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**Developing an institutional model for the extension
and adoption of environmental Best management
Practices by pastoral farmers in New Zealand**

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Developing an institutional model for the extension and adoption of environmental Best management Practices by pastoral farmers in New Zealand

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MAF Policy

Abstract

The practice of extension of environmental Best Management Practices (BMPs) involves the integration of a range of complex issues. Currently the practice of this in New Zealand is somewhat piece-meal, ad-hoc, and not well coordinated amongst the organisations involved. There is also a strong rationale for Government involvement. This paper discusses these issues and proposes a way forward.

Adult Learning

Learning refers to a change in behaviour that can be observed and managed, and involves the acquisition of knowledge, skills, and attitudes associated with job mastery (Davies, 1981). There are two major approaches to the psychology of learning: cognitive and behavioural (Johnson (1979).

Of these, the cognitive viewpoint is the most widely supported. Cognitive learning is the acquisition, through insight, of cognitive structures. It is an internal process, not necessarily observable, in which information is integrated into the structure of what the person already knows and understands. Humans are life long explorers of their environment; seeking, organising coding, storing, and retrieving information – building on their cognitive structures to continue learning. People are viewed as active and curious beings, innately social and co-operative, constantly seeking better adaptations to the environment by systemising perceptual and cognitive information into meaningful patterns.

Research has found that the learner themselves plans the vast majority of their learning projects. The next important “planner” is a group (or its leader), followed by one person in a one to one situation, a mixture of the above, and lastly a non-human source such as an instructional book (Tough, 1982). Often the most efficient way to learn is where an instructor interacts with the learner on a one-to one basis (Tough, 1971). In a one-to-one situation the learner benefits from having the person’s expertise adapted to them as a unique individual and to their particular learning project. The learner can obtain immediate responses to their questions, difficulties, fears, doubts, and concerns. In this situation the resource person can easily modify the procedure and/or content as appropriate.

Adoption and Diffusion of Innovations

The diffusion of innovations is defined as “*the acceptance, overtime, of some specific item, idea, or practice, by individuals, groups, or other adopting units, linked to specific channels of communication, to a social structure, and to a given system of values or culture*” (Katz, Levin, and Hamilton, 1963).

The most widely researched innovation diffusion model is one proposed by Rogers (1962) and revised by Rogers and Shoemaker (1971), which has four stages:

(i) Knowledge

The individual is exposed to the innovation and gains some understanding of how it functions.

(ii) Persuasion

The individual forms a favourable or unfavourable attitude towards the innovation.

(iii) Decision

The individual engages in activities that lead to a choice to adopt or reject the innovation.

(iv) Confirmation

The individual seeks reinforcement for the innovation-decision they have made. Conflicting information about the innovation may cause them to reverse the earlier decision at a later stage.

Rollins (1993) adjusted this to a five-step process:

- (i) Awareness of an innovation;
- (ii) Interest in the innovation;
- (iii) Evaluation of the innovation;
- (iv) Trialling of it; and
- (v) Assuming a successful trial, adoption.

Rogers and Shoemaker (1971) found (in their North American studies, and again confirmed by Rollins (1993)) that the distribution frequency of the number of adopters of an innovation over time follows a normal bell curve distribution. This distribution curve can be split into five characteristics:

Innovators

The first 2.5% to adopt an innovation. Innovators are venturesome and eager to try new ideas, generally have more cosmopolitan social relationships, and often communicate with, and belong to, a group of innovators. They usually have reasonable financial resources, so as to absorb a possible loss, and the ability to understand and apply complex technical knowledge.

Early Adopters

The next 13.5% of the population to adopt an innovation. Early adopters are a more integrated part of the local social system than are innovators, and often have the greatest degree of opinion leadership. Potential adopters often look to early adopters for advice and information about an innovation.

Early Majority

The next 34% who adopt before the mean time. The early majority deliberate some time before completely adopting a new idea. They follow the early adopters willingly, but carefully and seldom lead.

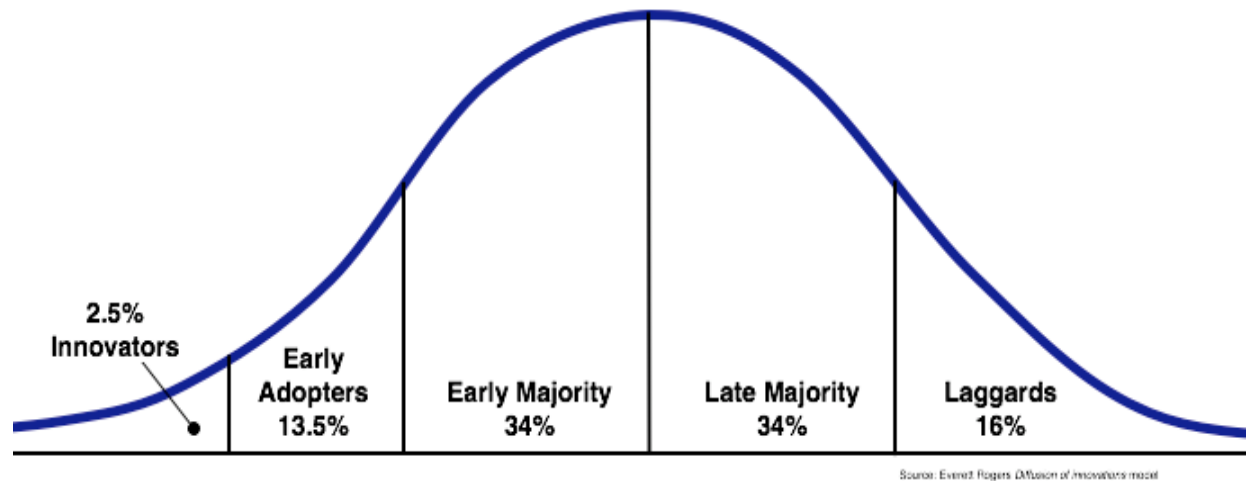
Late Majority

These are the next 34% to adopt, after the mean time. The late majority approach innovations with a sceptical and cautious air, and do not adopt until most others in their social system have done so. The weight of social norms must definitely favour the innovation before the late majority are convinced.

Laggards

The last 16% to adopt. Laggards are traditionalists who are guided in their decisions by the past. They are suspicious of new ideas, and allow a long time to elapse between knowing of an innovation and adopting it.

Figure 1. Adoption Curve



Exactly the same framework is used in a marketing approach (McManus and Powe, 2007), who note that any marketing effort should be targeted towards the innovators and early adopters, as these are the people most likely to be attracted to a new product.

Uptake of Innovations

There are four factors that influence the uptake of innovations.

1. Characteristics of the innovation. There are five attributes of an innovation that influence its adoption:
 - (i) Relative advantage – the degree to which an innovation is perceived as being better. Often expressed in economic terms.
 - (ii) Compatibility – the degree to which it is perceived as being consistent with existing values, past experience and needs of the individual and (in a farming context) how readily it fits within the current farming system.
 - (iii) Complexity – the degree to which the innovation is perceived as relatively difficult to understand and use.
 - (iv) Trialability – the degree to which an innovation may be experimented with on a limited basis.
 - (v) Observability - the degree to which the results of an innovation are visible
2. Characteristics of the individual. This relates to the personal characteristics and circumstances of the individual – e.g. age, education, financial circumstances, goals, family circumstances, support networks, interaction with scientists and extension agents.
3. Characteristics of the social system. This relates to the structure of the social system, incorporating its beliefs, norms, values, and communication systems.

For example, a traditional social system may well limited adoption of innovations, while a more open social system with well developed technology, exposure to a range of media and ideas, and a more positive attitude to change, is more likely to support innovative behaviour.

4. Channels of communication. This is the means by which the message travels from a source to a receiver, and there are two main channels: mass media and interpersonal.

Mass media channels are relatively more important at the knowledge function level, in creating an awareness of an innovation. These channels would include; TV and radio, magazine articles, field days, discussion groups, seminars, and conferences.

Interpersonal channels are those that involve a face-to-face exchange between two or more individuals. It allows for a two-way exchange of ideas, and can be used to persuade receiving individuals to form or change, strongly held attitudes.

5. Change Agent's role. The Change Agent (or advisor) functions as a communication link between two or more social systems (Rogers and Shoemaker, 1971). They have a major influence on adoption and diffusion of innovations, both through the methods they use, and their availability (Cronin 1968, Hughes, Squire and Payne, 1973, Fairgray 1979, Pannell 2001, Guerin 1999).

Social Factors

Traditional extension has usually been a top-down process whereby scientists developed products and methods that were promulgated by extension agencies, and farmers were expected to adopt. Extension agents considered farmers who failed to adopt new techniques were to be recalcitrant and irrational, and that farmers' attitudes and their lack of knowledge were the main barriers to adoption. Little consideration was given to farmers' points of view, and the idea that resistance to change might have some logical basis was seldom considered. Recent analysis reveals that most "barriers" have a rational basis and can be categorised as: conflicting information; risk; implementation costs and capital outlay; intellectual outlay; loss of flexibility; incompatibility with other aspects of farm management and farm and personal objectives; as well as social and perceptual issues. Vanclay and Lawrence (1994).

This was expanded on by Vanclay (2004), who noted: "*agriculture has too long been thought of as a technical issue involving the application of science and the transference of science outputs via a top-down process of technology transfer. It is not. Agriculture is farming, and farming is people*". He notes that there is often a lack of awareness of the social issues affecting farming people, which is critical to the promotion of natural resource management issue in agriculture, and has developed 27 principles relating to these social issues.

A few of these principles are outlined below:

Principle 1. Farming is a socio-cultural practice – farming is a way of life and a vocation. As a socio-cultural practice it is governed, informed and regulated by social processes.

Principle 2. Farmers are not all the same – the farming community is not homogenous; farmers and farms are rich and poor; big and small; old and young; ready to adopt new ideas or conservative and traditional. It would be more meaningful for extension agents to group farmers according to farming style rather than adopter/non adopter, and address these different styles and priorities accordingly.

Principle 3. Adoption is a socio-cultural process – extension is not just a process of communication between science as the only originator of ideas and farmers as passive adopters. Adoption is a social process – it is not an unthinking response to information provided by extension, but a deliberate decision by a farmer in response to a wide range of issues. Adoption also takes place in a social context with farmers discussing their ideas with other farmers. Much adoption occurs when the idea or practice has become part of the normative concept of “good farm management”.

Principle 7. Farmers don't distinguish environmental issues from other farm management issues. Good farm management is a composite entity; it includes production issues, environmental issues, and social issues. While many extension approaches are differentiated into production issues or conservation issues, this is a meaningless differentiation for farmers. There is only one farm; farming practices have both production and environmental outcomes and extension advice must be integrated.

Principle 9. Sustainability means staying on the farm. Often sustainability is regarded in a biophysical sense and sometimes in terms of economic issues. For farmers the social significance of farming means that the social dimension of sustainability is central; sustainability is meaningless unless it involves the ability to stay on the farm.

Principle 27. Farmers need to feel valued. In terms of natural resource management, farmers are often asked to make a significant personal investment for what is largely a public benefit. Because of the notions of stewardship and the concept of good farm management, most farmers are prepared to make their contribution. But they need to know that this contribution is appreciated and valued by the wider community.

Social Marketing

Because of the wide range of issues involved in endeavouring to target extension appropriately, particularly the incorporation of social factors involved, a number of extensionists have turned to the ideas and principles of social marketing to facilitate behaviour change. Social marketing is based on the principles of marketing but promotes behavioural change rather than promoting a product. The main aim being to facilitate adoption and diffusion to change the behaviour of a target audience, and with the key principles including; strong customer orientation, matching the specifications of the “product” to the customer, and the use of market research to understand the needs, desires, beliefs and attitudes of the target audience so that communications can be targeted at segmented audiences.

The more an individual expects that a behaviour has good consequences for themselves, the more they will have a positive attitude towards that behaviour, and similarly with the converse. This therefore provides a useful framework for agencies taking a marketing approach to strategies for behaviour change.

Belief based social research can therefore directly assist extension programmes by providing information about the behaviours to be focused on, audience segmentation, how to influence decision making and social norms, the balance between mass communication and personal contact, and the intervention methods to be used. (Parminter *et al*, 2006)

Agricultural Extension in New Zealand

The government has been a significant factor in agricultural extension in New Zealand, particularly via the Advisory Services Division of the Ministry of Agriculture and Forestry (MAF). This reached its peak in 1986 when it consisted of some 670 staff, half of them graduates in agricultural or horticultural science, and with an annual budget of \$22 million (Journeaux & Stephens, 1997).

The provision of agricultural extension services by the government was based around the concept that it was a “public good”. Prior to the restructuring through the late 1980s–early 1990s, policy makers felt that agricultural research and extension were public goods which government should provide. In this context the definition of “public good” was possibly wider than that given below; the material benefit to the nation from agricultural exports was such that government continued to allocate funds to support agricultural research, extension, and farm credit. Considerable private benefit accrued to farmers, but it was felt that state funding could be justified. While an extension service provides a mixture of public and private goods, and the boundary between the two is difficult to define, the new government in 1985 decided that the results of extension were wholly appropriable, and set in train the privatisation of the advisory service.

A public good is one for which consumption by one individual does not prevent consumption by another. Knowledge, information and improved management practices are public goods because they can be transmitted from one individual to another without diminishing benefits to either. In pure form, a public good is non-excludable in the sense that no practical rationing mechanism exists by which consumption is controlled by price. Non-paying individuals cannot be excluded from the benefits derived from the good. A private firm is discouraged from developing a market for a product or service that can be easily shared. In this situation, the benefits of such a product or service cannot be appropriated and therefore, profit incentives do not induce private development, even though social benefits may be high (Just & Rausser, 1993, cited in Journeaux & Stephens, 1997). There is a continuum between public and private goods, with few pure public goods.

This issue around public versus private goods is crucial in the argument around environmental extension, as many of the benefits of such extension lie in the public arena.

The overall impact of the reforms through the 1980s and 1990s has been a reduction in the number of agricultural extension workers in New Zealand; although there has

been a significant increase in the private sector following the demise of government funded services (with many of the previous government workers moving into the private sector).

The issue around the reduction in numbers relates to the availability of advice, a key component in adult learning/extension. In addition, while private consultants are important in disseminating research results, they are taking a limited role in environmental extension (Botha, 2008) – due to a combination of lack of expertise, and that the Regional Councils (and Fertiliser Companies to a lesser extent in nutrient management) are effectively providing a “free” service.

The main inconsistency in the current research-extension mix is the communication of the results of publicly funded research. Research is still largely viewed as a public good, and the bulk of research funding in New Zealand comes from the State. If this spending is seen as “public good”, a strong argument can be made that the transfer of this also has a high public good component, especially with respect to environmental, social, and sustainability issues relating to the agricultural sector.

Current Environmental Extension in New Zealand

Currently there is a range of bodies involved in environmental/sustainable land management extension within New Zealand:

1. Regional Councils/Unitary Authorities. These are the primary environmental agencies responsible for devising and promoting sustainable management of regional natural resources, under the aegis of the Resource Management Act 1991 (RMA).

Each Council is involved to varying degrees in environmental education, research, seminars and field days, and provision of information and publications. However, staff numbers involved in such work are relatively few in number.

2. Industry organisations. This includes the likes of DairyNZ, Meat & Wool NZ, and Deer NZ. These carry out a range of functions, including research and extension. While the bulk of this is around farm business issues, sustainable land management is also included.
3. Other agencies, including NZ Farm Environment Awards Trust, NZ Landcare Trust, and Fonterra, all of which carry out a range of functions promoting sustainable land management.
4. Government Ministries such as MAF and Ministry for the Environment (MfE), both of whom operate funds, which, although they do not have the sole purpose of achieving land management extension, they do allow for initiatives towards this end.

The argument is not that these various organisations aren't doing good work – they are, but that there is a need for much more of it.

A major challenge of the 21st century will be meeting the food needs of an increasing world population, as well as ensuring agriculture implements the principles of

sustainable development. Based on FAO projections for food demand and supply, it is clear that much greater investment is required in:

- Research to generate productivity-enhancing technologies without adverse environmental consequences, and
- Extension so that there is widespread dissemination and efficient use of these technologies

(Crowder, 1996).

A role for Government in Sustainable Land Management

Allen *et al* (2002) found that:

- Based on Coase (1937) there is a sound rationale for such intervention, which would seek to persuade farmers to act in an environmentally sustainable way by using their own resources, rather than giving farmers direct assistance. Government would provide indirect assistance via providing information and technology transfer, rather than provide direct assistance (e.g. subsidies for planting trees or fencing streams);
- The indirect assistance (i.e. extension) would be specifically required to target environmental off-farm benefits so that benefits are captured by the community, either regionally or nationally. Plus these benefits would have to be measured using an economic approach and set along side the costs;
- Policy devised must take into account how the overriding financial and economic farming imperatives interacts with farmer willingness to continue making improvements to the land that are consistent with government environmental policy objectives; and
- Co-ordination between central government and regional/local government is an important ingredient for success of any environmental extension process

The report also considered the implementation of such a programme, noting; *“that information is key to learning and subsequent behaviour change, but learning will only happen if it is supported by a number of social processes. These include shared understanding, bounded conflict, and a supportive environment. This implies a need to ensure that the different interest groups have adequate capacity to participate in such processes. Therefore the public good aspect of sustainable development refers to both task (getting sustainable development on-the-ground) and process (creating the conditions for sustainable development) outcomes”*. The report suggested there are two key elements which must be improved to achieve this:

- (i) Ensuring the development of information and information systems that are responsive to the needs of end-users; and
- (ii) Creating a favourable social environment for the use of information to underpin constructive change.

In particular, the report noted that the constraints to achieving a more integrated approach to sustainable development extension are:

- Information and knowledge is fragmented; and
- There is a lack of capacity to institute collaborative and learning-based approaches on a scale beyond that of individual groups.

(Allen *et al*, 2002)

Discussion

As noted in this paper, there are a range of factors affecting the uptake of innovations. With respect to environmental BMPs, the general situation could be taken as not overly conducive to adoption:

- (i) Characteristics of the innovation. Generally environmental issues bestow relatively little relative advantage – often most of the benefit is off-farm. They are also often complex, difficult to trial and observation of the outcomes is problematic.
- (ii) Characteristics of the individuals. This could probably be taken as neutral – the issues here would be the same as for other innovations, and there is evidence that farmers have often made commitments to sustainable land management (Rhodes *et al* 2000).
- (iii) Characteristics of the social system. There are two components of this:
 - (a) The social environment within New Zealand - societal acceptance and support of change is an important component in the sense of giving (in this case) farmers the feeling that as part of New Zealand society they are acting in the common good.
Unfortunately there appears to be a degree of urban/rural split, with the perception by the farming community that they are often portrayed as environmental vandals by an urban society that has consistently refused to accept that they also need to change. Such misconceptions, on both sides, means that more time is spent on arguing the point rather than devoting energies to develop better approaches for adoption of environmental BMPs, and creating an environment where farmers feel that they are more supported in making decisions around environmental issues, particularly around economic/environmental trade-offs.
 - (b) Consideration of the social process of adoption, and the fact that farming is a socio-cultural practice - a way of life - rather than just a technical activity. This means that the traditional linear/top-down approach to extension is limited in its effectiveness, and incorporation of social factors, farmer participation, and the use of social marketing would greatly enhance extension approaches.
- (iv) Channels of communication. The main current means of communicating with farmers around environmental issues very largely falls within the “mass media” approach. This includes a range of approaches, including: television, printed material, field days, workshops, and monitor farm programmes. These channels are quite effective in raising awareness of issues, and in imparting some knowledge about the issue in question. They can be quite effective in triggering “innovators” (aka the innovation diffusion model) to investigate the issue further and, having worked through the pros and cons, take the decision to adopt. However, they are much less effective in persuading later groups in the innovation diffusion model to take the innovation any further, unless the innovation is relatively simple and easy to incorporate into farm systems. In this respect therefore, an extension system that relies solely on a mass media approach will almost inevitably result in a slow rate of adoption.

- (v) Change Agent contact. A key feature in adoption of innovations is, as outlined earlier, having advisors operate in a one to one approach with farmers. A key component of this process is the trust the farmer has in the advisor, which in turn is a function of the length of time they have worked together, and the understanding the advisor has around the various factors of farm management – economic, animal production, environmental. New Zealand is facing two significant problems in this area: the lack of (number of) advisors operating in the agricultural sector, and the lack of capability across both business and environmental issues. The implications of limited numbers of agricultural advisors/extension workers are significant. If the greatest degree of adoption flows from one to one contact between an advisor and a farmer, and then given the relatively low numbers of advisors, their limited expertise in either environmental issues or farm management, and the amount of time it takes to develop a degree of trust between the parties, then the implications are that adoption of environmental BMPs will be slow.

Role of Government

The role of the government in environmental extension, and the extent to which it becomes involved, revolves mainly around the question of public versus private goods. The extension of mostly farm business information and practice to farmers, as carried out by MAF in the past, was seen as largely being a private good, which is why it was privatised. However, there is a strong rationale for government to be involved in environmental extension, given the externalities involved – improved performance by farmers would directly benefit the wider community. Any government support would therefore not necessarily involve direct assistance to farmers (e.g. subsidies for fencing streams, or planting trees), but take the form of provision of information and support for technology transfer. Thus the government support is on public good grounds, where the off-farm benefits would be targeted.

The case for Government intervention is also strengthened around market failure arguments. This would revolve around two main factors:

- (i) Information failure – there is a lack of reliable information on what to do and how to do it, with the issue of effluent management a case in point.
- (ii) Missing market – there is very little market demand for environmental extension as farmers are not willing to pay for it, and the wider community is (largely) not willing to pay farmers to adopt BMPs.

There is also the issue of externalities – for example erosion control and good riparian management reduces the cost of water treatment for downstream users.

One means of achieving this government intervention could be directly via a government (i.e. taxpayer) provided extension service, along the lines of the old MAF Advisory Services – i.e. the government would directly provide a delivery service. However, any such service would, of necessity to ensure both acceptance of the advice by farmers and ensure a reasonable rate of adoption, provide a mix of business and environmental advice. This then would again give rise to questions as to public versus private benefit of the service, it would be difficult to differentiate between the two, and therefore struggle to fully justify taxpayer funding.

A more probable approach would be to form a partnership with industry and Regional Councils, with government providing some share of the funding, as recognition of the public good aspect of the advice, and possibly taking the lead in coordinating a wider extension programme across the various land based sectors. This could be modelled on the recently announced Primary Growth Partnership (PGP) research programme, which is funded on a partnership basis between government and industry.

Subsidies

While a number of commentators have suggested that any government intervention should not include subsidies, there is a case to be made for them to be included in the mix of support. Several Regional Councils have provided subsidies to farmers in the form of part funding for fencing off streams and areas of native forest, provision of poplar poles for erosion control planting, and plants for riparian protection planting. In all cases this has been an effective incentive for farmers to take action, and significant areas have been fenced and/or planted up.

So again the “public good” of off-farm benefits could be used as justification to include some degree of subsidy incentive as part of a wider environmental extension programme. An example of a subsidy provided in order to gain wider public benefit would be the recent decision to subsidise home insulation. The immediate benefit is private – to the people living in the house, but the justification is the wider benefit to public health.

Time taken to adopt environmental BMPs

In a recent survey (Journeaux, 2009), a number of respondents felt that a 1-3 year horizon was sufficient for the majority of farmers to adopt environmental BMPs, while most opted for 5-10 years.

As discussed in this paper, there are many factors that affect the rate of adoption, and almost all of them would indicate that for environmental BMPs, the majority of these factors would work against rapid uptake. If the average time taken to adopt innovations on-farm through the middle part of the twentieth century was 23 years, when there were clear economic incentives to adopt, and a major extension workforce promoting these innovations, then one could expect a longer time period when most factors – lack of economic incentives, lack of a large and coordinated extension workforce, coupled with complex, hard-to-measure issues, are working against rapid adoption.

As has been noted, innovations that were disruptive, difficult to demonstrate, and difficult to see the benefits from – i.e. many environmental practices, are likely to take 25-30 years before the majority of farmers will adopt them. An example of this would be the issue around parasite control in farmed animals, where resistance to anthelmintic drenches is a significant issue on many farms. A lot of work has gone into this issue, with one useful approach being to do faecal egg counts coupled with integrated grazing of different stock types and ages. Again this is a complex solution, which is quite disruptive to established grazing systems, with the result that although there are powerful financial incentives, the rate of adoption by farmers is very slow.

Unless there are some major changes to the way in which environmental BMPs are extended to farmers, including a much more coordinated approach, then progress will continue to be slow, frustrating both sides of the debate.

Recommendations

1. The primary recommendation is to focus on the institutional arrangements for environmental extension. Currently there are a range of organisations involved in environmental extension, with all of them constrained by limits on financial resources and human capability. While individual industries and councils have their own strategies, generally approaches are piecemeal, and not coordinated.

The recommendation is for a single body, which acts as a coordinating agency across all the main organisations involved: Government, Industry, and Regional Councils. The three partners would also fund this body jointly. A model for this is the recently announced Primary Growth Partnership (PGP), which is a joint Government and industry body, tasked with the oversight and distribution of research funds to improve agricultural productivity growth. Government funding for this body is starting at \$30 million a year, rising to \$70 million a year, with the intention that this is matched by industry funding.

Currently the Government spends around \$200 million a year on agricultural and environmental research, plus the \$70 million a year to the PGP. It could be argued that perhaps 10% of this could be used on extension, thereby ensuring that the research was used by farmers.

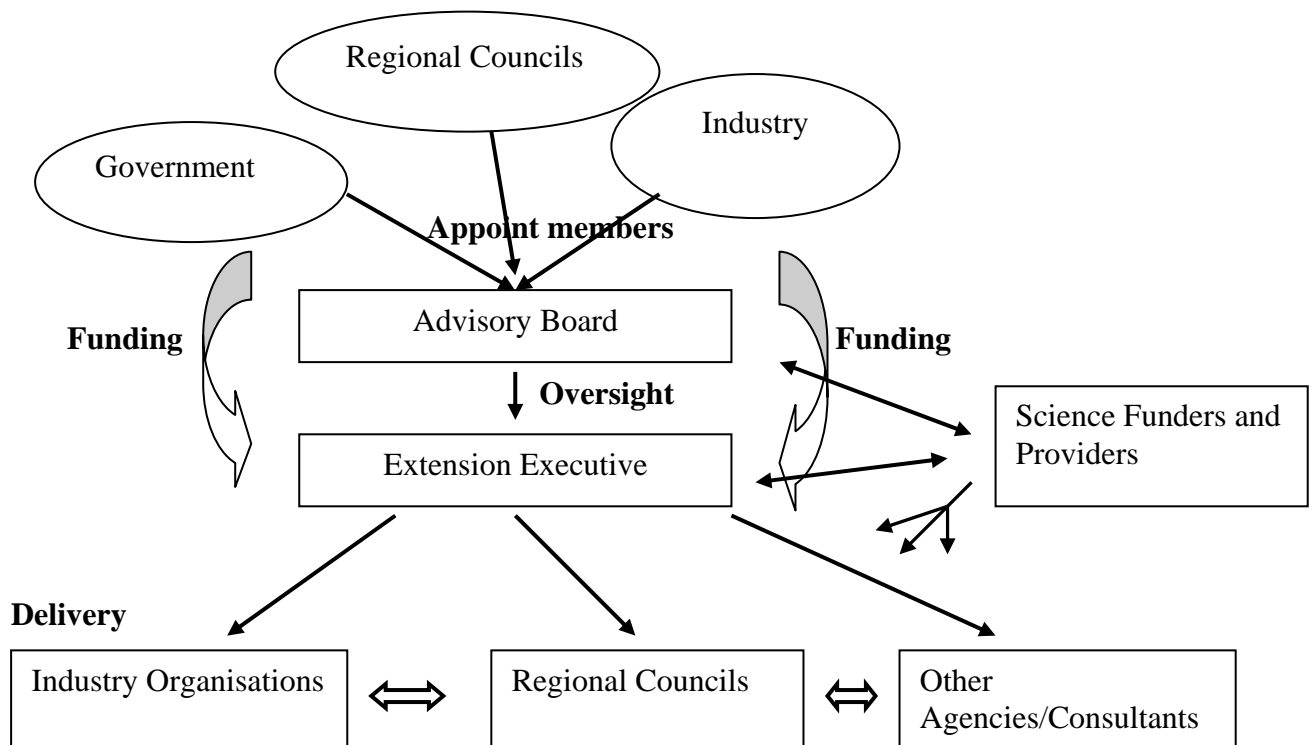
The structure and function of this arrangement would be as follows; an Advisory Board, with members appointed by each of the funders, would provide oversight of the process. A small executive/administrative team would manage the programme, providing the coordination as agreed between the three parties, and directly managing the funding process. Industry and Councils would put in bids for funding, which would be matched by their own funding relative to whatever share of funding was agreed to.

Actual delivery of the extension programmes would lie with the relevant industry organisation or Council, and other agencies such as Landcare Trust, potentially sharing resources as necessary. Additionally the extension funding/oversight agency plus the industry organisations and councils could contract direct with private consultants to deliver programmes, thereby overcoming one of the main constraints to their involvement, namely lack of financial incentive.

Science input would be contracted in at the various levels as required, and particularly so at the delivery end. Similarly, the Advisory Board and Extension Executive would provide feedback to the science funders and providers to ensure they were “within the loop” as to what extension was being carried out, progress on this, and any science priorities flowing back.

Diagrammatically the model would look like:

Figure 2. Proposed Institutional Extension Model



The function of the Advisory Board would be around: developing the constitutional/strategic framework for the extension model, developing the terms of reference and criteria for funding programmes, for ensuring coordination between both the funding and delivery organisations, and in determining specific targets for the programmes to achieve. It would also need to ensure an arbitration process if conflicts of interest arose between organisations in the bids for funding.

The Extension Executive would be primarily responsible for the operational side of the programme: receiving an adjudicating on proposals, contracting for work to be done, managing the funds, and ensuring that evaluations were carried out.

Given that most of the drivers for improved environmental performance are domestic, it will be necessary for government to drive this process, and to take a leadership role in consulting with the other partners, and in setting the system in place.

The intent of the model is to make the most of current people resources. Given the significant shortage of human capability it gives a mechanism to more readily engage private consultants into the system.

A key component in ensuring the system meets objectives is to ensure that evaluations of the effectiveness of individual extension programmes were an integral part of any such programmes.

A second possible and alternative model could be along the lines of the Sustainable Farming Fund (SFF), or an entity incorporated into the current SFF, whereby government provides funding for environmental extension and industry, councils, private consultants, and farmer/community groups bid into this for funding. Funding would again be on a proportional/shared basis, and directed so as to ensure a greater degree of co-ordination was achieved. However, this approach is unlikely to achieve the same degree of coordination and direction as the first model, as it would largely deal with individual projects, as opposed to being in a centralised position to directly coordinate extension in a partnership approach.

If subsidies were to be incorporated – and they need to be considered as part of the extension mix – then the easiest approach would be for government funding to be funnelled, via the Extension Executive, to the Regional Councils who would have the responsibility for their delivery. The main reason behind this is that they already have systems in place for such delivery. There would also need to be clear criteria around the subsidies as to what they cover and what they don't.

2. The above model, once operating, would directly assist in encouraging people into extension. It will also encourage current advisors on the need to improve either their farm business or environmental knowledge. This in turn would raise the demand for further training.

The second recommendation is to ensure that such training programmes are rapidly developed to ensure that demand is met. In most instances it is envisaged that this training would predominantly be university based, and take the form of training in farm systems analysis and design, and the integration of various disciplines such as farm management, economics, and resource management.

Incorporation of training in the sociological aspects of extension would also be an advantage.

3. The third recommendation is aligned with individual extension programmes, and has two parts:
 - (i) As discussed in this paper, if they are to be readily adopted, environmental issues need to be considered as part of normal farm management practice. The recommendation therefore is that they need to be directly integrated with any “business” related extension, and explained as part of a whole farm system. As long as environmental matters remain as an add-on to farm business or animal production matters, their rate of adoption will be slow.

This issue directly also relates to the second recommendation – to achieve a much greater degree of whole farm system approach there would need to be training in this discipline, in turn requiring university level courses to be available.

- (ii) The second relates to the need for extension programmes to be cognisant of social processes and issues. As noted in this paper, traditional linear

extension approaches of; scientist → extension agent → farmer has limited adoption success, especially with respect to environmental issues. The recommendation therefore is that farmers are much more directly involved in the design and delivery of such extension programmes, that programmes involve multiple approaches so as to cover the majority of farms, and that extension agents understand farmer views.

An important component of this would be the incorporation of social marketing approaches into extension programmes. In many respects, an extension programme is directly analogous to a marketing effort – the target audience, their beliefs and attitudes, and the issues around the new product or service need to be identified and understood, and approaches designed to appeal to that audience.

All of these recommendations relates back to the lack of human capability in the area of extension. Building up this capability will take some time, but unless it is done in a well co-ordinated manor, progress in farmers adopting environmental BMPs will remain slow.

Summary

Environmental issues are complex, with much of the benefit of on-farm adoption accruing off-farm. If farmers are to be encouraged to improve their environmental management, then a range of factors need to be addressed, namely:

- (i) A coordinated approach by the organisations involved in promoting such improvements;
 - (ii) University level training for extension agents;
 - (iii) Farmer participation in extension programmes;
 - (iv) Environmental issues directly incorporated into a whole farm systems approach; and
 - (v) A social marketing approach used in designing extension programmes.
- Without these, progress will be slow.

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References

- Allen, W.J., Kilvington, M.J., Nixon, C., Yeabsley, J. (2002). *Sustainable Development Extension*. MAF Technical Paper 02/03. ISSN 1171-4662. ISBN 0 478 07663 0
- Botha, N., Coutts, J., Roth, H. (2008). *The Role of Agricultural Consultants in New Zealand in environmental extension*. The Journal of Agricultural Education and Extension. Vol.14. Number 2. June 2008.
- Coase, R.H. (1937) *The Nature of the Firm*. 4 *Economica* 386
- Cronin, M.B. (1968). *A Study of factors Hindering Increased Production on the Rangitaiki Plains and in Galatea*. MAgSc Thesis, Massey University.
- Crowder, L. Van (1996). *Ag Extension for Sustainable Development*. FAO Research, Extension and Training Division. <http://www.fao.org/sd/exdirect/exan0004.htm>
- Davies, I.K. (1981). *Instructional Technique*. McGraw-Hill Publishers.
- Fairgray, J.D.M. (1979). *The Influence of Farm Advisory Officers on the Diffusion of Agricultural Innovations*. PhD Thesis, Geography Department, Auckland University.
- Guerin, T.F. (1999) *An Australian perspective on the constraints to the transfer and adoption of innovations in land management*. Environmental Conservation, 26:4, pp 289-304. Cambridge University Press
- Hughes, A.H., Squire, J.D., Payne, W.G. (1973). *An Evaluation of the Rangataiki Plains Dairy Company Pilot Advisory Scheme*. Occasional Paper No. 5, Department of Ag Economics and Farm Management, Massey University.
- Johnson, D.W. (1979). *Educational Psychology*. Prentice Hall Inc.
- Journeaux, P.R. (2009). *Developing an institutional model for the extension and adoption of environmental Best management Practices by pastoral farmers in New Zealand* Unpublished Masterate disseration.
- Journeaux, P.R., Stephens, P. (1997). *The Development of Agricultural Advisory Services in New Zealand*. MAF Policy Technical Paper 97/8. ISSN 1171-4662. ISBN 0 478 07453 0.
- Just, R.E., Rausser, G.C. (1993). *The Governance Structure of Agricultural Science and Agricultural Economics: A Call to Arms*. American Journal of Agricultural Economics 75: 69-83.
- Katz, E., Levin, M.L., Hamilton, H. (1963) *Traditions of Research in the Diffusion of Innovations*. American Sociological Review 28, 237-252.
- McManus, G., Powe, M. (2007) *The Entrepreneurial Process*. ISBN 978 0 9803682 0

- Pannell, D.J. (2001). *Explaining non-adoption of practices to prevent dryland salinity in Western Australia: implications for policy*. In Land Degradation, AJ Conacher (ed), pp335-346. Kluwer Academic Publishers.
- Parminter, T.G. Water, C., Mortimer, C. (2006) *Examples of Extension and Policy Strategies Developed Using Theories of Human Behaviour and Social Marketing*. Proceedings of the 2006 APEN International Conference. www.apen.org.au
- Rhodes, T., Willis, B., Smith, W. (2000) *The Impediments to Optimising the Economic and Environmental Performance of Agriculture – A study of Issues Affecting North Island Hill Country Farmers*. MAF Policy Technical paper 2000/17. <http://www.maf.govt.nz/mafnet/rural-nz/profitability-and-economics/performance/impediments-to-optimum-performance/>
- Rogers, E.M. (1962). *Diffusion of Innovations*. Free Press of Glencoe Inc.
- Rogers, E.M., Shoemaker, F.F. (1971). *Communication of Innovations*. The Free Press, New York.
- Rollins, T. (1993). *Using the Innovation Adoption Diffusion Model to target Educational Programming*. Journal of Agricultural Education. <http://pubs.aged.tamu.edu/jae/pdf/Vol34/34-04-46.pdf>
- Tough, A. (1971). *The Adult's Learning Projects*. Research in Education Series 1. Ontario Institute for Studies in Education.
- Tough, A. (1982) *Intentional Changes*. Follett Publishing Co.
- Vanclay, F., Lawrence, G. (1994) *Farmer rationality and the adoption of environmentally sound practices; A critique of the assumptions of traditional agricultural extension*. Journal of Agricultural Education and Extension. Vol 1, Issue 1, pp 59-90.
- Vanclay, F. (2004) *Social principles for agricultural extension to assist in the promotion for natural resource management*. Australian Journal of Experimental Agriculture. Vol44, pp213-222.