Staff turnover was also mentioned as a problem, as it prevents the development of relationships between farmers and advisors and means the advisors do not have local knowledge (a key part of ‘common sense’ that farmers prize). Many farmers had formal qualifications and continue to update their skills although very few have any formal environmental management training (several have undertaken environmental improvements and have learnt ‘on the job’). This combination of formal training and experience helped them deal with the complexities inherent in managing the farm enterprise, which in turn helped them access opportunities for environmentally friendly farming. Promoters also noted the relationship between uptake and a farmer’s ability to interpret technical knowledge depended on the indi-

viduals desire to learn, which is often negatively correlated with available time.

Time is linked to the availability of labour, the farming system, off-farm employment (or diversification businesses) and the size of the property. Time is also linked to an emerging theme of 'complexity' covering the complexity of farm management, complexity of forms and complexity of policy and regulatory interactions as all of these require an investment of time for management. For many smaller farms, time is in short supply. Farmers who feel short of time are less likely to read material, attend meetings, discuss things with their neighbours or attend discussion groups. Even if they are interested in changing their practice, they are less likely to take the steps required to do so.

The reduction in available (or affordable) labour was often a trigger for changes in farm management practices, although not always towards environmentally friendly practices e.g. intensifying and mechanising indoor dairy operations that create more manure. Many farmers argued that they did not have time to carry out the environmental improvements they would like to (planting hedges, maintaining wetlands, managing riparian woodland) as they had reduced their labour to reduce costs. Some of our sample utilise temporary farm labour, often from overseas and these people may have different understandings of environmental management. There is also increased use of contractors on farms due to reduced on-farm labour. Others use agronomists or land agents to help manage the farm. These changes make the audience for advice more heterogeneous.

Linked to the issue of labour and time is the data on farmers cooperating and sharing labour, machinery and ideas. Some of our interviewees were members of a cooperative, buying ring or informal 'circle of friends' and this allowed them to manage their enterprises more effectively and/or economically than individually. The existence of such groups not only provides information pathways, but also increases the capacity of these farmers to share the risk and the expense of trying new practices whilst providing the opportunity to learn from the experiences of others.

Willingness to Change

Achieving long-term behavioural change depends on the farmer's willingness to change. This is a complex area encompassing individual values and self-identity; perceptions of the future of farming and intelligent

strategies in light of this; social influence; and farmer responses to the associated carrots and sticks (income, regulation, administrative burden).

Behavioural change is influenced by values such as the desire for independence and autonomy. Farmers want advice that recognises them as individuals, that treats them as equals and that allows them to retain control of their enterprise. Farmers disliked the administrative burdens created by regulation, and the emphasis on standardisation as part of quality assurance schemes. Likewise, many farmers, particularly the smaller family farmers, displayed considerable resistance to the idea of external surveillance by agencies or regulators. Some farmers identified themselves as progressive farmers and embraced new practices as a way of demonstrating this. Others drew their self-identity from continuity with past practices. In both cases, advice is interpreted in light of the 'fit' with their chosen identities and value orientations.

Behavioural change is more likely at times of strategic re-positioning. Our data shows considerable heterogeneity in the strategies that farmers are pursuing, with some considering exiting farming, some diversifying, some extensifying whilst others were moving to more intensive production. Those seeking to extensify tended to want to farm more environmentally, whilst those intensifying were motivated more by avoiding regulatory sanctions. Most family farmers were unsure whether their successors would take over the farm, creating additional uncertainties for strategic planning. Again, advice is sought and/or interpreted in light of the 'fit' with their chosen strategies.

Willingness to change is also related to respect between farmers. Respect is a component of maintaining social capital and respect is engendered and maintained by the judgments of their peers. Therefore, farmers may couch decisions to change their behaviour in the context of what their peers will think of this. Where actions have the potential to be judged negatively, this is likely to act as a potential barrier to uptake. However, the judgments made and the benchmarks used are likely to vary between farming styles and farming systems. Farmers themselves believe that their sectors can be divided in those who act responsibly and were keen that the majority did not bear the regulatory burden created by "a few bad apples".

Farmers were more willing to respond to advice if it was an opportunity to prevent onerous legislation through self regulation and/or an opportunity to anticipate, rather than have to react, to regulation. However, fear of, or

actual, prosecution was a driver in both the A and D case studies. In many cases, there was limited evidence of long term behavioural change – mitigation measures were adopted but farmers still rationalized their choices in terms of investing in their farm and/or reducing the risk of prosecution. There was no explicit recognition of the risk of diffuse pollution to the *environment* or motivation to protect water quality for its own sake. Therefore, there were clear differences in the motivations of the agencies providing the advice (to protect the environment) and the motivations of the farmers (to manage their farms effectively).

Any advice given is interpreted in light of individual and collective sense-making processes. These processes will be influenced by the individual's underlying values and existing social norms. For advice to resonate with the audience it has to be seen as relevant and important. If they don't feel responsible for environmental impacts, farmers want to see how changing behaviour will *benefit* them. There were nuanced different judgments about why, how and under what circumstances change will be perceived to be beneficial, and how farmers weight this against judgments regarding risks and possible negative side effects. In some cases, where behavioral change was achieved through incentives, attitudinal change followed once benefits are recognised.

Discussion: Role of Knowledge Networks

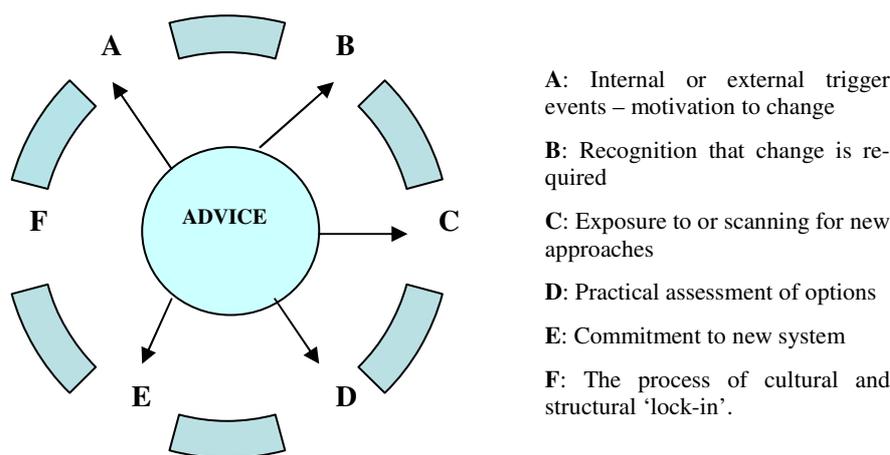
The overall synthesis of these findings suggests a theory of when and how change becomes both possible and probable. Thus, the following elements contribute to land use decision making:

- A. Internal or external trigger events – motivation to change
- B. Recognition that change is required
- C. Exposure to or scanning for new approaches
- D. Practical assessment of options
- E. Commitment to new system
- F. The process of cultural and structural 'lock-in'.

There is a complex relationship between advice and decision making – at times decisions are taken (stimulated by market forces, regulation or social relationships) and then advice is used to select how to change the practice; but at other times, advice can stimulate the need for a decision in the first place. Thus, different forms of advice and information are required at different stages as shown in Figure One. Furthermore, advice can be very in-

fluent at moments of transition but may be dismissed when the farmer is 'locked in' (ideologically, financially, and physically) to the existing system.

Figure One: Relationship of advice to stages in theory of change



This paper highlights the importance of knowledge networks within this model of the relationship between advice and behavioural change. Drivers of change, decisions regarding whether to change, information about what options are available and what might work for their enterprises (A – D in Figure One) are all influenced by knowledge constructed from information circulating through networks and the judgments of their peers.

Firstly, there are data on intra-family dynamics and their impacts on behavioural change. In some case studies, the family dynamic, often the influence of children or the spouse, promotes positive environmental behaviour. However, in other cases, often involving decisions over investment in equipment or changing farming practices, there were power struggles between parents and successors. Younger farmers were not always more environmentally aware than older farmers, as some successors were keen to intensify and divest themselves of agri-environmental responsibilities whilst older farmers felt more of a responsibility to their local environment. As working off farm is becoming more common, and succession is more uncertain, these dynamics are getting more complex. It is also important to note the circulation of knowledge between the farmer and their staff

or contractors. In most cases, the farmers assumed that their contractors would operate best practice but environmental management was not discussed with them. Thus, it is useful that policy makers have started to include contractors as part of their target audiences for advice.

Secondly, as discussed under the section on engagement, the relationship between the farmer and the advisor/advisory organisation is crucial. There is data suggesting that farmers are more willing to engage with advice when they perceive the process to be one of mutual respect and negotiation, rather than being told what to do by an external entity. Farm visits were appreciated when they provided an opportunity for the farmer's local knowledge to be validated against professional judgments. One of the benefits of having external advisors was that they were able to help put the farmer's specific knowledge into a wider context, in terms of changing business practices and scientific advances. Often, there was a difference between what the agencies see as good practice, and the farmers' own definitions. A key part of the advisor-farmer relationship is to recognise the heterogeneous perceptions of 'common sense' and 'good practice' in order to build a common understanding of the problem.

But to move beyond understanding to changing behaviour involves the farmer being able to put this knowledge into practice on their farm – hence the need for the advisor to translate their knowledge into a tailored solution. Equally, the advice has to come from a credible source and farmers are less likely to take advice from a source with whom they have had negative dealings with before, or which is judged to be 'anti-farmer'. This highlights both the importance of long term relationship building by agency staff and the reason why many regulatory agencies work in partnership with other organisations to gain access to farming networks. It is also important to recognise that information is provided by other non-farming stakeholders e.g. industry representatives, consultants, quality assurance schemes and vets. If different sources provide conflicting advice, this further undermines the message.

Finally, advice is often circulated, discussed, reinforced or ridiculed within farmer to farmer networks. When advice is promoted through farming networks, it has additional cachet as it is more likely to be perceived to be practical. Some interviewees attend farmer discussion groups and these settings allow individual farmers to both provide advice and seek advice from their peers. Others visited farmers using new techniques in order to gain advice about these practices. These were part of a community of interest (zero tillage farmers; organic dairy farmers etc) rather than a com-

munity of place. However, a few farmers felt they did not have time to take part in such networks, either of place or interest. These differences seem to be partly due to personalities but often linked to their situation, most prominent in marginal farming enterprises with bleak prospects for the future where the farmer could not afford to, or did not see the value of, taking time to network. Therefore, fragmenting networks and decreasing social capital impedes the informal farmer to farmer pathway for information and advice, and those least networked were most likely to lack information. They are also more immune to social influence from their peers.

Conclusions:

The paper has outlined some findings from a project looking at the relationship between the provision of advice and positive environmental behaviour by farmers. This topic is of central interest to policy makers involved in mitigating diffuse pollution, given the difficulties in designing regulatory or economic instruments to reduce diffuse pollution. Our research builds on the literature on agricultural extension by highlighting the important role of knowledge networks. We indicate that information and advice is interpreted, negotiated and reconfigured by farmers through interactive networks within the enterprise, with other farmers and with the advisors and other stakeholders. However, the provision of advice to farmers is only part of the process of inducing long-term behavioural change. The impact of advice may be very limited if the farmer is 'locked in' to the existing system.

The attention to knowledge networks highlights the importance of ensuring advice is considered relevant, credible, reliable and practical by the recipients. It also highlights different understandings of diffuse pollution and water quality, with worrying implications for long term behavioural change. The concept highlights the heterogeneous process of sense making within the modern industrial agricultural sector. These points indicate the importance of placing advice and behavioural change in the wider context, particularly the role of farming in the UK and the relative rights and responsibilities of farmers viz a viz other stakeholders in protecting and enhancing water quality. Finally, knowledge networks provide a systemic approach that links farmers, advisors, policy makers and other stakeholders together in the process of social learning.

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