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AgImpact Project: Identifying Approaches to Improving Knowledge Exchange (KE) in the Irish AgriFood Sector using Expert Opinion

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Comhshaol, Pobal agus Rialtas Áitiúil
Environment, Community and Local Government

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EPA Research Programme 2014–2020

AgImpact Project: Identifying Approaches to Improving Knowledge Exchange (KE) in the Irish Agri-Food Sector using Expert Opinion

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by

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DISCLAIMER

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Executive Summary

The objective of this small-scale project was to identify potential approaches to developing a more integrated model to improve knowledge exchange (KE) in the Irish agri-food sector, which would contribute to the growth and sustainable intensification (SI)[1] of primary agricultural production, as envisaged in Food Wise 2025 and Northern Ireland's Going for Growth strategic action plan. The project methodology was based on eliciting expert opinion in two workshops and a stakeholder survey on approaches that could improve KE. For the purpose of this report, KE is broadly defined as the two-way flow of knowledge required to deliver SI, from generation through acquisition, dissemination and application.

There is a significant challenge in developing KE processes to promote the application of existing and new knowledge that will deliver increased production efficiency and profitability while protecting natural capital, including water. This challenge is characterised by the variability in the bio-physical environment in which agricultural production occurs and in the socio-economic and demographic profiles of those involved in implementing the knowledge. In addition, the ever-increasing knowledge base, its complexity and its often compartmentalised nature add to the challenge. Finally, at policy level, conflicting goals and agendas have often led to a level of uncertainty that increases the difficulties in the application of knowledge by stakeholders. The key findings of this report are:

- The traditional top down, linear knowledge transfer model of research from advisory body to farmer can be improved using a more balanced bottom up–top down KE approach.
- Three groups were identified as being critical in the KE process of delivering SI. These were knowledge, policy and implementation groups. The knowledge group are those involved in the generation of knowledge. The policy group are the high-level stakeholders who develop national policies, provide direction and funding, and create the KE operating environment. The implementation group are the active participants in the "on the ground" exchange and application of the knowledge at regional, local/community or farm level.
- The project participants identified a need for improved communication between and within the three groups that will build mutual trust, create a shared SI vision and deliver the required outcomes.
- Education, including lifelong learning, for all agri-food stakeholders, optimised using information and communication technology (ICT), was recognised as an important enabler of the communication process. In addition, the role of primary and secondary education in community-based initiatives was highlighted.
- The need for a "knowledge translator" was identified to focus on translating the scientific knowledge into a language and context suitable for the other two groups.
- The essential role of the farm advisor in KE systems within the implementation group was emphasised. New support models for the advisor may be required against the background of the ever-increasing knowledge base and depth required to deliver SI. The requirement to integrate social science practitioners into the KE process at implementation level was identified as being critical to facilitating and managing the change in the stakeholder behavioural patterns.
- The continued development of integrated SMART (specific, measurable, achievable, realistic and time-bound) metrics for SI was identified as a significant knowledge requirement in facilitating KE systems. The most urgently required farm-centred metrics are those for water, air, soil and biodiversity. Where possible, these should be systemised and/or integrated with production metrics. In addition, it was noted that SMART metrics will also be required for the effective monitoring and evaluation of the KE system itself.

1 A definition of SI, based on one proposed by Dr James Moran, Institute of Technology, Sligo, was adopted for the project: 'Simultaneously improving the productivity and environmental management of agricultural land for (i) food, fibre, etc. (ii) protection of the environmental media (water, air, soil, biodiversity) including the achievement of our legislative obligations, e.g. the Water Framework Directive water quality targets and (iii) for aesthetic and cultural services'.

- The potential of a community-based (e.g. catchment, producer group, value chain) initiative was identified as the preferred framework for enhancing KE among the implementation group. This approach facilitates a more targeted and cost-effective approach to KE systems engaged in realising SI.
- Within a KE framework, measures that promote a better balanced bottom up–top down approach were highlighted. These included:
  - discussion groups, "champion farmers" (i.e. early adopters) and new ways of encouraging farmers to talk to farmers can contribute;
  - demonstration initiatives to create knowledge demand among stakeholders; these should be as practical as possible in order that outcomes can be seen in a way that promotes learning and curiosity;
  - citizen science initiatives to promote KE between implementation and knowledge groups; the growing use of technology with in-field and animal data collection (sensor networks) will facilitate the process and the farmers will have greater involvement in the knowledge generation;
  - open innovation approaches in which farmers (or other end users) are included in the identification of the problems to be addressed and involved in developing solutions; this approach helps build a coalition of the willing and provides an important channel of communication;
  - recognising the need to identify the knowledge user's position on the technology adoption curve and tailoring the communication strategy accordingly;
  - using incentives to promote the implementation of measures on farms (e.g. champion farmers, tax breaks to support technology adoption, demonstration farms/catchments, award systems to support sustainable farming like those already used in Ireland or based on those used in New Zealand);
  - making full use of ICT to enhance the communication strategy between and within the groups, for example, greater use of social media, using smartphone and tablet formats, as well as the use of smartphone-friendly media such as YouTube, Vimeo and Twitter.
- A suggested approach arising from this project is the development of a grant scheme that could be used to initiate a catchment competition focused on providing community stakeholders with funding and resources to implement a better balanced bottom up–top down approach to KE for SI within their catchment.

1 Introduction

There is an emerging national and international consensus that the application of new and existing knowledge to support the development of sustainable primary food production systems requires more effective knowledge exchange (KE) systems. Recent reviews by the OECD (2015) and EU SCAR (2013) provide valuable insights into the challenges and potential solutions.

For the purpose of this report, KE is broadly defined as the two-way flow of knowledge among stakeholders, its generation, dissemination, acquisition and application, required to deliver sustainable intensification (SI)[2] in the agri-food sector. The focus of this work was on identifying potential approaches to improve KE. The traditional linear knowledge transfer model, research – advice/education – farmer, has served us well over the last 50 years in terms of supporting the development of a productive Irish agriculture. Teagasc and its predecessors [An Foras Talúntais/The Agricultural Institute (AFT) and An Chomhairle Oiliúna Talmhaíochta/The Agricultural Training Council (ACOT)], universities and the Department of Agriculture were and remain key players in supporting farmers in the conduct of their business. Recent incremental improvements in KE focusing on farmers have been made and include, among others, discussion groups,[3] the Teagasc BETTER farm[4] and the Teagasc Glanbia Joint Development Programme[5] initiative. However, the increased complexity of the agri-food system, with multiple economic, environmental and social objectives and a broader range of stakeholders requires on-going innovation to ensure a KE framework that reflects this new order.

The need for further innovations in KE systems to support the sustainable development of agriculture in Ireland was identified at the AgImpact workshop held in Dublin (January, 2015).[6] The primary objective of this workshop was to identify the water quality research priorities for the next 5 years. However, it was strongly argued during the discussions that the biggest step-change in mitigating the impact of agriculture on water quality could be achieved by adopting existing knowledge/measures on farms rather than from more research.

In response, the Environmental Protection Agency (EPA), the AgImpact project funder, provided a 6-month project extension to explore the options to improve the current KE initiatives and systems. The project approach was based on eliciting expert opinion from two workshops and an online survey. The project team recognises that KE at all levels in the agri-food system has social, economic, production and environmental barriers that are significantly beyond the scope of this short-term project.

This report provides some background to the project, the methodology used, the outcomes and a suggested approach to piloting a community-based project that integrates the outcomes to enhance KE systems and achieve the SI envisaged in Food Wise 2025 and Going for Growth.

2 A definition of SI, based on one proposed by Dr James Moran, Institute of Technology, Sligo, was adopted for the project: 'Simultaneously improving the productivity and environmental management of agricultural land for (i) food, fibre, etc. (ii) protection of the environmental media (water, air, soil, biodiversity) including the achievement of our legislative obligations, e.g. the Water Framework Directive water quality targets and (iii) for aesthetic and cultural services'.

3 http://www.teagasc.ie/publications/2013/1845/Impact_of_Participation_in_Teagasc_Dairy_Discussion_Groups150113.pdf

4 http://www.teagasc.ie/publications/view_publication.aspx?PublicationID=3210

5 http://www.teagasc.ie/publications/2015/3516/Final_Teagasc_Glanbia_Joint_Development_Programme_web.pdf

6 http://erc.epa.ie/safer/reports

2 Project Context

The objective of an agri-food KE system is, among others, to contribute to the sustainable development of the sector. A critical point for delivery of SI is an agreed vision to which all stakeholders can aspire and work towards. The national policy vision for the Irish agri-food sector has recently been outlined by the Department of Agriculture, Food and the Marine's (DAFM's) new strategy, Food Wise 2025.[7]

This ambitious strategy envisages a 65% increase in the value of farm gate output to almost €10 billion in the next 10 years. It also sets a target for an additional 23,000 jobs in the sector, with an 85% increase in food exports from their 2012 level to €19 billion. Food Wise 2025 recognises that achieving economic competitiveness and environmental sustainability are equal pillars in the delivery of the vision. The report also highlights the relevance of the agri-food sector to broader issues of rural development and tourism.

The Minister for Agriculture, Food and the Marine, Simon Coveney TD, said that "Food Wise 2025 sets out a vision for the industry to continue along this path of sustainable growth and recognises the strategic importance of specific market and consumer insights if emerging global opportunities are to be fully realised in the decade ahead."

The Minister of State, Ann Phelan TD, commented on the wider importance of Food Wise 2025 in terms of rural development and tourism, "I am particularly heartened by the focus in the report on rural diversification, entrepreneurial development and agri-food and marine tourism. These elements are key to the sustained development of rural communities."

In Northern Ireland (NI), the Agri-Food Strategy Board published its strategic plan Going for Growth[8] in 2013. The vision of this plan is to grow a sustainable, profitable and integrated agri-food supply chain focused on the needs of the market. It envisages 60% and 15% growth in sales and employment, respectively. The vision includes a 75% growth in sales outside NI and an increase of 60% in the total added value of products and services from local companies.

Food Wise 2025 envisages that the growth potential of the primary production sector will be anchored on grass-based production systems. The growth and resilience of the sector will be driven primarily by an expansion in dairying and an overall improvement in the efficiency of all farming systems, while meeting the increasing demands of global consumers. The growth must be consistent with meeting our legally binding commitments in terms of targets for improved water quality and biodiversity and reductions in gaseous emissions. The realisation of the vision "must therefore continue to be based on policies and approaches that enhance the provision of public goods and maximise the continued economic, social and environmental sustainability of these natural resources".

The Food Wise 2025 vision must also be realised in ways that improve the prosperity of Irish farms and rural economies. It will also require an increased emphasis on and greater clarity concerning the intensification associated with the provision of public goods and services. Innovations such as Origin Green (OG)[9] provide a potential mechanism that can contribute to achieving SI. Food Wise 2025 concludes that "New resources and new thinking will be needed as businesses enter larger and more dynamic trading environments. As the industry embraces new levels of growth, it will also be required to show an absolute commitment to the principles of sustainability, recognising that gains in productivity must not be at the expense of the environment."

2.1 Knowledge Exchange – Realising the Vision

Food Wise 2025 identifies the importance of both KE, and innovation systems and measures in delivering its vision, including:

- translating research into commercial products;
- increasing the innovative capacity at primary producer and processor levels;

7 http://www.agriculture.gov.ie/foodwise2025/

8 http://www.agrifoodstrategyboard.org.uk/

9 http://www.origingreen.ie/

- increasing the focus on consumer demands and insights – built on improved collaboration and partnerships to develop the image and reputation of Ireland in emerging markets;
- a commitment to knowledge transfer that brings technological and process advances to the sector;
- creating new partnerships with other sectors of the economy including pharmaceutical, tourism, bio-economy, biotechnology, bio-energy and information technology (IT) (including big data and precision technologies);
- improving competitiveness at producer level through improvements in the adoption and application of cutting-edge sustainable processes and technologies.

Realisation of the Food Wise 2025 and Going for Growth visions requires improved application of knowledge to increase production efficiencies and the maintenance/ improvement of our natural capital. The actions required to achieve this include:

- developing, adapting and applying new technologies and practices for agricultural production and farm management;
- increasing and accelerating the more widespread adoption and application of existing technologies and practices.

This report is focused on identifying approaches to improve KE systems that will deliver this vision.

3 Project Approach to Eliciting Expert Opinion

The approach adopted in this project focused on eliciting the expert opinion from agri-food stakeholders in two workshops and by conducting an online survey. The participating stakeholders covered a broad spectrum of expertise from policymakers through scientists, advisors, farmers and the agri-food business.

3.1 First Stakeholder Workshop (July 2015)

The objective of the first AgImpact Extension Workshop (26 July 2015) was to "identify ideas to enhance KE among Irish agri-food stakeholders". The participants (Appendix 1) were asked to generate a list of ideas or measures to improve KE in the agri-food industry. The workshop took the form of a roundtable facilitated discussion, which was preceded by a presentation from a guest speaker, Dr Patrick Crehan, of CKA (http://www.cka.be). A report[10] on the workshop outcomes was prepared, circulated to participants for comment, and was updated based on comments received.

3.2 Best–Worst Scaling Survey

The KE measures identified by the participants at the first stakeholder workshop were collated and formed the basis of the online survey sent out to over 140 agri-food stakeholders.

Currently, meaningful assessment of the importance of measures to enhance KE is problematic because of the level of uncertainty associated with each measure, which in turn hinders efficient policymaking (Smith *et al*., 2007). When confronted with an incomplete systematic evidence base, alternative methods of evidence rationalisation are required. This frequently involves the provision of recommendations to policymakers based upon best available data, while acknowledging any uncertainties in the evidence. Eliciting expert opinion and evaluating consensus between experts is one such approach that has been shown to lead to balanced informed decisions (Cross *et al*., 2012).

Several methods have been used to elicit expert opinion on environmental issues. Commonly in agricultural research, a qualitative approach has been followed, using open-ended survey questions or group discussions at workshops and on expert panels to elicit individual or group opinions (Moran *et al*., 2008; Barnes *et al*., 2010). Alternative quantitative approaches include the use of Likert and other rating scales (MacLeod *et al*., 2010) and discrete choice surveys to analyse choice behaviour and determine preference scores for alternative items. Typically, discrete choice surveys require respondents to make trade-offs between items of interest to reveal their relative preferences for each item. Examples in agricultural research include the use of conjoint analysis to determine farmer and veterinary preferences for animal disease mitigation strategies, and the "potentially all pairwise rankings of all possible alternatives" method to determine expert and farmer preferences for alternative sheep breeding objectives (Cross *et al*., 2012; Byrne *et al*., 2012).

Best–worst scaling (BWS) is an alternative discrete choice technique that enables large numbers of standalone items to be ranked (Cross *et al*., 2012). It is typically employed in health, social science and market research and has recently been successfully used to evaluate mitigation measures at a farm scale in relation to animal and zoonotic disease management (Auger *et al*., 2007; Lusk and Briggeman, 2009; Cross *et al*., 2012). BWS was employed in this study to elicit expert opinion on the relative importance of the KE measures identified at the first workshop.

The BWS method is a choice-based technique that requires respondents to make repeated choices between sets of options (Auger *et al*., 2007). In a BWS study, respondents are presented with repeated, varying, sets of (typically four or five) items and asked to identify the extremes of their preferences. For example, in a set of four control measures (A to D), the respondent indicates which they consider to be the "most effective" and "least effective" measures. If A is more effective than D, then information is obtained for five of the six possible pairs of measures within the set. It is known that A is viewed as more effective than B, C and D (three pairs) and that B and C are more effective than

10 http://erc.epa.ie/safer/reports

D (two pairs). The only pair on which no information is available is B–C. Similarly, for a five-item set, information is gained on 18 of the 25 paired combinations. The process is repeated with new sets (generated via an experimental design) and, in each case, choices are made at the extreme using the criteria specified. The data are analysed by counting procedures or by estimating choice models to derive importance weights across the items featured in the sets.

The BWS method is typically used when information is sought over a large set of items (Marley and Louviere, 2005). It holds a number of advantages over other rating and ranking techniques (Lusk and Briggeman, 2009). First, approaches that use some form of scaling (e.g. scoring an item on a scale of 1–5) assume that the distance properties on the scale are equal. Where scaling properties are unknown the possibility of transforming these into parametric data is not reliable (Jaeger *et al*., 2008). Second, scales can be interpreted differently between individuals. For instance, a respondent may score an item as a "4" while another scores it a "5" when both respondents rate the item equally but have different conceptions of the value of the scores on the scale. Third, respondents are not necessarily compelled to choose one option over another, and frequently they score all of the items with equal importance (Lee *et al*., 2007). This relates to another problem common to rating/ranking approaches, namely the lack of discriminatory power between items (Jaeger *et al*., 2008). Finally, interpretation of the scores is comparatively simple, as the number of times an item is selected as best, minus the number of times an item is selected as worst, approximates the true scale value (Marley and Louviere, 2005; Auger *et al*., 2007).

In this project, the approach was used in a novel manner. The sets were defined in terms of measures to enhance KE for SI of the Irish agri-food sector and used the choice criteria of "importance" with those sets. These were based on the KE measures identified at the first stakeholder workshop (see Table 4.1). Respondents were asked to evaluate the list of KE measures using the BWS method. This involved respondents assessing 12 sets, each containing four measures, with the combinations of measures within sets determined by an experimental design. An example of a BWS set is shown in Table 3.1. The respondents indicated the most and least important measure in each set they faced.

The BWS data on perceptions of the measures' importance can be analysed in a number of ways. The first form of analysis involves counting rather than estimation. The analyst calculates on what proportion of occasions each measure was selected as "most" and "least". A more sophisticated analysis involves estimation of importance scores via a choice model based on random utility (RU) theory (McFadden and Train, 2000) which dominates the empirical analysis of choice in many fields. The approach is explained in detail in Appendix 2.

3.3 Second Workshop (October 2015)

The objectives of the second AgImpact workshop (28 October 2015) were to:

- present the outcome of the BWS survey;
- identify an approach through which the 15 measures (and others if required) could deliver improvements in the agri-food sector KE system.

The workshop took the form of a presentation on the outcomes of the BWS survey, followed by a facilitated group discussion to broadly agree three frameworks within which the 15 measures could be implemented.

Table 3.1. Example of a "practicality" best–worst scaling choice set

Most Important		Least important
☐	Involve stakeholders in developing a common and agreed vision of national SI	☐
☐	Define SMART, measurable objectives of SI for both agricultural production and environmental goods and services	☐
☐	Work with farmers to identify and overcome existing communication issues, agricultural concerns and priorities for implementing SI	☐
☐	Develop an action plan for SI implementation at catchment/community level, including goals and mechanisms for delivery	☐
☐	Customise the range of innovation support measures to reflect the natural, social and demographic characteristics of the target area (i.e. there is no one-size-fits-all solution)	☐

Once the frameworks were agreed by the workshop participants, they formed the basis of three individual breakout groups (BGs), with each group initially considering how the measures might be applied in their framework and then developing a KE system to deliver it. At the end of the breakout groups' discussions the participants reported their findings back to the workshop. The participants are listed in Appendix 3.

4 Outputs from the Workshops and Survey

4.1 Summary of the First Stakeholder Workshop Discussions

The context for the discussion was focused on ensuring that "sustainable intensification of Irish agri-food as envisaged in Food Wise 2025 and Going for Growth can be achieved". A characteristic of the workshop discussion was the openness of the participants and their willingness to share their perspectives and interest in improving KE to achieve SI.

- It was agreed that there is scope for improving the KE system, based on new initiatives in the areas of communication and the social processes around technology adoption.
- The discussion led to the identification of three distinct groups involved in the agri-food KE system (Figure 4.1).
  - Policy group: the policy development (high level) group, which includes government departments, their agencies [e.g. Teagasc, EPA, Bord Bia, National Parks and Wildlife Services (NPWS)], universities, senior representatives of farmers, processors and consumers. They develop the policies, provide direction and funding and create the KE operating environment.
  - Implementation group: this group has the same stakeholders as the policy group but they are "active on the ground" participants in the exchange and application of the knowledge at regional, local/community or farm level.
  - Knowledge group: the stakeholders are those involved in knowledge generation, acquisition, procurement, dissemination and funding. It generally includes government departments, universities, colleges, research organisations, commercial companies and third-level educators and entrepreneurs.
- The absence of clarity in the shared vision and understanding of SI among the agri-food stakeholders was noted.
- The need to develop and improve communications among the agri-food stakeholders, developing a common language built on trust that transcends their different roles and objectives.
- The case for a new translational leadership role to address and improve communications, especially between the knowledge and policy groups, was proposed.
- There was a significant emphasis on improving the knowledge levels of all stakeholders through appropriate and targeted educational programmes.
- There was agreement that, in devising and implementing KE initiatives and measures to support innovation, there is no "one size fits all" solution.
- The need to develop tangible metrics for (1) SI environmental performance and (2) evaluating innovation support policies and practice was identified.
- A range of initiatives to support innovation on farms was identified, including "champion farmers" (i.e. early adopters), tax breaks to support technology adoption, demonstration farms/catchments, award systems to support sustainable farming like those already used in Ireland or based on those used in New Zealand.
- Initiatives such as Open Innovation and Citizen Science that were outlined during the introductory talk to support enhanced KE should be integrated in future initiatives.
- It was generally agreed that the agri-food stakeholders are already innovating, but this can be improved by focusing attention on the processes by which innovations are copied or adopted by the greatest number of producers. There are opportunities to boost KE by improving the involvement of pioneering stakeholders in the initial phase of the technology lifecycle. However, there is even greater scope for improvement in the rate of adoption by the large majority of producers.

The KE measures identified at the first workshop and selected for inclusion in the online survey are listed in Table 4.1.

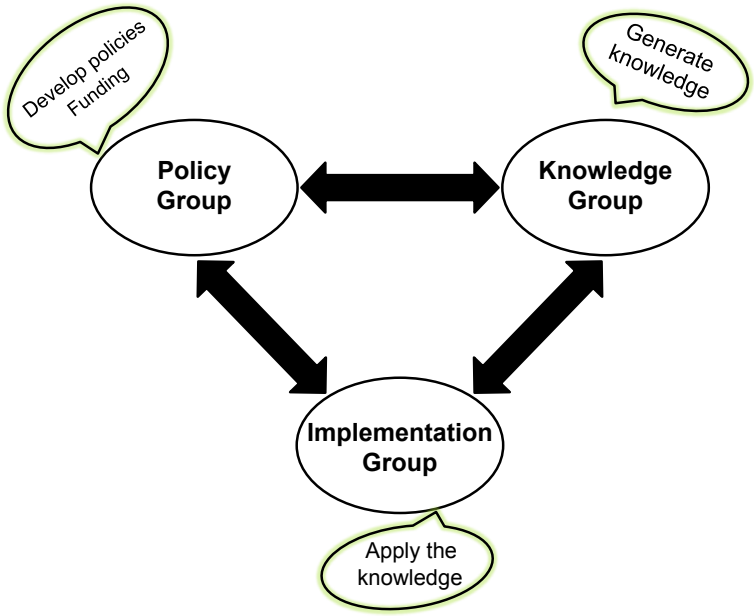

Figure 4.1. The three groups and their functions identified in KE systems.

Table 4.1. Measures to enhance KE identified at the July 2015 Stakeholder workshop and selected for inclusion in the survey

1	Involve stakeholders in developing a common and agreed vision of national SI
2	Define SMART, measurable objectives of SI for both agricultural production and environmental goods and services
3	Work with farmers to identify and overcome existing communication issues, agricultural concerns and priorities for implementing SI
4	Develop an action plan for SI implementation at catchment/community level, including goals and mechanisms for delivery
5	Customise the range of innovation support measures to reflect the natural, social and demographic characteristics of the target area (i.e. there is no one-size-fits-all solution)
6	Develop a national network of relevant advisory bodies and professional bodies to deliver clear, co-ordinated evidence-based advice to support innovation and KE on adoptable SI measures
7	Develop an inventory of existing innovation and knowledge exchange measures to learn from successes and failures and avoid duplication of effort
8	Create a new role of “knowledge translator” to improve the flow and application of knowledge from research to stakeholders
9	Develop lifelong educational programmes for all stakeholders that support the delivery of the SI vision
10	Employ dedicated agri-environmental advisors to support farmers and rural dwellers
11	Address the negative perception of legislation by explaining the benefits of compliance in terms of business opportunities
12	Develop new ways of “farmers talking to farmers”, for example by partnering with local farm innovators to develop communication initiatives
13	Broaden the coalition of stakeholders, e.g. the educational and public sectors, responsible for natural resource management
14	Develop SMART metrics to measure success of SI innovation and knowledge exchange measures
15	Develop an ongoing communication programme to share the successes and benefits of SI, with messages relevant for public sector actors, farmers, etc.

4.2 Best–Worst Survey Results

Eighty-seven respondents completed the online survey, the majority of whom described their professional status as government, research or advisory (Figure 4.2). More than half of respondents described their role within their profession as knowledge generation (Figure 4.3). Respondents completed a total of 1077 BWS sets, making two choices within each one. The choice data were initially considered descriptively rather than by using model estimates. These estimates provide a powerful description of the typical assessment of a measure and also the degree of consensus. For example, measure 3 (Work with farmers to identify and

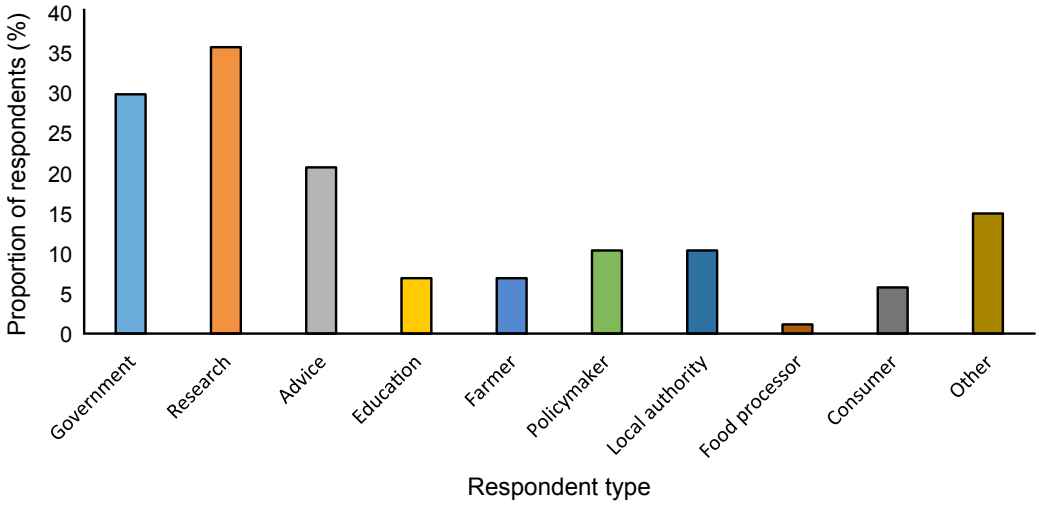

Figure 4.2. Survey respondents' professions.

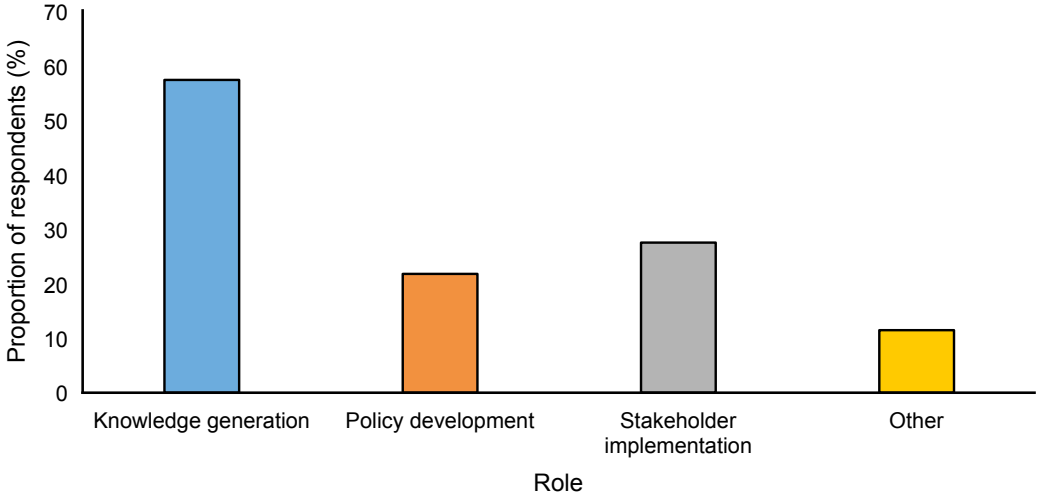

Figure 4.3. Survey respondent's role in their professions.

overcome existing communication issues) was ranked most important in almost 12% of the sets in which it appeared and least important in only 2% of the sets. In contrast, measure 8 (Create a new role of knowledge translator) was ranked most important in only 2% of the sets but also least important in 12% of the sets (Fig. 4.4).

The mean importance scores of the measures are combined in Figure 4.4. The estimated scores are zero-centred and plotted by importance, where the axis represents the mean (zero) importance scores within the sample. Hence, measures plotted above 0 to the right of the axis have higher than average importance scores, while those with scores below 0 to the left of the axis have below average importance scores.

4.2.1 Survey response heterogeneity

While BWS provides a finely scaled estimate for the mean importance of any one measure, there remains considerable variation in the extent of agreement among respondents regarding several measures. A proxy for an agreement/disagreement scale can be provided by plotting the mean and standard deviation of scores for each measure (Figure 4.5). A measure with a relatively high level of agreement will have a smaller standard deviation than a measure provoking greater disagreement. For instance, measures 8 and 13 ("Create a new role of knowledge translator to improve the flow and application of knowledge from research to stakeholders" and "Broaden the coalition of stakeholders, e.g. the educational and public sectors, responsible for

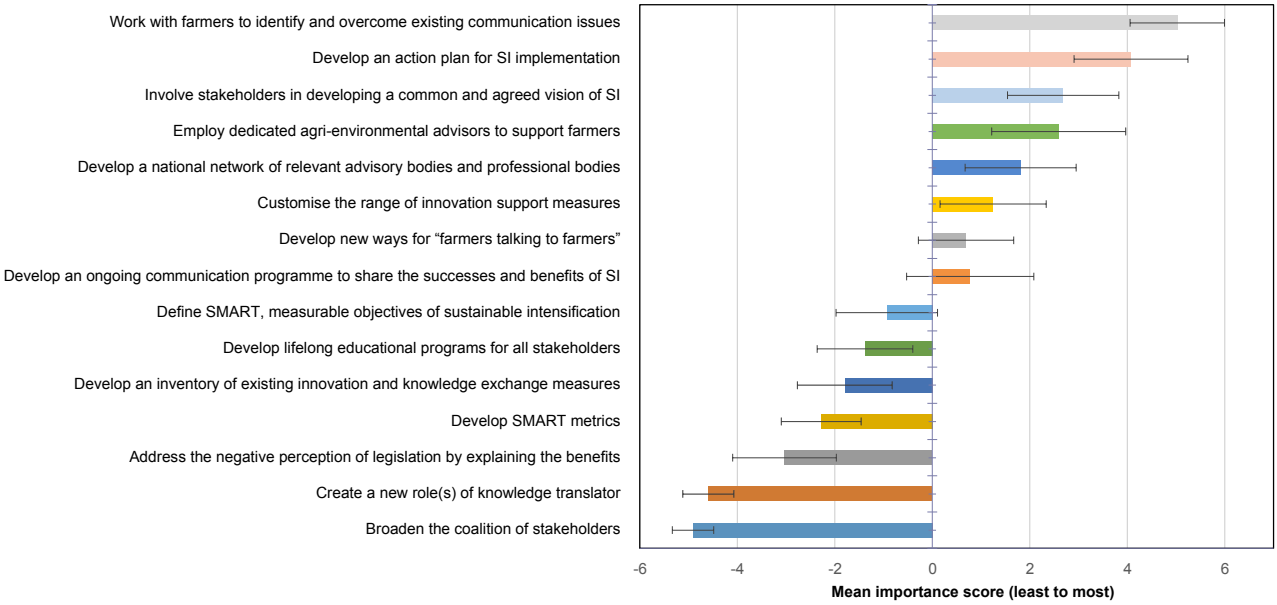

Figure 4.4. Respondents' zero-centred preferences. Measures with higher than average importance scores are located to the right of the *y*-axis; measures with lower than average importance scores to the left.

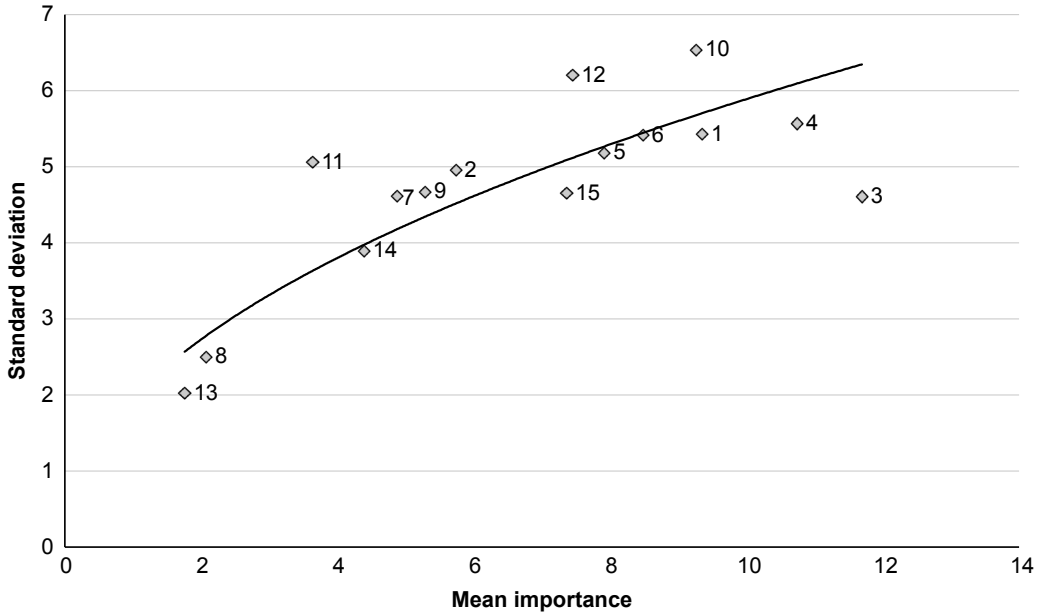

Figure 4.5. Degree of relative agreement of importance for each of the 15 measures as estimated by the standard deviation of the mean (R^2 = 0.73).

natural resource management") were at the lower end of the mean importance scale (Figure 4.5), suggesting that respondents were in agreement about the relative unimportance of the measures. In contrast, there was greater heterogeneity for those measures ranked the most important: for example, measure 10 "Employ dedicated agri-environmental advisors to support farmers and rural dwellers" and measure 12 "Develop new ways of 'farmers talking to farmers', for example by partnering with local farm innovators to develop communication initiatives".

4.2.2 Additional comments from online survey respondents

Survey respondents were asked two additional questions once they had completed the survey form.

The questions were:

1. Were there any innovation and KE actions missing from our list that are important to delivering SI?
2. Are you currently involved in any KE/communication activities? If yes, please share any lessons learned for successful KE/communication in delivering SI.

The responses received to both questions were integrated and summarised (Appendix 4). A number of these are highlighted below. They are most relevant to the implementation group:

- the need to integrate the role of social scientists into the KE system;
- the need for demonstration initiatives – to create a knowledge demand; all aspects of SI should be included – linking the elements of production, water quality, biodiversity, food quality; peer learning integrated into dissemination activities; keeping demonstration activities as practical as possible – seeing outcomes rather than talking about outcomes; demonstration activities should focus on transferring information in a way that promotes learning and curiosity; the desired outcome is learning leading to behavioural change; messages should be clear and easily understood;
- the need for greater use of technology to facilitate:
  - knowledge flows (e.g. social media, web-based education programmes);
  - real-time data flows associated with metrics for monitoring progress towards goals;
- the need to use local stakeholder groups to develop communities of practice;
- the need to use a value chain approach (farm to fork) to improve integration and ownership;
- the need to improve the translation and integration of component research knowledge to improve the application of knowledge at local/farm level;
- the need to include local authorities, DAFM, EPA and NPWS in the development of local SI initiatives;
- the need for stakeholder involvement in identifying appropriate measures and metrics that may be required at local level to supplement those already in place at a national level, for developing local understanding of measures and instruments and the ability to localise them to ensure better targeting and outcomes, and for simple and positive framing of measures and actions.

4.3 Summary of the Outcomes of the Second Workshop

Three frameworks were selected to provide a context for the BG discussions:

- national/catchment/farm;
- community/regional;
- consumer/farmer to fork.

Each BG was tasked with describing how the 15 survey measures, though not limited to these, could be deployed to deliver the KE required for SI.

Participants self-selected the BG that they participated in. One person in each group volunteered to facilitate the discussion and a second person from the AgImpact project team recorded notes on the discussions.

The objective was to provide different perspectives on the frameworks through which the 15 measures could be applied. The three BGs were asked in the first breakout session to review the measures presented in Table 4.1 and their survey rankings (Figures 4.4 and 4.5) in terms of how these might be used to improve KE within their framework. In the second breakout session they were asked to outline an approach for implementing the measures to enhance KE within their frameworks.

An interesting outcome of the BG discussions was that participants identified differences in the KE measures. Some measures were considered as framework measures while others were measures to be implemented within the framework. This may explain the observed different priority given to the measures during the workshop compared with the survey rankings (Figure 4.5).

There was a general similarity between the discussion outcomes from the three BGs in both breakout sessions. Therefore, they are integrated here rather than presented individually. A schematic representation of how the BGs viewed KE between stakeholders is reproduced in Figure 4.6. Underpinning the discussion was the requirement that farming has to be sustainable economically, environmentally and also in terms of farm working conditions (socially).

The importance of all value chain stakeholders being involved in developing an agreed vision was fully supported by the BGs. This was ranked as the third most important of the 15 measures in the survey (Figure 4.4).

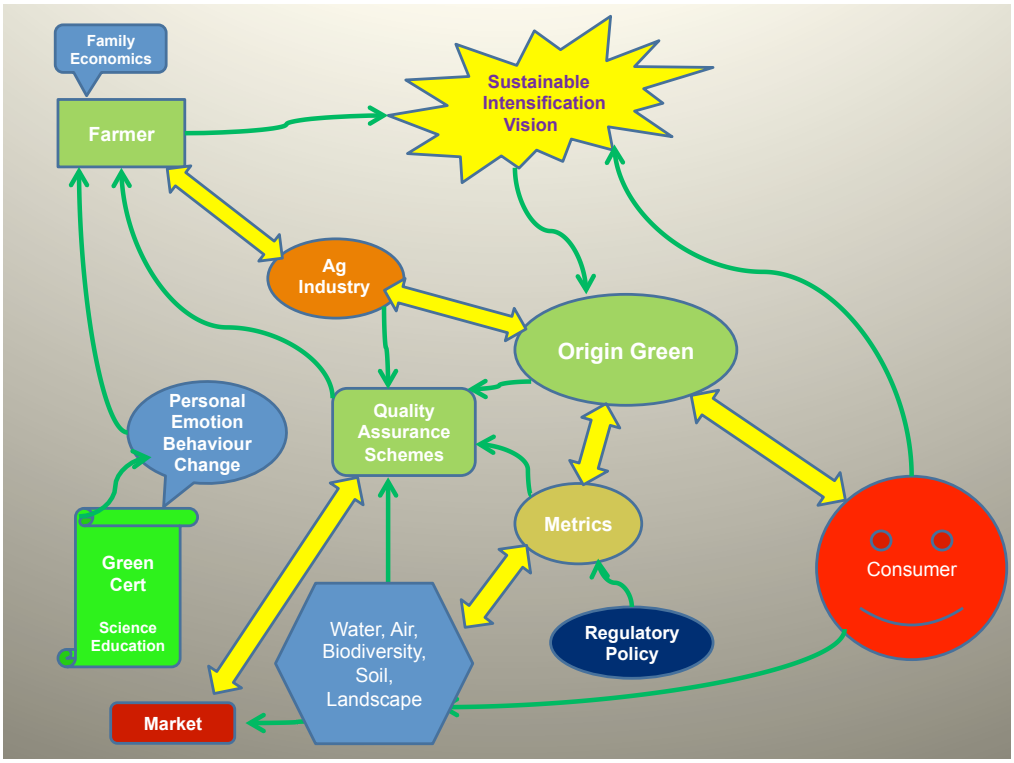

Figure 4.6. A schematic representation of the KE flows in the agri-food value chain proposed by one of the breakout groups at the second workshop.

The ever-increasing focus and importance of the consumer in driving and demanding SI from the agri-food sector was emphasised by the BGs. This was not an issue specifically identified in the survey measures. There was considerable discussion about consumers and their requirements in relation to food safety, origin, traceability and sustainability. OG was selected as a potential central or focus point in the KE platform. While recognising it as a marketing tool that added value to the food outputs, the three BGs identified it as an important communication node in the value chain.

Greater use of social media, using smartphone and tablet formats, as well as the use of smartphone-friendly media such as YouTube, Vimeo and Twitter was also discussed. There was general support for using this approach as part of developing a KE communication strategy. In this respect, it is worth noting that the survey identified "working with farmers to identify and overcome existing communication issues" as the most important measure (Figure 4.4). This highlights the importance of including farmers (i.e. the end users) in identifying the knowledge requirements and in acquiring knowledge. Such a bottom up approach will help in the development of new communication channels.

The importance of SI environmental metrics for OG, its linkages to quality assurance schemes and regulatory/policy functions was identified by all three BGs. It is interesting to note that the measure "develop SMART metrics" was not highly ranked (12th of 15) in the online survey (Figure 4.4). However, the measure "define SMART, measurable objectives of SI" was ranked ninth. The metrics for the measurement of primary farm production efficiency are more generally available and can be benchmarked against targets (e.g. Teagasc Road Maps[11]). The metrics provide goals and feedback mechanisms on the effectiveness of the on-the-ground measures applied by stakeholders to achieve them.

The need to continue to develop SMART environmental metrics was highlighted in two of the three BG discussions. They suggested a requirement to develop scientifically verifiable metrics for the environmental components at farm level and, where possible, that they are integrated with production metrics rather than as standalone environmental metrics. For example, nutrient management planning is a win–win scenario (e.g. Buckley and Carney, 2013) in terms of reducing production costs and the nutrient load pressure on

11 http://www.teagasc.ie/whats_new/roadmaps.asp

water resources. Another example suggested was the linking of biodiversity and water quality metrics. Metrics will contribute to making OG traceable, defendable and authentic with consumers. The extent of this challenge is not to be underestimated. The workshop discussions noted the need for farmer/community involvement in the development of these metrics. The "Management of Species Rich Grassland" in the Burren Life Project provides an example of how metrics are successfully used in this respect.[12] They also highlighted the critical need for social scientists to be involved in facilitating not only this element but all elements of enhancing and improving KE.

There was also note made of the need for SMART metrics for the KE systems themselves. These are required to monitor and evaluate their effectiveness and to identify any need for change.

The potential for citizen science approaches to data collection and verification was noted. Citizen science is the term applied to scientific research that is undertaken by ordinary citizens often in collaboration with or under the direction of professional scientists or institutions. An example of this approach is Teagasc's PastureBase Ireland.[13] This web-based management decision support tool provides customised grassland management advice for participating farmers based on data they have input from their own farms. The data they provide are stored in a database and are available to researchers and other stakeholders. For example, Teagasc researchers are using the data to investigate the persistency and performance of perennial ryegrass cultivars and the farmers contributing data receive grassland management advice for their farms. Citizen science provides a mechanism for KE in a synergistic way that ensures the relevance and applicability of new knowledge to the end users.

The use of new sensor, analytical, database and data-sharing technologies has yet to be fully exploited. This might involve piloting the use of tools such as phone apps (e.g. Herdwatch[14] and Farmflo[15]) and Teagasc's new online nutrient management planning. A possible example of such an approach is the Discovery Farms initiative in Arkansas.[16] The overarching goal of the initiative is to determine the effectiveness of water and soil conservation practices adopted on working farms. At each site, conservation practices selected for evaluation are based upon the interests and wishes of the farm owner and may coincide with regional water or soil quality issues common to many producers in the area.

The role of education for all farmers and stakeholders was emphasised by all three BGs as a measure to improve KE and communications in the value chain. Achieving behavioural change among all stakeholders was considered to be central to the application of knowledge. The need to focus on science education was mentioned as being relevant in this context. The role of primary and secondary education in rural communities to create awareness of and to develop knowledge in relation to their local natural capital was identified as an important element of improving KE. Some examples of this include the Ballinderry River Trust,[17] The IRD Duhallow Life Project[18] and the Streamscapes[19] initiatives.

Generally, formal education programmes operate at national or regional levels. The requirement to upgrade courses to include a greater emphasis on environmental sustainability was highlighted. The role of online learning to provide localised educational programmes for community-based initiatives was suggested. The use of Massive Open Online Courses[20] (MOOC), for example, is changing the role of the traditional lecture, freeing the time of educators to design and revise course programmes that develop soft skills using project-based or problem-based techniques. There was agreement that this development could contribute to improving the necessary lifelong learning opportunities for all agri-food stakeholders.

Workshop reflections among the three BGs were unanimous on the central role of advisors in knowledge flows leading to innovation at farm level. However, it was noted that there is a requirement to significantly develop their knowledge of the integrated measures required to deliver SI-based knowledge on production efficiency

12 http://burrenlife.com/wp-content/uploads/2013/05/burren-case-study.pdf

13 http://www.teagasc.ie/publications/2013/2808/index.asp

14 http://www.herdwatch.ie/

15 http://farmflo.com/

16 http://discoveryfarms.uark.edu/

17 http://www.ballinderryriver.org/

18 http://www.duhallowlife.com/

19 http://streamscapes.ie/

20 https://en.wikipedia.org/wiki/Massive_open_online_course

and protection of the natural capital. The need for dedicated agri-environmental advisors was ranked highly (4th of 15) in the survey. There was some discussion, but no conclusion, on the relative value of a separate dedicated environmental sustainability advisor. The trust between advisor and farmer is an invaluable asset to KE and must be earned over time. The introduction of a second environmental sustainability advisor may create an additional burden on the farmer's time and might not be conducive to integrating production and environmental needs.

The need for education initiatives for advisors was highlighted. This is required to keep pace with the rapidly expanding and deepening knowledge base required to deliver SI. In this context, it was noted that new advisory models might be needed. The requirement to integrate social science practitioners into the KE process at implementation level was identified as being critical to facilitate and manage the change in stakeholder behavioural patterns.

In all three BGs there was considerable debate on the range of interventions currently operating or that could be introduced to assist in improving KE at the implementation group level. Improved use of discussion groups, demonstration farms and awards to promote the SI agenda were identified. The need for greater involvement of the agri-food processing sector was also highlighted and in this respect the example of Glanbia's Sustainable Dairy Audit Scheme[21] was noted as an example.

In the second BG session, participants focused on frameworks for the development and implementation of KE. The outcomes are reflected in the Silver Streams framework (Figure 4.7). It is important to note that the Silver Stream title has no provenance and was used only as a working title during the discussion. The framework was based on an agri-food sector platform to integrate the SI issues and KE requirements. The difference between this framework and river basin management plans is that it integrates the production objectives of farmers and land managers not only with natural capital objectives, but also with consumer demands.

The Silver Streams framework is a community-based approach at a catchment/sub-catchment scale. This initiative is initiated and managed by the

21 https://www.glanbiaingredientsireland.com/sustainability/farm

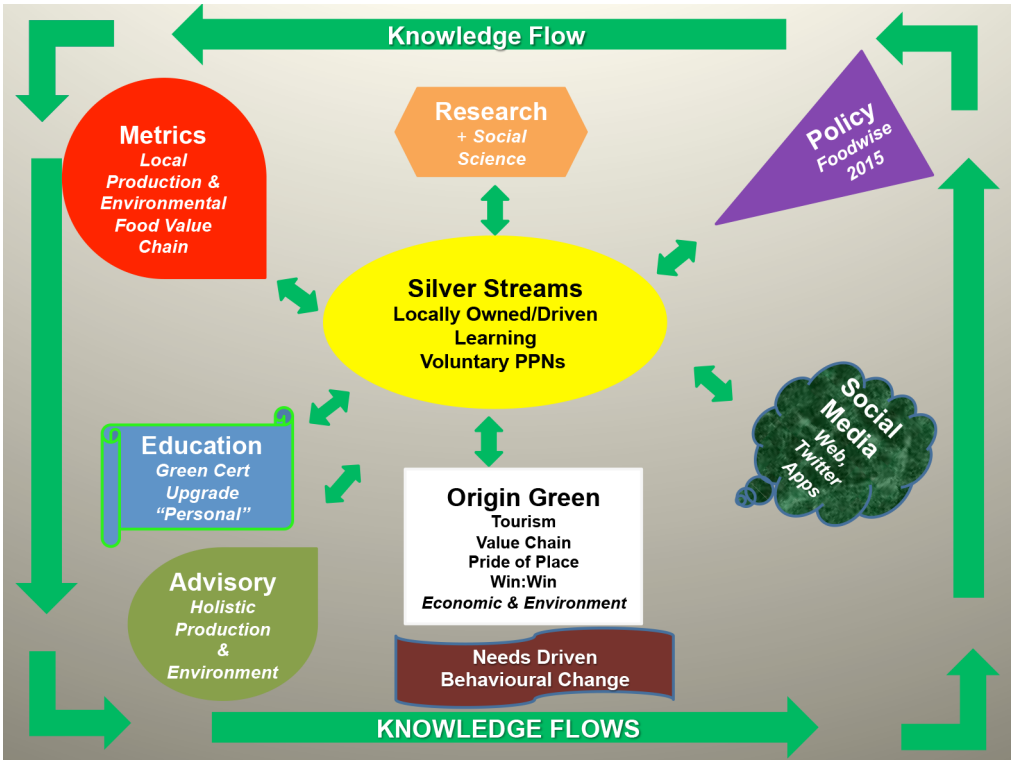

Figure 4.7. A delivery framework, "Silver Streams" for a community-based approach to improve KE and innovation developed during the BG discussions at the second workshop.

community stakeholders and is focused on their vision and knowledge needs required to deliver that vision. This represents a shift in the KE balance away from a top down towards a bottom up approach. It is not the replacement of the former with the latter, but a more balanced integrated approach and will require significant changes in the behaviours of all the stakeholders. Examples of this approach are Tidy Towns[22] and Blue Flag Beaches.[23]

An interesting aspect of this outcome was that the measure "broaden the coalition of stakeholders" was least popular in the BWS survey (Figure 4.4). However, this measure was discussed and generally promoted at all the BG sessions. The reason for this may have been that the discussion focus was on the context and model required to integrate the measures into an actionable programme. This may suggest that the focus of attention for enhancing KE should be more on progressing the model architecture within which the KE measures are applied rather than the specific measures themselves.

It is essential in developing any community-based model to improve KE and implementation engagement activities that all stakeholders are involved. Some of the steps identified during the discussions that might be considered necessary in the process are:

- developing a vision for the development of SI and authentication of using a participative approach involving stakeholders;
- developing a road map for implementation at catchment/community level;
- developing a communication strategy for sharing the vision, mobilising local stakeholders, and accelerating adoption of relevant practices; a modern and complete communication strategy might segment the various stakeholders, the messages they need to hear and the channels by which they can be reached; this could include a focus on using smartphone-friendly media such as Facebook, YouTube, Vimeo and Twitter;
- developing a coherent set of messages that promote the different stakeholders' positions with respect to the vision, making it relevant for public sector actors, farmers, and other actors such as consumer groups and the general public;
- piloting new ways of "farmers talking to farmers", for example by partnering with local lead-adopters on communication initiatives.

It is worth highlighting a Dutch research paper on community-based approaches to SI. Bouma *et al.* (2011) noted the requirement for stakeholder involvement. The important characteristics of successful examples reviewed were (1) the persistence of entrepreneurs (participants) supported by knowledge brokers and the development of new business and organisational models, and (2) the mobilisation and strategic injection of various forms of tacit and scientific knowledge in the overall engagement process. These processes took over 10 years to mature, requiring an important role for knowledge brokers with hard knowledge and social intelligence. Community-based approaches to SI are unique for each project and there is no standard recipe.

There were other relevant issues relating to the policy and knowledge groups and the challenges the variability agri-food sector creates for developing KE frameworks and measures. A short exploration of these is presented in Appendix 5.

22 http://www.tidytowns.ie/

23 http://www.blueflagireland.org/

5 Establishing a Community-Based Approach to Knowledge Exchange

As evidenced from the project outcomes, there is a need for the development of community-based approaches to improve the KE model required to deliver SI. The recent EPA StreamScapes report (EPA, 2015) on public engagement highlights the need to facilitate initiatives in which communities develop local plans for the management of their catchment. The Integrated Local Delivery (ILD) Model developed by the Gloucestershire Farming and Wildlife Advisory Group (FWAG) is an example of an approach in which stakeholders have been engaged in the decision-making related to a range of land-use practices in their local area.[24] The ILD Model involves a six-stage process through which an invited facilitator works with a local community to develop proposals and embed local community governance in local decision-making on countryside management. Work by The Carnegie UK Trust (2009) outlines three enabling factors for simulating innovation within the rural community: (1) growing the capacity of the local people; (2) enhancing community assets, for example local knowledge; and (3) effective community-led planning and local governance. One of the action areas proposed by the Carnegie UK Trust was the establishment of community learning accounts, which are community-directed funds focused on priority areas identified by the community.

There was a consensus at the second workshop that KE to support the delivery of SI should be driven by the needs of users. This suggested a process of KE that is delivered through a better balanced bottom up–top down community-based approach. A conceptual framework (Figure 4.7) of such an approach was discussed at the workshop and has been outlined in section 4.3 of this report. Although there was general consensus on the concept of a bottom up approach to KE, how such an approach could be initiated within a catchment, without being driven by government bodies or non-governmental organisations (NGOs) remained uncertain. In addition, integration of bottom up approaches into top down governance structures remains a challenge (Doody *et al*., 2012).

During the workshop, the Tidy Towns competition was held up as a model community-based initiative that has been supported by local communities, businesses and government. It has been sustained by local community involvement since its inception as a national competition in 1958 by Bord Fáilte and has succeeded in generating environmental activism at grass-roots level. The Value Water Award has been recently added to the TidyTown competition, rewarding communities for sustainable water management. Similar exemplars have been implemented elsewhere, such as the Community Energy Saving Competition[25] funded by the Department of Energy and Climate Change in the UK. Funding is provided of up to £20,000 to enable communities to implement innovative schemes to save energy in their local area. A similar approach is taken in Washington, DC, through the Georgetown University Energy Prize,[26] which aims to stimulate innovative approaches to energy saving in local communities, to develop exemplars of local communities working together with government and industry, and to build the capacity of local communities through education and engagement.

An approach to designing a grant scheme to initiate a catchment competition that integrates the measures identified to enhance KE to achieve SI was developed by the project team.

5.1 Proposal for the Development of a Catchment Competition Grant Scheme

The proposal outlined below is aimed at developing a catchment competition grant scheme that stimulates a community-based approach to KE for SI at catchment scale. It includes:

24 http://www.ccri.ac.uk/ild/

25 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/397514/community_energy_saving_competition_guidance.pdf

26 https://www.georgetown.edu/news/georgetown-university-energy-prize-launch.html

1. an outline of the scope and indicative actions to be supported through the catchment competition grant scheme;
2. funding mechanisms that could be used to deliver the scheme;
3. details of the application stages;
4. the evaluation process and criteria for the applications.

5.1.1 Scope

The catchment competition grant scheme aims to fund initiatives that take an innovative approach to KE and brings together stakeholders with competing visions of SI and sustainable land use in their catchment. The scheme will fund applications that are inclusive of stakeholders across multiple sectors, for example farming, angling and tourism, who will work together to enhance KE for the delivery of SI and sustainable land use in their catchment. A range of KE actions should be utilised, including community events, education, citizen science and social media, to ensure that the initiative is accessible to all stakeholders.

Beyond the catchment scale, the applicants should demonstrate how they will link the local community with policy, research, NGOs and advisory stakeholders, with a view to embedding their initiative within existing governance structures. These links should provide the community initiative with additional expertise, knowledge and resources that are currently unavailable within the catchment.

A key task of the proposed KE initiative should be the selection and adoption of local SI metrics for use within their catchment. While a community-based approach to the metrics will be essential, utilisation of research, NGOs and advisory organisations will be encouraged to ensure that the metrics are evidence based and that they inform regional and national initiatives such as OG. The evolution and development of a catchment brand that encompasses the uniqueness of the catchment's SI credentials and stakeholders' identities would be considered a valuable outcome of this initiative.

The applicant will be required to clearly state the barriers to KE between stakeholders and demonstrate how these barriers will be overcome through the proposed initiative. Applicants will be encouraged to think innovatively and pilot new KE measures within the catchment. A list of indicative measures that may be considered for funding are included below:

1. development of a catchment stakeholders' forum aimed at developing a common and agreed vision of SI in the catchment;
2. development of SMART objectives for sustainable land use in the catchment that are based on best available evidence, national policy targets and the community values and expectations;
3. development of initiatives to overcome existing KE barriers between specific groups of catchment stakeholders;
4. development of a road map detailing how the community will support SI in the catchment including goals and mechanisms for delivery;
5. development of initiative(s) to customise the range of existing national, regional and local support mechanisms to reflect the natural, social, economic and demographic characteristics of the catchment area, which may involve collaborations with stakeholders outside of the catchment such as advisory services, agri-food industry, research organisations, etc.;
6. creation of a new KE role (e.g. social scientist) to provide a resource that will support an improvement in the flow and application of knowledge between catchment stakeholders;
7. development of educational programmes for stakeholders that support the delivery of SI;
8. development of innovative ways of stakeholders talking to stakeholders, for example by partnering local farm innovators with research institutions; initiatives supporting the implementation of citizen science actions are encouraged;
9. provision of a forum that engages a broad coalition of stakeholders, for example the educational and public sectors and those responsible for natural capital management;
10. development of an ongoing communication programme to share the successes and benefits of community KE and sustainable land use within the catchment, which should include strategies to communicate with stakeholders within and outside of the catchment area at local, regional and national levels.

While applicants are not required to incorporate any of these indicative actions, they must include actions that are inclusive and community-based; that improve KE for SI and sustainable land use; and that are sustainable beyond the lifetime of the funding provided. Continuity beyond the lifetime of the current funding will be a key evaluation criterion for all proposals and, as such, actions should be considered that will increase the likelihood of community stakeholders accessing EU, national, regional and/or industrial funding into the future. Consideration needs to be given to differentiating proposals based on regional variation and/or farming system.

5.1.2 Funding

It is anticipated that funding for the catchment competition grant scheme will be provided through a number of sources with the aim of obtaining buy-in from government, industry and the local community stakeholders. This will help to widen the funding base and increase the options available to continue the initiative beyond the lifetime of the funding. The core funding for the competition will be provided through the catchment competition grant fund, which will enable successful projects to deliver the actions proposed in their applications. It is envisaged that a number of government departments would contribute to establishing this fund due to the cross-cutting nature of the initiative being proposed.

In addition, to demonstrate commitment and buy-in from the local community, inclusion of match funding and/or benefit-in-kind contributions will be encouraged. Benefit-in-kind from the local community can come in the form of, for example, access to facilities, volunteering and other non-financial resources. In addition, the catchment grant scheme fund should seek to gain buy-in, funding and/or benefit-in-kind contributions from a range of representative organisations, NGOs, and regional and national agri-food businesses.

5.1.3 Implementation of the catchment grant scheme

The catchment competition grant scheme will be delivered in three phases (summarised in Table 5.1) focused on (1) engaging with stakeholders, (2) the application process, and (3) monitoring and evaluation.

Phase 1: Stakeholder engagement

In this phase, approaches will be made to organisations and businesses that have a role in achieving SI. Examples of organisations that could be approached include Bordbia, Glanbia, Devenish Nutrition, the Ulster Farmers Union (UFU), the Irish Farmers Association (IFA), Environment Link, the Sustainable Water Network (SWAN), the World Wide Fund for Nature (WWF), Enterprise Ireland and Invest NI. Discussions will be held with these organisations to establish if

Table 5.1. Summary of the three phases of the catchment competitions to develop community-based knowledge exchange networks

Phase	Activities	Outcomes
Stakeholder engagement	Engagement with agri-food industry stakeholders on what contributions and/or support they will provide to the catchment competition fund	Securing additional funding and support to implement the catchment competition
	Marketing and communication of the upcoming catchment grant scheme to community stakeholders	Provide stakeholders with the information and resources required to submit a successful bid
Funding applications	Call for stage 1 short applications for evaluation	Provide funding to three to five successful applications to implement pilot projects for 1 year
	Shortlist applications based on short applications and presentation/interview to an expert panel	
	Select final list of projects for the stage 2 pilot study phase of the application process	
Evaluation and awards	During the 1 year pilot study, projects will be evaluated on two occasions by an expert panel	Funding awarded based on the outcome of the expert evaluation
	Projects will submit a short report at the end of the pilot study period	
	Conduct “before and after” surveys with a wider range of stakeholders impacted by the pilot study	Project used as exemplar of community-based knowledge exchange
	Completion of evaluation by the expert panel	

and how they can contribute to successful projects through, for example, endorsement of initiatives, match funding, and/or providing benefit-in-kind (e.g. technical, business, marketing, advisory or scientific support to communities). Careful consideration should be given to aligning the contributions of organisations with their existing structures and initiatives, with a view to enhancing the sustainability of these contributions beyond the lifetime of the catchment grant scheme.

Implementation of phase 1 will also entail marketing and communication of the upcoming catchment grant scheme to community stakeholders. This will involve advertising, articles in the local press, information evenings and networking events. The objective is to provide community stakeholders with sufficient information to make a competitive bid for funding and to encourage them to focus on the development of a KE initiative that meets their needs. In addition, networking events will be conducted to provide community stakeholders with links to each other and to organisations related to policy, research, the agri-food industry and advisory bodies that may be in a position to provide support to stakeholders interested in bidding.

Phase 2: Funding applications

There will be a two-stage application process put in place. The stage 1 application will be a short description of the proposed initiative which should address the following evaluation criteria:

- Inclusive: does the project involve stakeholders from a range of sectors within the catchment?
- Sustainable: are the actions being proposed sustainable beyond the lifetime of this project? Consideration of the project legacy needs to be clearly defined.
- Innovation: is the project proposing innovative actions that go above and beyond previous efforts to improve communication between catchment stakeholders?
- Leadership: do the applicants have the experience and skills to deliver on the proposal?
- Technical: does the project engage with the necessary policy, science or advisory groups to ensure that they have access to the necessary technical expertise to deliver the actions proposed?
- Sustainable land use: how will the initiative contribute to sustainable land use?
- Integration: how will the initiative be embedded with existing governance structures?
- Benefit-in-kind: applicants will increase their likelihood of success by showing buy-in from local business or stakeholder groups through the offer of matching funding or provision of benefit-in-kind contributions. Benefit-in-kind contributions can include access to land, volunteering and free access to facilities.

Following an initial assessment of the application by a panel of experts from government, NGOs, the agri-food industry, research, advisory and community organisations, a shortlist of applicants will be invited to meet and give a presentation of their proposals to the expert panel. The expert panel will select a final list of three to five initiatives to receive funding to pilot the proposal.

During the application process applicants must detail how the money will be spent if their project is awarded the overall grant. Pilot projects will be supported during their setup phase to ensure that the funding and the benefit-in-kind committed during phase 1 are successfully integrated into the proposed initiative.

Phase 3: Evaluation and awards

Pilot projects will run for 12 months and will be visited by the panel of experts on two occasions to assess the merits and success of the initiative. Through consultation with experts and community stakeholders during phase 1, a list of quantitative and qualitative indicators of success will be developed, which will be used by the expert panel to assess the initiatives. At the end of the year a short report will be submitted to the expert panel and a presentation given during the final visit. Interviews will also be conducted with key stakeholders to consider how the initiative has contributed to KE and SI in the catchment. Assessment may also be based on a “before and after” survey of a wider selection of stakeholders to evaluate changes in attitudes, behaviours, skills and knowledge as a result of the KE initiatives.

Based on the outputs of the expert panel assessment, further funding for the first-, second- and third-placed initiatives will be awarded. The additional funding will be used to implement the successful initiatives on a larger scale, with the expectation that they will act as exemplars for a bottom up approach to KE. Part of the additional funding must be used in hosting external groups and visitors with a view to transferring the outputs and knowledge over a wider area.

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Abbreviations

BG	Breakout group
BWS	Best–worst scaling
DAFM	Department of Agriculture, Food and the Marine
EPA	Environmental Protection Agency
FLM	Functional Land Management
ICT	Information and communication technology
KE	Knowledge exchange
NFS	National Farm Survey
NGO	Non-governmental organisation
NI	Northern Ireland
NPWS	National Parks and Wildlife Service
OG	Origin Green
RU	Random utility
SI	Sustainable intensification
SMART	Specific, Measurable, Achievable, Realistic and Time-bound

Appendix 1 July Workshop Participants and Project Team

A1.1 List of the July AgImpact Extension Workshop Participants

Kevin Murphy, farmer

Brendan Horan, Teagasc, researcher

Ger Shortle, Teagasc, Agricultural Catchments Programme manager

Eric Long, College of Agriculture, Food and Rural Enterprise (CAFRE)

Terence Patton, Department of Agriculture and Rural Development (DARD)

Liam Stack, Dairygold

Anne Browne, Glanbia

Bernie O'Flaherty, Monaghan County Council

Patricia Torpey, DAFM

Deirdre Fay, DAFM

Donal Daly, EPA

Pat Byrne, EPA

Mark Plunket, Teagasc advisory specialist – cereals

Eddie Burgess, Teagasc Agricultural Catchments Programme advisor

Tom O'Dwyer, Teagasc advisory specialist – dairy

Richard Howell, DAFM

Chris Stoate, Game and Wildlife Conservation Trust

Patrick Crehan, CKA, invited speaker

A1.2 AgImpact Project Team

Donnacha Doody, AFBI

Cara Augustenborg, Impact Research Management

Seamus Crosse, Greenfield Dairy Solutions

Paul Cross, University of Bangor

Paul Withers, University of Bangor

Owen Carton, Greenfield Dairy Solutions

Appendix 2 The Approach to the Estimation of Importance Scores via a Choice Model Based on Random Utility Theory

See McFadden and Train (2000).

Faced with a BWS set, the respondent is asked to indicate the best and worst performing measure, hence the respondent is choosing the two measures with the maximum difference in performance between them. In a set of K measures there are $K(K-1)$ best–worst combinations. The objective is to retrieve estimates of the sample's performance scores that best explain the observed pattern of best–worst choices, and it is the RU choice model which permits this. We consider there to be a scale of importance on which measures can be located and refer to ϕ_A as the position of measure A on that scale. Respondent n's unobserved importance score for measure A is given by ϕ,

$$P_{nA} = \phi_A + \varepsilon_{nA} \qquad \text{(Equation A2.1)}$$

where ε_{nA} is an error term, the inclusion of which creates a probabilistic rather than deterministic choice model. The probability of person n choosing any pair of best–worst choices, for example measures A and D, is given by the probability that $(P_{nA} - P_{nD})$ exceeds all other $K(K-1)$ performance differences within the BWS set.

The model is statistically implementable via the assumption that the error term, ε_{nA}, has an extreme value type I (Gumbel) distribution. This means that the probability that A and D are chosen as most and least important respectively is given by the standard conditional logit formulation:

$$\frac{\exp^{\phi_A - \phi_D}}{\sum_{b=1}^{K}\sum_{w=1}^{K}\exp^{\phi_b - \phi_w} - K} \qquad \text{(Equation A2.2)}$$

Maximum likelihood estimation of equation A2.2 involves retrieval of estimates of the ϕ performance scores, which maximise the likelihood of the observed pattern of BW choices being observed.

The conditional logit model in equation A2.2 does not, as specified, include personal characteristics and, as such, does not allow for the investigation of heterogeneity among the sample. One could extend the model to include characteristics: for example, we could allow and test whether specific performance scores differ across respondents of differing expertise or demographic profiles. An alternative approach to the accommodation of heterogeneity is the infinite mixture, or mixed logit, model. In this model, the importance scores are assumed to be drawn from a distribution, the mean and standard deviation of which are estimated. An attraction of this model is that, as well as identifying a point estimate of the mean importance score, estimates can be derived for each survey respondent, conditional on the BW choice data and the estimated population parameters. More formally, person n's performance score for measure A (ϕ^*_A) is drawn from a distribution with mean (ϕ^*_A) and standard deviation, σ_A. Person n's performance score deviates from the sample mean (ϕ^*_A) via a disturbance term, ∇ where $\nabla \sim N(0,1)$:

$$\phi_{nA} = \phi^*_A + \sigma_A \nabla_{nA} \qquad \text{(Equation A2.3)}$$

The derivation of respondent-specific performance scores is particularly attractive in this study, given the desire to examine the degree of consensus or disagreement among the experts on the performance of the KE measures. We refer readers to McFadden and Train (2000) and Train (2003) for more on the estimation of the mixed logit model, noting only that we estimate the model using Bayesian methods (Rigby *et al*., 2009) with the sampler run for 30,000 iterations (the "burn in") before the parameters were recorded, followed by another 30,000 iterations with which to summarise the posterior distribution of the measures' performance scores.

Appendix 3 October Workshop Participants and Project Team

A3.1 List of the October AgImpact Extension Workshop Participants

M. Archbold, EPA

Eric Long, College of Agriculture, Food and Rural Enterprise (CAFRE)

Terence Patton, Department of Agriculture and Rural Development (DARD)

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Donal Daly, EPA

Pat Byrne, EPA

Tom O'Connell, Teagasc Agricultural Catchments Programme Advisor

Paul Devine, Department of Agriculture and Rural Development

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Catherine Watson, Agri-Food and Biosciences Institute (AFBI)

Ray Spain, South Eastern River Basin District (SERBD)

Katrina Mackintosh, Queen's University Belfast

Tadg O'Mahony, EPA

Eadoin Joyce, Irish Water

Gill Gallagher, Devenish

Paul Murphy, University College Dublin

Gerard McCutcheon, Teagasc, Pig Development Unit

Paddy Savage, Department of Agriculture and Rural Development (DARD)

Kieran McCavana, Northern Ireland Environment Agency (NIEA)

Alice Murphy, Irish Water

A3.2 AgImpact Project Team

Donnacha Doody, Agri-Food and Biosciences Institute (AFBI)

Cara Augustenborg, Impact Research Management

Seamus Crosse, Greenfield Dairy Solutions

Paul Cross, University of Bangor

Owen Carton, Greenfield Dairy Solutions

Appendix 4 Summary of Additional Comments from Survey Respondents

Additional comments from survey participants are presented below in terms of the "need to" actions suggested to improve KE that will contribute to the achievement of SI. They are loosely assembled around the policy and knowledge and implementation groups. However, it is evident that there is a crossover in some of the actions to all groups. There was no attempt made to prioritise the actions, so the place in the listing below does not represent a ranking in terms of the relative importance of one measure over another.

A4.1 Policy and knowledge groups

- The need to improve the translation and integration of component research knowledge to improve the application of knowledge at policy level.
- The need for integrated SI vision and targets agreed at a national level with equal emphasis on production and environment; the use of scenarios in the process involving all stakeholders; stakeholder commitment to working partnerships is essential.
- The need to ensure that engagement/communication strategies are developed between "exchanging parties".
- The need for a better integrated balance between top down and bottom up approaches to policy and research development.
- The need for clear targets, monitoring, review and revision.
- The need for incentives to promote knowledge adoption.
- The need for the development of environmental metrics benchmarked against international standards.
- The need for better alignment of policy measures/ instruments with measureable outcomes.
- The need for greater sharing of intelligence between regulators to assist in identifying problems/ solutions.
- The need for improved dialogue with all stakeholders to highlight and translate knowledge into simple "doable" measures; transparent communication and dialogue; use of workshops to achieve this.
- The need for stakeholder education; include practical field-based education; the importance of lifelong education.
- The importance of the advisory role.

A4.2 Implementation groups

- The need for a "one stop shop" to co-ordinate and facilitate direct contact with stakeholders in the implementation of local or community-based initiatives focused on delivering SI.
- The need to integrate the role of social scientists into the KE system.
- The need for demonstration initiatives to create a knowledge demand; all SI aspects should be included linking the elements of production, water quality, biodiversity, food quality; peer learning integrated into dissemination activities; keeping demonstration activities as practical as possible, seeing the outcomes rather than talking about outcomes; demonstration activities should focus on transferring information in a way that promotes learning and curiosity; the desired outcome is learning leading to behavioural change; clear, simple-to-understand messages.
- The need to continually highlight the benefits of sustainability – possibly by using initiatives such as OG.
- The need for greater use of technology to facilitate knowledge flows (e.g. social media, web-based education programmes) and real-time data flows associated with metrics for monitoring progress towards goals.
- The need to use local stakeholders' groups to develop communities of practice.
- The need to use a supply chain approach (farm to fork) to improve integration and ownership.
- The need to improve the translation and integration of component research knowledge to improve the application of knowledge at local/farm level.
- The need to include local authorities, DAFM, EPA and NPWS in the development of local SI initiatives;

- The need for stakeholder involvement in identifying appropriate measures and metrics that may be required at local level to supplement those already in place at a national level; for developing local understanding of measures and instruments and the ability to “localise” them to ensure better targeting and outcomes; for simple and positive framing of measures and actions.
- The need to expand the use of on-farm/environment research; citizen science.
- The need for direct contact with all stakeholders.

Appendix 5 A Short Exploration of Issues in Relation to the Policy and Knowledge Groups and the Challenges the Variability in the Agri-Food Sector Creates for Developing KE Frameworks and Measures

Knowledge exchange between stakeholders in the agri-food system is multi-faceted and reflects the interest of the individual stakeholders (Figure A5.1). Their diversity emphasises the need for an agreed vision to enable effective KE in community-based approaches. It facilitates the alignment of the individual objectives, the identification of their own particular roles and knowledge needs in delivery of the vision. It also reduces the potential for conflicts between individual stakeholder interests.

An interesting aspect of stakeholder groupings was identified at the first workshop. The workshop report[27] noted that the discussion distinguished three broad levels or groups involved in the KE systems: the policy, implementation, and knowledge groups. However, the majority of the discussion in the two workshops focused on actions to improve KE within the implementation group. As such, further consideration is given here to the policy and knowledge groups.

27 http://erc.epa.ie/safer/reports

A5.1 Policy groups

The first workshop identified blockages to KE flows that were considered to have important implications for the effective functioning of the policy group. This creates a significant challenge that must be addressed to create the platform required for the effective functioning of the implementation and knowledge groups.

Progress in improving KE to increase production efficiency at farm level is still required as evidenced by the data in Figure A5.2. The knowledge required to achieve these targets is available and considerable focus remains on KE to improve uptake of the production targets. These have universal policy-level support among all stakeholders. However, there may not be such policy group agreement regarding the achievement of environmental sustainability.

The Department of the Environment, Community and Local Development has national responsibility for policy and legislation in terms of our binding commitments in relation to emissions to water and air. The areas of relevance to the agri-food sector include the Water Framework Directive (WFD), Climate Change and

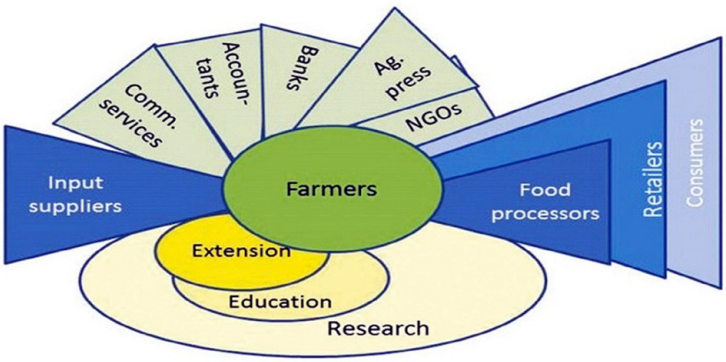


Figure A5.1. The EU SCAR (2013) representation of the agri-food stakeholders.

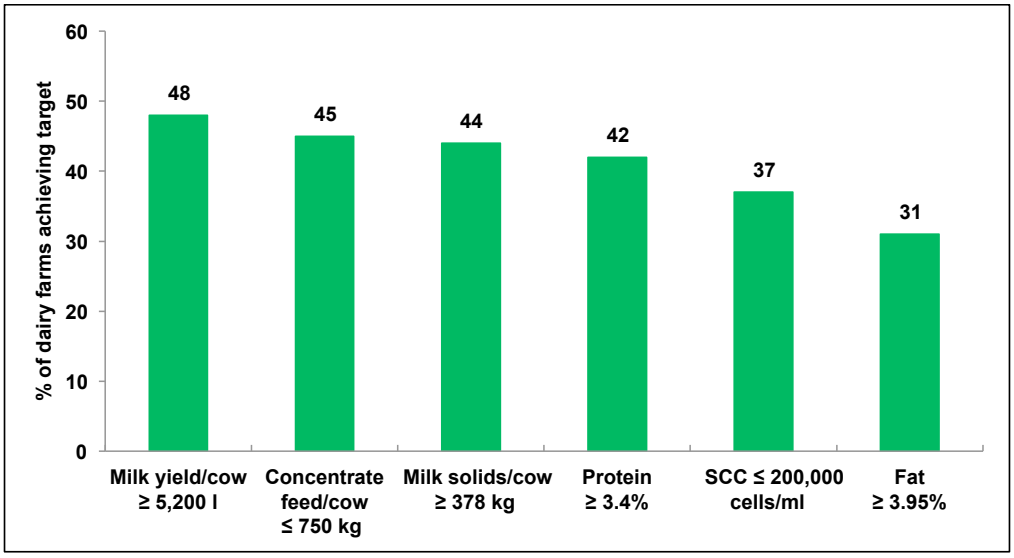


Figure A5.2. Dairy farms (%) achieving Teagasc road map key performance indicator targets (annual) 2011 (adapted from Boyle, 2012).

National Emission Ceilings. The EPA, local authorities and the regional fisheries boards have significant roles in relation to monitoring, reporting and the implementation of national measures to address water quality issues.

Progress has been made in reducing nutrient losses from agriculture. However, 47% of our river water bodies are currently failing to meet our WFD target of good water status.[28] The expected primary production intensification aspired to in Food Wise 2025 may increase the pressure especially in areas of the country where water quality is currently not in a satisfactory condition.

In terms of both greenhouse gas (GHG) and ammonia emissions, meeting our targets is similarly challenging. National projections for GHG emissions up to 2020[29] indicate that Ireland will exceed its non-emission trading scheme (to which agriculture contributes over 40% of the total) target. Projected national ammonia emissions,[30] which are almost totally of agricultural origin, are similarly expected to exceed the 2020 and 2030 targets. Neither of these projections considers Food Wise 2025 expansion in primary production.

The Department of Arts, Heritage and the Gaeltacht has responsibility for policy and legislation in terms of compliance with the implementation of international and EU heritage obligations. This includes halting biodiversity loss and protecting ecosystems. The NPWS, which is fully integrated in the Heritage Division of the Department, has responsibility for the protection and conservation of Ireland's natural heritage and biodiversity. The most recent national habitat assessment[31] for the period 2007 to 2013 reports that 50% and 41% of the habitats assessed were considered "inadequate" or "bad", respectively. The proportion of habitats impacted by an agricultural pressure or threat was slightly less than 40%.

Food Wise 2025 makes eight recommendations with associated actions that are necessary for the delivery of environmental sustainability. Central to these is the commitment to work with other government departments, their agencies, stakeholders and our international partners. However, trusted, effective and measurable mechanisms for KE to improve the harmonisation across government departments and agencies have to be evolved. In this respect, it is worth noting a comment in the July AgImpact workshop report that suggests a willingness to make this happen:

28 http://www.epa.ie/pubs/reports/water/waterqua/wqr20102012/#.Vk9BwtLhA-U

29 http://www.epa.ie/pubs/reports/air/airemissions/irelandsghgemissions2014-2035.html#.Vk9Do9LhA-U

30 http://www.ceip.at/ms/ceip_home1/ceip_home/status_reporting/2015_submissions/

31 http://www.npws.ie/sites/default/files/publications/pdf/NPWS_2007_Conservation_Status_Report.pdf

> The single most important characteristic of the workshop discussion was the openness of the participants and their willingness to share their perspectives and interest in improving innovation and knowledge exchange to achieve sustainable intensification. Participants also clearly expressed a willingness to extend this openness and stakeholder engagement in a higher level forum...

Acting on this sentiment will result in a shared agreement on the measures and their implementation to balance intensification with environmental sustainability. This policy group agreement is an essential cornerstone for improving knowledge flows at implementation level.

A5.2 Knowledge groups

The first workshop identified the importance of improving the knowledge flows between the knowledge group and both the policy and implementation groups. One of the outcomes from the first workshop was the suggestion "A translational leader role might be established to address and improve communications within the policy group stakeholders – with a focus on translating the scientific knowledge into a language and context that can be understood by all". However, this was ranked as the second least important measure in the BWS survey. The identified need for a translational leader role suggests that the problem exists in the communications between the knowledge group and both the policy and implementation groups.

The 2013 EU SCAR AKIS report (EU SCAR, 2013) identified a potential blockage in the KE from the knowledge group to other groups. It indicated that in research organisations there is an increasing emphasis on scientific quality (in terms of papers and citations in quality categories as judged by peers on purely scientific grounds) at individual and institutional levels. It argued that such emphasis on scientific quality is drawing attention away from the importance of their research to stakeholder needs, its potential contribution to innovation and the interaction required in multi-actor groups such as advisory groups or farmers.

It is very important to stress that this statement does not suggest that scientific quality can be separated from stakeholder needs. It is a given that unless the science achieves high standards, stakeholder needs cannot be delivered.

SCAR commissioned a study to (1) to identify possible incentives and evaluation criteria for researcher and research organisations that could be used in addition to scientific quality, and (2) identify measures that would encourage researchers to take part in multi-actor research and innovation processes. A summary of the SCAR study recommendations is given in the text box below.

Recommendations for research policy

1. Create and promote new evaluation criteria for funding research proposals that reward not only disciplinary excellence but also achievements in interdisciplinary and transdisciplinary work.
2. Include practitioners/experts along with scientific experts on selection committees for project funding and evaluation processes for research proposals.
3. Create new evaluation criteria for the performance of institutions that include achievements in interactive research.
4. Support sabbaticals or short-term visits/internships of junior and senior researchers in industry, political and administration units or civil society organisations.
5. Provide funding for research-practice partnership projects that involve science and practice on equal footing.
6. Establish an easily accessible database/repository for high quality non-academic publications/articles.

Recommendations for research institutions

7. Develop targeted training courses for undergraduates, graduates, doctoral students and experienced researchers to enhance the necessary skills for effective science-practice interaction.
8. Create a new centre/discipline for the integration and implementation sciences.
9. Establish a comprehensive database assembling information about institutions and methods.
10. Include assessment of a researcher's (non-academic) societal impact into the overall evaluation of his/her performance.

Progress is already being made in universities and research institutions to improve the impact of their research. This should be maintained to enhance KE in the sector.

A5.3 Research/policy silos

The compartmentalisation or splitting into silos of agri-food policy and research was noted at the July workshop. For example, measures that were identified to improve production performance did not take into account the implications of their implementation on other elements of production or the environment. This suggests the need for a newer architecture that can integrate or systemise the knowledge flows to improve uptake and adoption by stakeholders.

A5.4 Variability in the agri-food sector

There was a definite consensus at the first workshop that there is no one-size-fits-all approach to actions aimed at enhancing the application of knowledge on farms. This was based on the variability/diversity of:

- stakeholders' vision and objectives;
- weather and soil type;
- farm managerial levels;
- production systems and output levels;
- environmental goods/services impacts – water, soil, air, biodiversity;
- local community aspirations.

It was agreed that the basic KE inputs required (clarity of vision, objective(s), implementation, measures, effective and focused communication strategies) are similar, but they need to be customised to reflect the bio-physical, socio-economic and farming system variability. Three main elements were identified as reasons to move away from a one-size-fits-all approach to KE: (1) variability in the socio-economic and demographic characteristics of the farmers; (2) variability in the bio-physical characteristics; and (3) variability in the rate of adoption of new knowledge and technology.

A5.5 Variability in the socio-economic and demographic characteristics of the farmers

As was evident in the workshop outcomes, the focus in any discussion about KE in the sector is often the farmer. The word "farmer" is used generically, which can contribute to obfuscation when considering and arriving at approaches to improve KE and its application. It is important to have a better understanding of the term "farmer" as there are considerable variations in terms of farm size, system demographics and viability.

The 2015 Agri-Taxation Review,[32] which was published as part of the Budget 2015, provides data on the structure, demographics and economic viability of Irish farming. These are briefly summarised here. In 2010, the average farm size of just under 140,000 farms was 32.7 ha. Nationally, over 42% of all farm holdings are less than 20 ha, while a little over 3% of farm holdings over 100 ha. Farm size is generally higher – 38.6 ha – in the south and east compared to the border, midlands, and west regions where it is 27.3 ha. On average, farms were made up of 3.8 separate parcels.

The age profile of Irish farmers is high. More than half (51.4%) of all farm holders in 2010 were aged 55 years or older, while more than a quarter (26.3%) of all farm holders were aged over 65 years. Only 6.2% of farmers were aged under 35.

The Agri-Taxation Review divided the 140,000 farms into four economic groups:

- National Farm Survey (NFS) farms: 80,000 farms (57%), annual farm income greater than €8,000 excluding direct payments;
- Small farms: 50,000 farms (36%), annual farm income less than €8,000; average size is 19 ha and they account for 850,000 ha of total agricultural land; mainly cattle farms which make a limited contribution to total agricultural output;
- Pig/poultry farms: 2,000 farms (1%), very commercially focused enterprises;
- Micro farms: 8,000 farms (6%), very little data on these and are assumed to be small or hobby farms.

An economic viability analysis on the 2013 NFS farms[33] reported that approximately 28,000 (35%) of the 80,000 NFS farms are "viable", 26,000 (32.5%) are "sustainable" and 26,000 (32.5%) are "vulnerable" (Figure A5.3).

32 http://igees.gov.ie/publications/economic-analysis/agriculture/agri-taxation-review/

33 http://www.teagasc.ie/publications/2014/3305/Farm_Viability_Analysis.pdf

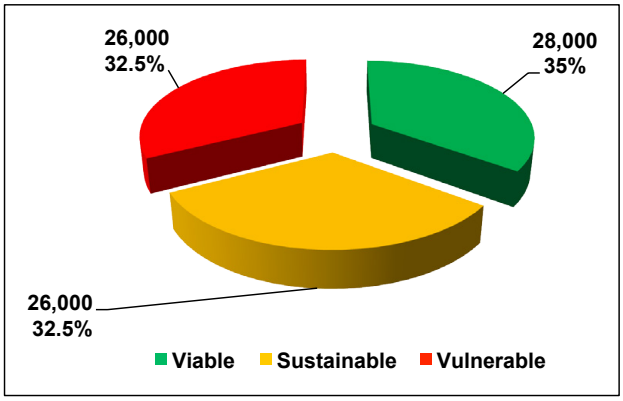


Figure A5.3. The National Farm Survey distribution of farms into three economic groups.

The NFS defines a farm as "viable" when it can remunerate family labour at the average agricultural wage, and provide a 5% return on non-land assets. A "sustainable" farm is not economically viable on the basis of income from farming, but is sustainable due to the off-farm income of the farm holder and/or spouse. A farm is a "vulnerable" farm when the income from farming is not sufficient to make these farms economically viable and they have no off-farm employment.

The NFS farm viability survey identified a number of important regional and system differences between regions and enterprise. There are large differences in farm viability across the regions. The highest proportions of viable farms are located in the east, south-west, south-east, south midlands and south. At least 40% of farms in these regions are viable. This contrasts with the west and border regions where more than 33% of farms are classified as vulnerable.

There are equally large differences in farm variability across enterprises. Dairying has the highest proportion (approximately 80%) of viable farms, followed by approximately 55% for tillage farms and approximately 51% of mixed livestock farms. Less than 25% of cattle and sheep farms are considered viable, with more than 40% classified as vulnerable.

It is therefore important when considering strategies to enhance KE that account is taken of the different socio-economic, demographic and farming system characteristics of the farmer. The use of the term "farmer" generically can result in confusion and undermine the potential effectiveness of KE measures.

A5.6 Bio-physical variability

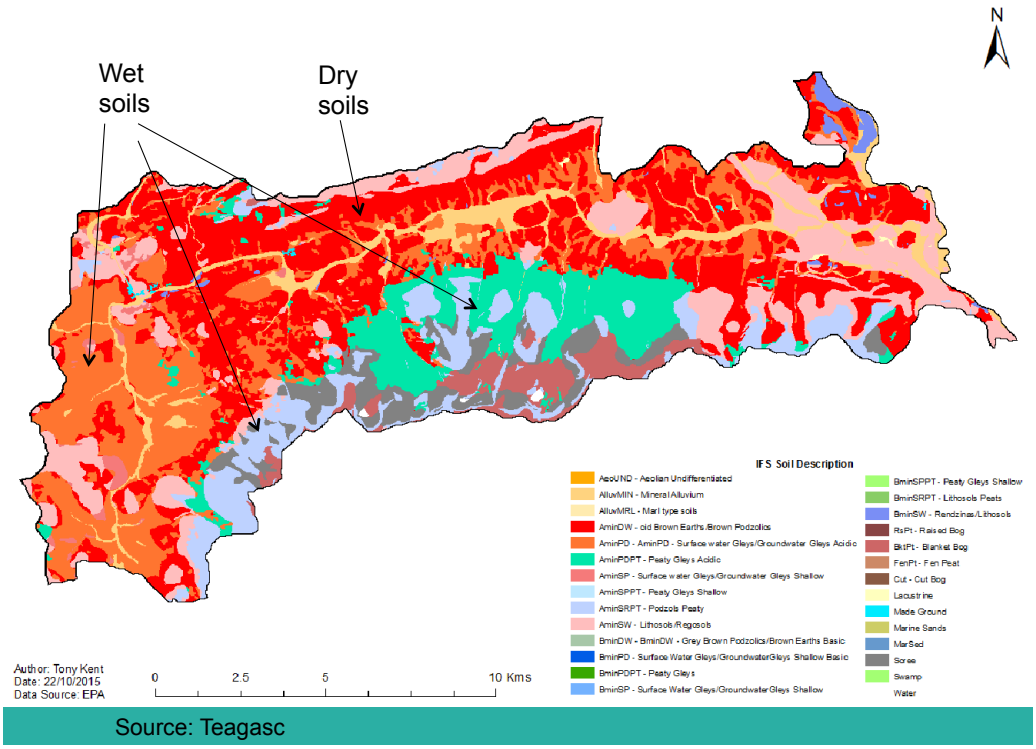
The concept of Functional Land Management (FLM) as a framework for managing soil-based ecosystem services for the SI of agriculture has been proposed by Schulte *et al*. (2014). The SI of agriculture requires soils to deliver a number of functions including food production, water purification, carbon sequestration, habitat for biodiversity and recycling of external nutrients. All soils deliver these functions to varying degrees. However, soils depending on their type (physical, chemical and biological properties) differ in their ability to provide these functions. In addition, local climatic conditions will influence delivery. For example, the generally freer draining soils in the drier south-east of the country are associated with more intensive food production compared with the slower draining wet soils in the north-west. Soils and subsoils also vary within catchments (Figures A5.4 and A5.5) and influence the soil functions. Therefore, the strategies and measures to deliver SI will vary between geographic regions of the country, within catchment areas and even between fields on individual farms.

Significant elements of the reporting and discussion of Food Wise 2025 have focused on the expansion of the dairy sector. However, it is clear that the economic, social and demographic variability of Irish farmers, combined with soil and weather variability will demand other development options. These include the delivery of environmental goods and services. The development and application of the FLM concept has the potential to provide the policy framework for this.

A5.7 Variability in technology adoption

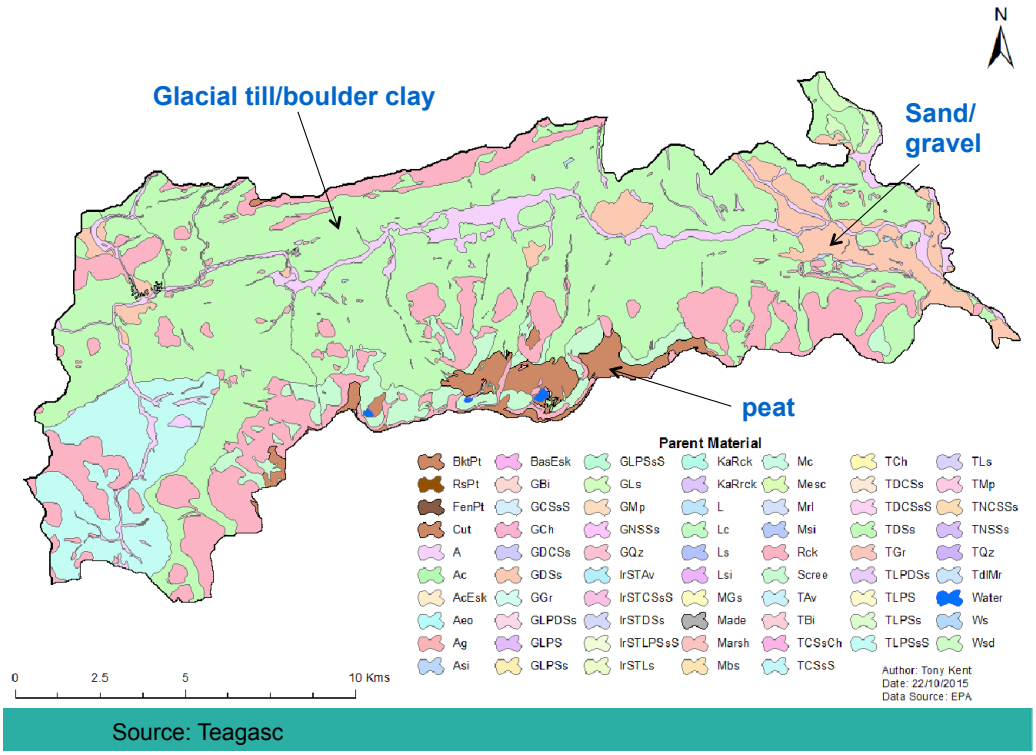
At the first workshop the technology adoption curve, based on Rogers (1983), was introduced to illustrate the rate of adoption of new knowledge/practice (Figure A5.6). This is a theory about the rate at which individuals adopt a new technology or implement a change in their practice. It identifies five groups. These groups are described below, based on Rogers (1983).

- Innovators: Innovators are the first individuals to adopt an innovation. Innovators are willing to take risks, are generally younger and have closest contact to scientific sources and interaction with other innovators. Risk tolerance means that they adopt technologies that may ultimately fail. Financial resources help absorb these failures.



Source: Teagasc

Figure A5.4. A catchment example of soil variability (courtesy of D. Daly, EPA).



Source: Teagasc

Figure A5.5. A catchment example of subsoil variability (courtesy of D. Daly, EPA).

- Early adopters: This is the second fastest category of individuals who adopt an innovation. They are generally opinion leaders but are more risk averse than innovators. However, they generally have the foresight to see that the advantage of adoption of the knowledge or technology will be of benefit to them.
- Early majority: Individuals in this category adopt an innovation after a varying degree of time. They do not like to take the risks of pioneering but are open to the advantages of proven knowledge or technologies.
- Late majority: Individuals in this category will adopt an innovation when it is generally accepted and used by their peers.
- Laggards: Individuals in this category are the last to adopt an innovation. These individuals typically have an aversion to change agents and tend to be focused on traditions.

The workshop participants identified with the technology adoption concept and noted that they often did not consciously tailor their message and approach for the different technology adoption groups.

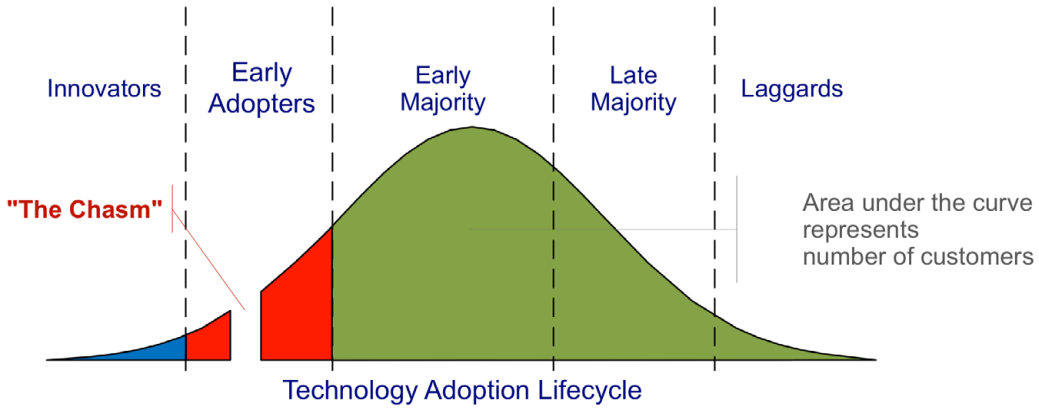


Figure A5.6. The Silicon Valley model of technology adoption.

AN GHNÍOMHAIREACHT UM CHAOMHNÚ COMHSHAOIL

Tá an Ghníomhaireacht um Chaomhnú Comhshaoil (GCC) freagrach as an gcomhshaol a chaomhnú agus a fheabhsú mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaol a chosaint ó éifeachtaí díobhálacha na radaíochta agus an truaillithe.

Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

Rialú: *Déanaimid córais éifeachtacha rialaithe agus comhlíonta comhshaoil a chur i bhfeidhm chun torthaí maithe comhshaoil a sholáthar agus chun díriú orthu siúd nach gcloíonn leis na córais sin.*

Eolas: *Soláthraímid sonraí, faisnéis agus measúnú comhshaoil atá ar ardchaighdeán, spriocdhírithe agus tráthúil chun bonn eolais a chur faoin gcinnteoireacht ar gach leibhéal.*

Tacaíocht: *Bímid ag saothrú i gcomhar le grúpaí eile chun tacú le comhshaol atá glan, táirgiúil agus cosanta go maith, agus le hiompar a chuirfidh le comhshaol inbhuanaithe.*

Ár bhFreagrachtaí

Ceadúnú

Déanaimid na gníomhaíochtaí seo a leanas a rialú ionas nach ndéanann siad dochar do shláinte an phobail ná don chomhshaol:

- saoráidí dramhaíola *(m.sh. láithreáin líonta talún, loisceoirí, stáisiúin aistrithe dramhaíola)*;
- gníomhaíochtaí tionsclaíocha ar scála mór *(m.sh. déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta)*;
- an diantalmhaíocht *(m.sh. muca, éanlaith)*;
- úsáid shrianta agus scaoileadh rialaithe Orgánach Géinmhodhnaithe *(OGM)*;
- foinsí radaíochta ianúcháin *(m.sh. trealamh x-gha agus radaiteiripe, foinsí tionsclaíocha);*
- áiseanna móra stórála peitril;
- scardadh dramhuisce;
- gníomhaíochtaí dumpála ar farraige.

Forfheidhmiú Náisiúnta i leith Cúrsaí Comhshaoil

- Clár náisiúnta iniúchtaí agus cigireachtaí a dhéanamh gach bliain ar shaoráidí a bhfuil ceadúnas ón nGníomhaireacht acu.
- Maoirseacht a dhéanamh ar fhreagrachtaí cosanta comhshaoil na n-údarás áitiúil.
- Caighdeán an uisce óil, arna sholáthar ag soláthraithe uisce phoiblí, a mhaoirsiú.
  - Obair le húdaráis áitiúla agus le gníomhaireachtaí eile chun dul i ngleic le coireanna comhshaoil trí chomhordú a dhéanamh ar líonra forfheidhmiúcháin náisiúnta, trí dhíriú ar chiontóirí, agus trí mhaoirsiú a dhéanamh ar leasúchán.
- Cur i bhfeidhm rialachán ar nós na Rialachán um Dhramhthrealamh Leictreach agus Leictreonach (DTLL), um Shrian ar Shubstaintí Guaiseacha agus na Rialachán um rialú ar shubstaintí a ídíonn an ciseal ózóin.
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaol.

Bainistíocht Uisce

- Monatóireacht agus tuairisciú a dhéanamh ar cháilíocht aibhneacha, lochanna, uiscí idirchriosacha agus cósta na hÉireann, agus screamhuiscí; leibhéil uisce agus sruthanna aibhneacha a thomhas.
- Comhordú náisiúnta agus maoirsiú a dhéanamh ar an gCreat-Treoir Uisce.
- Monatóireacht agus tuairisciú a dhéanamh ar Cháilíocht an Uisce Snámha.

Monatóireacht, Anailís agus Tuairisciú ar an gComhshaol

- Monatóireacht a dhéanamh ar cháilíocht an aeir agus Treoir an AE maidir le hAer Glan don Eoraip (CAFÉ) a chur chun feidhme.
- Tuairisciú neamhspleách le cabhrú le cinnteoireacht an rialtais náisiúnta agus na n-údarás áitiúil *(m.sh. tuairisciú tréimhsiúil ar staid Chomhshaol na hÉireann agus Tuarascálacha ar Thascairí)*.

Rialú Astaíochtaí na nGás Ceaptha Teasa in Éirinn

- Fardail agus réamh-mheastacháin na hÉireann maidir le gáis cheaptha teasa a ullmhú.
- An Treoir maidir le Trádáil Astaíochtaí a chur chun feidhme i gcomhair breis agus 100 de na táirgeoirí dé-ocsaíde carbóin is mó in Éirinn.

Taighde agus Forbairt Comhshaoil

- Taighde comhshaoil a chistiú chun brúnna a shainaithint, bonn eolais a chur faoi bheartais, agus réitigh a sholáthar i réimsí na haeráide, an uisce agus na hinbhuanaitheachta.

Measúnacht Straitéiseach Timpeallachta

- Measúnacht a dhéanamh ar thionchar pleananna agus clár beartaithe ar an gcomhshaol in Éirinn *(m.sh. mórphleananna forbartha)*.

Cosaint Raideolaíoch

- Monatóireacht a dhéanamh ar leibhéil radaíochta, measúnacht a dhéanamh ar nochtadh mhuintir na hÉireann don radaíocht ianúcháin.
- Cabhrú le pleananna náisiúnta a fhorbairt le haghaidh éigeandálaí ag eascairt as taismí núicléacha.
- Monatóireacht a dhéanamh ar fhorbairtí thar lear a bhaineann le saoráidí núicléacha agus leis an tsábháilteacht raideolaíochta.
- Sainseirbhísí cosanta ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

Treoir, Faisnéis Inrochtana agus Oideachas

- Comhairle agus treoir a chur ar fáil d'earnáil na tionsclaíochta agus don phobal maidir le hábhair a bhaineann le caomhnú an chomhshaoil agus leis an gcosaint raideolaíoch.
- Faisnéis thráthúil ar an gcomhshaol ar a bhfuil fáil éasca a chur ar fáil chun rannpháirtíocht an phobail a spreagadh sa chinnteoireacht i ndáil leis an gcomhshaol (*m.sh. Timpeall an Tí, léarscáileanna radóin).*
- Comhairle a chur ar fáil don Rialtas maidir le hábhair a bhaineann leis an tsábháilteacht raideolaíoch agus le cúrsaí práinnfhreagartha.
- Plean Náisiúnta Bainistíochta Dramhaíola Guaisí a fhorbairt chun dramhaíl ghuaiseach a chosc agus a bhainistiú.

Múscailt Feasachta agus Athrú Iompraíochta

- Feasacht chomhshaoil níos fearr a ghiniúint agus dul i bhfeidhm ar athrú iompraíochta dearfach trí thacú le gnóthais, le pobail agus le teaghlaigh a bheith níos éifeachtúla ar acmhainní.
- Tástáil le haghaidh radóin a chur chun cinn i dtithe agus in ionaid oibre, agus gníomhartha leasúcháin a spreagadh nuair is gá.

Bainistíocht agus struchtúr na Gníomhaireachta um Chaomhnú Comhshaoil

Tá an ghníomhaíocht á bainistiú ag Bord lánaimseartha, ar a bhfuil Ard-Stiúrthóir agus cúigear Stiúrthóirí. Déantar an obair ar fud cúig cinn d'Oifigí:

- An Oifig um Inmharthanacht Comhshaoil
- An Oifig Forfheidhmithe i leith cúrsaí Comhshaoil
- An Oifig um Fianaise is Measúnú
- An Oifig um Cosaint Raideolaíoch
- An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag comhaltaí air agus tagann siad le chéile go rialta le plé a dhéanamh ar ábhair imní agus le comhairle a chur ar an mBord.

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AgImpact Project: Identifying Approaches to Improving Knowledge Exchange (KE) in the Irish AgriFood Sector using Expert Opinion

Authors: Owen Carton, Paul Cross, Anna Jones, Seamus Crosse, Paul Withers, Cara Augustenborg & Donnacha Doody

epaResearch
Climate - Water - Sustainability
Identifying pressures • Informing policy • Developing solutions

Identifying Pressures

There is significant pressure to develop knowledge exchange (KE) processes that will facilitate the application of existing and new knowledge in order to deliver increased agricultural production efficiency and profitability while protecting natural capital including water. During the AgImpact workshops the participants identified that key pressures on KE processes are the variability in the bio-physical environment in which production agriculture occurs, and variability in the socio-economic and demographic profiles of those involved in implementing the knowledge. It was clear from the workshop discussions that the ever increasing knowledge base, its complexity and its often "compartmentalised" nature further adds to the pressure. In addition the project identified that at policy level, conflicting goals and agendas has led to a level of uncertainty that increases the pressure on stakeholders in applying knowledge.

Informing Policy

The growth in the agri-food industry, as envisioned in Food Wise 2025 and Northern Ireland's Going for Growth strategic plan, must be achieved within the context of the targets established within European Union environmental directives, such as the Nitrates (91/676/EEC) and Water Framework Directives (2000/60/EC). The project workshop participants identified that the increased complexity of the agri-food system, with multiple economic, environmental and social policy objectives in addition to a broader range of stakeholders, requires on-going innovation to ensure a KE framework that reflects this new order. It was agreed that at policy level there was a need for a common vision for how sustainable intensification of agriculture could be achieved within the constraints of current environmental regulation.

Developing Solutions

The key recommendation from this project is the need to change from the traditional top-down linear knowledge transfer model of KE to a more balanced system that integrates both a bottom up and a top down approach. A suggested approach to achieving this integration was the establishment of a grant scheme that could be used to initiate a catchment competition. This scheme would focus on providing community stakeholders with funding and resources to integrate a bottom up approach to KE into exiting top-down structures within their catchment.

Comhshaol, Pobal agus Rialtas Áitiúil
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