The background of the poster is a photograph of a lush green field with several black and white dairy cows grazing. In the foreground, two men are standing in the grass, facing each other in conversation. The man on the left is older, with grey hair, wearing a black jacket, blue jeans, and black rubber boots. The man on the right is younger, with dark hair, wearing a bright blue jacket, dark trousers, and grey rubber boots. He is gesturing with his hands as he speaks. A semi-transparent green banner is at the top right, and a large green curved shape is at the bottom.

Advisory
Programme

Teagasc Best Practice in Extension Services

‘Supporting Farmer Innovation’

Aviva Stadium, Lansdowne Road, Dublin 4 - Thursday, 1 November 2012





TEAGASC

Best Practice in Extension Services Conference

- *Supporting Farmer Innovation*

Thursday, 1st November 2012

Aviva Stadium,

Lansdowne Road, Dublin 4



Conference Proceedings

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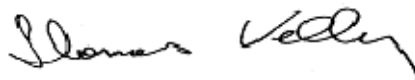
Foreword

Information is now more accessible than ever, with growing versatility, diversity and complexity in information formats and sources. The understanding of how to best facilitate knowledge transfer across a diverse population within an industry is important. The deliberate interventions that achieve change and the adoption of new practices are at the forefront of strategies to ensure that an industry like agriculture continues to improve its competitiveness and sustainability. These interventions are distinctive from the passive approach of simply making progressive information available, and require competencies like supportive research and analysis, empowerment of farm-level decision making, leadership and a wide variety of communication skills.

The farming population, in Ireland and across the EU, is largely underpinned by a family farm business model. While farmers are better educated than ever, the learning and re-learning that is part of farmer development must not be passive but must be strategic and responsive at industry-level while also reflecting farmers' own targets and ambitions. While farm-level change is a critical focus point of advisory work, Teagasc's Knowledge Transfer Directorate is also focused on being responsive and adaptive in creating extension systems to achieve an innovative agriculture sector. Teagasc as an agent of change is active in the continuous change and evolution of advisory and education programmes and in the development of new tools, methods of working and policy-responsive programmes and initiatives. In organising this conference, Teagasc focuses on bringing together international best practice in innovation support, particularly best practice in knowledge transfer.

The current review of the EU Common Agriculture Policy (CAP) recognises the importance of competitiveness and sustainability of agricultural production and the need for more adaptive and widespread use of new technologies and practices on farms. There are clear signals that there will be targeted support for improved knowledge transfer from research to farms. This conference, by providing a discussion on best practice in Ireland and internationally, is one step on the way to helping to ensure that lessons learned by Teagasc and others can offer guidance for efficient and effective knowledge transfer into the future.

Drawing from the perspectives of advisory professionals, policy-makers and social scientists, this conference pays attention to the key challenges of knowledge transfer; effective and efficient advisory models; factors influencing innovation and decision-making on farms; future skills and competencies for advisers; and benefits to be gained from working with industry partners. The workshops, presenting knowledge gained from Irish and international developments of advisory/extension supports to farmers, will address successful knowledge transfer projects in terms of their advantages and lessons learned for the future. The poster sessions will demonstrate that through applied, targeted research projects much can be learned to enhance our knowledge transfer efforts.



Dr Tom Kelly
Director of Knowledge Transfer, Teagasc



Key Note Speakers

Professor Gerry Boyle, Director, Teagasc

Professor Gerry Boyle was appointed Director of Teagasc – The Agricultural and Food Development Authority for Ireland – on 1st October 2007. Teagasc conducts research on agriculture and food; provides extension services to Irish agriculture; and is the sole provider of vocational education programmes to the sector and is also a provider of courses in higher education.



Gerry is Emeritus Professor of Economics at the National University of Ireland (NUI), Maynooth and former Head of its Economic Department. He also holds an Adjunct Professorship at the University of Missouri, Columbia. He was previously a Senior Research Officer with the Agricultural Institute and an Economist with the Central Bank of Ireland. From 1995-1997 he served as Economic Adviser to the Taoiseach (Irish Prime Minister), Mr. John Bruton T.D..

Prior to his position at Teagasc he was a Senior Associate with Farrell Grant Sparks Consulting and a Senior International Consultant, specialising in agricultural policy, with the World Bank on a number of their projects in Eastern Europe and Central Asia, including Belarus, Moldova, Russia and Tajikistan. Professor Boyle is a past President of the Irish Economic Association and of the Agricultural Economics Society of Ireland. He has also served as Editor of the Economic and Social Review, the European Review of Agricultural Economics and the Irish Journal of Agricultural Economics and Rural Sociology. Professor Boyle has published an extensive range of papers and reports on public policy issues in national and EU media. He was recently elected a Member of the Royal Irish Academy (M.R.I.A.).

Professor Cees Leeuwis, Wageningen University

Cees Leeuwis is professor of Knowledge, Innovation and Technology at Wageningen University, the Netherlands. He started his academic career in 1986 with a M.Sc. thesis on diverse patterns of farm development in the West of Ireland, which was published as a book entitled 'Marginalization Misunderstood'. He is interested in a broad range of societal domains, including agriculture, natural resource management, health and international development.



In his 2004 book 'Communication for Rural Innovation' he made a plea for widening the concept of agricultural extension. More recently, he writes about different forms of intermediation in innovation networks, and the need of aligning social and technical dimensions of innovation. As part of innovation process management, he is interested in processes of demand articulation, agenda setting for research, social learning, conflict management and coalition building.

Inge Van Oost, EU Commission, DG Agriculture and Rural Development

Inge Van Oost is policy officer in Unit H.1 (Environment, Genetic Resources and European Innovation Partnership) at the European Commission, Directorate General Agriculture and Rural Development (DG AGRI) and responsible for innovation and research. She is member of DG AGRI's Taskforce Research and Innovation and as such helping to shape DG AGRI's new research and innovation approach and involved in the linkages to the European Research Policy and programmes.



In her former post at the Commission she was policy officer in the Direct Support Unit and the Cross Compliance Unit, responsible for the Farm Advisory System and links to the Rural Development policy. Before working at the Commission she was coordinator of demonstration project programmes at the Directorate-General for Agriculture and Horticulture of the Ministry of the Flemish Region. There she was also involved in drafting rural development measures and designing the farm advisory system, and was a member of the selection committee and evaluator of many agricultural research projects.

In the former federal Belgian Administration for Agriculture she served the Secretariat General as coordinator of the Horticultural chain, dealing with chain management, quality control, traceability and food safety, plant protection products and residues, evaluation of sustainable production methods, related indicators and certification schemes, and communication with consumers. Before becoming administrator she worked many years as a farm adviser, then as coordinator of a team of agricultural advisers. Being based in an applied research institute the team was advising farmers, and designing and implementing demonstration projects.

Stephen Morrison, Farmer

Stephen Morrison is a beef farmer, based in Kill, Naas, Co. Kildare. After studying agriculture in Scotland and gaining work experience on farms in France, Switzerland and Australia, Stephen returned home to commence farming in 1995. His farm currently covers 120 hectares. Stephen has been a member of a discussion group for over 5 years and recently became a member and Chairman of a BTAP suckler discussion group in North Kildare. He is also Chairman of North Kildare Lamb Producer Group. Stephen's farm was host to European Commissioner for Agriculture and Rural Development, Dacian Ciolos in 2011 and frequently hosts delegations of agencies such as Bord Bia and the IFA. Stephen is married to artist Heidi and has four children.



Christy Watson, Teagasc Business and Technology Drystock Adviser

Christy Watson is a Graduate of Agricultural Science from University College Dublin having qualified in 1984 with a Bachelor of Agricultural Science (Honours). In 1985 Christy obtained a Masters of Agricultural Science (Honours) from University College Dublin. Christy joined the state advisory service ACOT in 1985. He has worked to date as a Cattle and Sheep adviser, initially specialising in sheep in County Wicklow for his first ten years in the advisory service. Christy moved to county Kildare in 1995 and continues to work there dealing predominantly with cattle farmers. He has been closely involved in the Teagasc/IFJ BETTER Farm Programme, with one of his clients an initial focus farm. Christy has used the discussion group model for delivering advisory services to his clients and currently facilitates four beef discussion groups including a joint Teagasc/Macra Na Feirme young farmer beef group. In 2000 he was the first Agricultural adviser elected as President of the Fertilizer Association of Ireland. Christy is married to Geraldine with two teenage children, and lives in Naas, Co. Kildare.



Martin McKendry, CAFRE

Martin McKendry BSc is Head of the Development Service at the College of Agriculture, Food and Rural Enterprise (CAFRE) and is based at its Greenmount Campus in County Antrim, Northern Ireland. He has responsibility for the industry facing programmes across agriculture, horticulture, food, sustainability and IT. He worked within DARD (Department of Agriculture and Rural Development) for 25 years in a number of different roles from lecturing in farm mechanisation, Senior Machinery/Buildings Technologist, Farm Director (Greenmount) and Head of Crops, Horticulture and Sustainability prior to taking up his current post in 2010.



Dr Nick Place, University of Florida

Dr Nick Place began his appointment as the Dean and Director of University of Florida/IFAS Extension in September 2012. From 2007 to 2012, Dr Place served as the Associate Dean and Associate Director of the University of Maryland Extension. In this role, Dr Place was administratively responsible to the Dean of the College of Agriculture and Natural Resources and Director of UME for meeting the mission and goals of the extension program, and he served on the College Administrative Team. Dr Place has received a number of awards, including: 2006 AIAEE Outstanding Achievement Award, 2006 NAAE Outstanding Early Career Award, 2006 AAEE Southern Region Outstanding Young Agricultural Educator Award, 2005 NACTA Teacher Fellow Award, and 2005 CALS Graduate Teacher/Adviser of the Year Award. Dr Place earned his B.S. in dairy husbandry at Delaware Valley College. He earned his M.S. in dairy and animal science and his Ph.D. in agricultural and extension education, both from Penn State University.



Dr Tim Mackle, CEO, Dairy NZ

Tim Mackle grew up on his family's dairy farm in the South Island of New Zealand and after graduating from Lincoln University with a B.Agr.Sc. (Hons) he had a brief stint with MSD AGVET before taking up a position as scientist at the Dairying Research Corporation, first on cow nutrition and then milk characteristics, looking at on-farm ways of producing milk with better functionality for processing or for producing health benefits. That in turn led to a scholarship to attend Cornell University, New York, where he attained his PhD in animal, food and nutritional sciences.



Tim then spent two years with the Dairy Board working as a Commercial Strategist, and followed that with a period as Executive Assistant to the CEO of Fonterra. Tim's next role with Fonterra was as General Manager of Anchor Ethanol. He was appointed CEO of Dexcel in August 2005, and is now CEO of DairyNZ, the dairy industry good organisation.

formed by the merger of Dexcel and Dairy InSight in November 2007. Tim and his wife Aroha have four young children and when he's not working, they keep him busy.

Prof Frank Vanclay, University of Groningen

Frank Vanclay is Professor and Head of the Department of Cultural Geography in the Faculty of Spatial Sciences at the University of Groningen in The Netherlands. Previously Professor of Rural Sociology in the Tasmanian Institute of Agricultural Research at the University of Tasmania, Frank specialises in the areas of social impact assessment, social understandings of place, and social aspects of agriculture, farming and natural resource management. He has a BSc(Hons) in environmental studies from Griffith University (Australia), a Masters degree in social research methods from the University of Queensland (Australia), and a PhD in agricultural and environmental sociology from Wageningen University (The Netherlands). Prof Vanclay is a former President of the International Rural Sociology Association (www.irs-world.org). He has also had a high level of involvement with the International Association for Impact Assessment (www.iaia.org). Vanclay has published over 70 journal articles and over 35 book chapters, and has over 1200 citations in Scopus.



Conference Programme

- 8.00 am Registration**
- 9.00 am Opening Address**
Sean Kelly - MEP for Ireland South
- The Knowledge Transfer Challenge**
Chairman - Frank O'Mahony, Teagasc Authority Member
- 9.15 am Effective and Efficient Innovation Support - The Teagasc Contribution**
Professor Gerry Boyle, Teagasc Director
- 9.45 am Development and Support Role of Extension Services for Sustainable Intensification in Agriculture**
Professor Cees Leeuwis, Wageningen University
- 10.15 am European Innovation Partnerships and Expansion of the Farm Advisory System (FAS)**
Inge Van Oost, DG Agriculture and Rural Development, EU Commission,
- 10.45 am Discussion Response**
Dr Kevin Heanue, Teagasc
- 11.00 am Tea/Coffee**
- 11.15 am Knowledge Transfer Systems**
Chairman: Dermot McCarthy, Assistant Director of Advisory Services, Teagasc
- Supporting the Development Needs of Farmers**
Christy Watson, Teagasc
- The Role of Professional Advisers**
Stephen Morrison, Farmer
- 11.45 am Context, Strengths and Limitations of Diverse Innovation Support Models**
Discussion Forum Moderator: Tom O'Dwyer, Teagasc
- | | |
|---------------------------|--|
| Northern Ireland - | Martin McKendry, CAFRE |
| USA - | Dr Nick Place, University of Florida |
| New Zealand - | Dr Tim Mackle, CEO, Dairy NZ |
| Australia - | Professor Frank Vanclay, University of Groningen |
- 12.45 pm Lunch / Poster Exhibition**
- 2.15 pm Workshops: Best Practice in Effective Knowledge Transfer (*concurrent sessions*)**
- Workshop 1) Factors Influencing Innovation and Decision Making on Farms**
Moderator – Paul Maher, Teagasc
- Teagasc Tillage Crops Report**
Tim O'Donovan/Michael Hennessy, Teagasc
- The Role of Public Events in Knowledge Transfer**
Mary Ryan, Dr Kevin Heanue, Teagasc Áine Ní Dhubháin, Alan Clarke, UCD
- The Use of Participatory Evaluation Methods in Agricultural Extension**
Dr Chris High, Open University, UK, Dr Gusztav Nemes, Hungarian Academy of Sciences; Dr Áine Macken Walsh, Tom O'Dwyer, Teagasc
- Factors which Influence Decisions/ Adoption of Technologies**
Kevin Heavin, Dairy Farmer
- Using Extension to Progress Genetic Improvement on Irish Dairy Farms**
George Ramsbottom, Teagasc
- Workshop 2) Efficient and Effective Advisory Models to Deliver Services and Developments**
Moderator – John Moloney, Teagasc
- The Impact of Discussion Groups**
Dr Thia Hennessy, Dr Kevin Heanue, Teagasc
- “EuroMilk” - A Team-Based Approach to On-Farm Mastitis and Milk Quality Issues**
Dr Finola McCoy, Teagasc

Development of Discussion Groups and Mobilisation of Farmer Engagement

Larry O’Loughlin, Teagasc

The Agricultural Catchments Programme

Eddie Burgess, Teagasc

Teagasc/Irish Farmers Journal BETTER Farm Beef Programme

Adam Woods, Teagasc

Workshop 3) Future Skills and Competencies for Professional Advisers

Moderator – Dr Karina Pierce, UCD

Discussion Group Facilitation Skills

John Maher, Teagasc

New Mobile Phone Applications

Fintan Monahan, Teagasc

Forestry Extension Services in Teagasc – Optimising the Use of ICT

Steven Meyen, Teagasc

The Teagasc/UCD M.Agr.Sc in Innovation Support

Dr Jim Kinsella, UCD

The ASA - Skills for Professionals in the Agri Sector

Peter Bolger, President, ASA

Workshop 4) Working with Industry Partners to Make Change Happen

Moderator – John O’Callaghan, Kerry Agribusiness

Teagasc/Dairygold Milk Quality Programme

Don Crowley, Tom Weldon, Gerard MacMahon, Teagasc

BVD Eradication

Dr David Graham, Animal Health Ireland

Grass Roots Programme

Abigail Ryan, Teagasc

Teagasc/Kerry Agribusiness Joint Programme

Ger Courtney, Teagasc

Working Jointly to Provide Services to Farmers

Dr Tom Butler, FBA/ACA Member

3.30 pm Workshop Summary and Lessons for the Future

Moderators & Dr Tom Kelly, Director of Knowledge Transfer, Teagasc

4.00 pm Close of Conference

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Enhancing Irish Agricultural Productivity through Technology Adoption: A Critique of the Irish Agricultural, Knowledge and Innovation System (AKIS)

Professor Gerry Boyle, Director, Teagasc, Oak Park, Carlow¹

Email: gerry.boyle@teagasc.ie

Introduction: Teagasc's mission is to support science-based innovation so as to underpin profitability, sustainability and competitiveness. As farmers are price takers they cannot influence relative prices (the ratio of output to input prices). However, product quality and productivity are to a substantial extent under farmers' control, subject to the natural constraints of soil, climate and farm topography. Our central hypothesis is that productivity is driven by technology adoption. In this paper I want to address two questions. 1) is there a technology "gap" in Irish agriculture and what is its extent? 2) what is the role of the Irish Agricultural Knowledge and Innovation System (AKIS) in bridging that gap?

Evidence on the technology gap: Two sources of evidence establish that there is a significant technology "gap" in Irish agriculture. The key results of a recent Teagasc National Farm Survey analysis of the levels of adoption of specific agricultural technologies or practices on Irish farms are reported in Table 1. These data show evidence of a technology-adoption gap within the sector as a whole but they also highlight the critical importance of advisory/extension contact. In addition, these findings demonstrate that the rate of adoption ranges from very high to very low levels.

Table 1: Indicators of technology adoption – percentage of Irish farmers that adopt certain practices with and without advisory contact, 2009

Practice	Percentage of farms adopting – advisory contact	Percentage of farms adopting – no advisory contact
Use of dry cow therapy	98	96
Use of Teat disinfection	91	90
Use of AI	82	74
Regular soil testing	72	49
Milk recording	51	19
Use of strip grazing for dairy cows 12 hours	43	49
Use of BVD vaccination	42	22
Regular re-seeding (2)	38	16
Use of 'Herd Plus' (1)	37	10
Use of genomically selected bulls	30	7
Visit to research farm in the last 5 years	29	14
Use of e-Profit Monitor	12	0.3
Completion of grass covers	7	1
Completion of cash-flow budgets	6	1
Completion of formal grass budget	4	0.4
Use of strip grazing for other livestock 12 hours	0.9	0.7

Source: Teagasc National Farm Survey, 2009

Notes:

1. *Herd Plus* is a detailed animal information system provided by the Irish Cattle Breeding Federation.
2. *Regular re-seeding* is defined here as a seeding rate of 1%-20% in the last three years.

In Table 2 a similar story is evident for Ireland's dairy farmers who would, of course, be considered to be our most efficient producers.

¹ I would like to thank the following colleagues for assistance in the preparation of this paper, without implicating any of them in any errors and omissions: Tom Kelly, Lance O'Brien, Thia Hennessy, Gerry Quinlan and Kevin Connolly.

Table 2: Indicators of technology adoption – percentage of Irish dairy farmers that adopt certain practices, 2009

Practice	% adopting
Use of dry cow therapy to reduce mastitis	98
Use of teat disinfection to reduce mastitis	90
Use of AI	82
Milk recording	42
Use of BVD vaccination	39
Use of Herd Plus	28
Use of genomically selected bulls	23

Source: Teagasc National Farm Survey and Kelly (2010).

A useful general classification of technologies is between those that are embodied in the inputs purchased by farmers (e.g. chemicals, semen straws, etc.) versus those technologies that are disembodied (e.g. grassland management). Embodied technologies generally possess a simple or direct relationship to inputs, usually a single purchased input. Disembodied technologies on the other hand have a complex or indirect relationship to a number of purchased inputs. In the case of certain technologies, the relative inherent complexity of technology contrasts with the relative ease of its adoption. An excellent example is the Economic Breeding Index or EBI based on both conventional and the more recently developed genomic selection. The successful adoption of the technology of high quality sires with desirable economic traits can be largely attributed to the highly effectively marketing EBI tool (Ramsbottom, 2012).

A second analysis, also based on the Teagasc National Farm Survey, contrasts certain Key Performance Indicators (KPI's) being achieved by different farm enterprises relative to targets established by Teagasc experimental farms and summarised in the form of enterprise "Roadmaps" that are published by Teagasc on a periodic basis. These KPI's would be expected to be positively correlated with best practice adoption. The percentages of farmers achieving these KPI's are shown in Table 3. Again these data demonstrate that there is a significant gap between on-farm performance and "best practice".

Table 3: Farms (%) achieving Teagasc "Roadmap" KPI targets (annual) on different enterprises, 2011

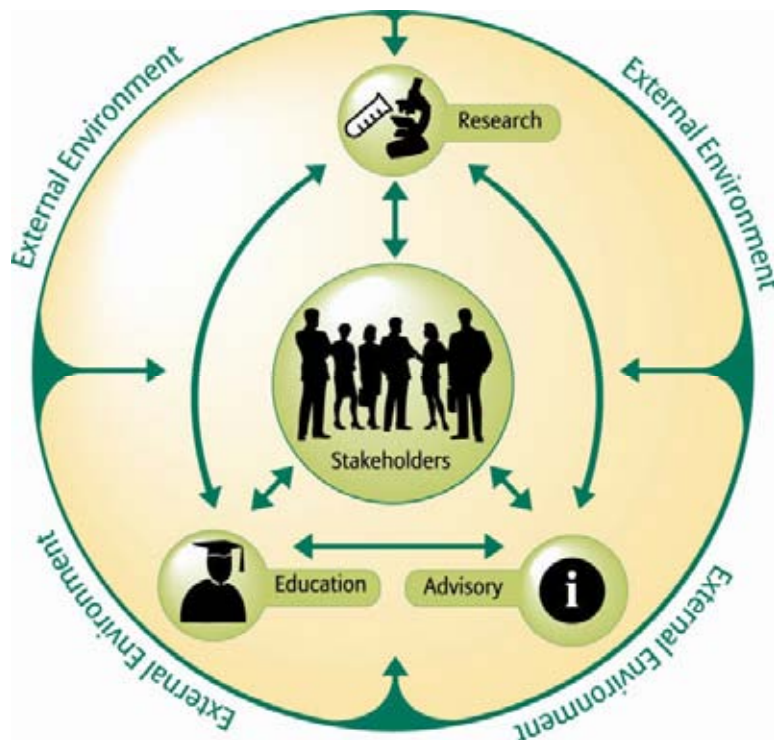
KPI	% achieving target	KPI	% achieving target
Dairy		Cereals	
Milk yield/cow $\geq 5,200$ lts	48	Wheat yield (all) t/ha ≥ 9.5	54
Concentrate feed/cow ≤ 750 kg	45	Wheat yield (top 10%) t/ha ≥ 10.0	44
Milk solids/cow ≥ 378 kg	44	Barley yield (all) t/ha ≥ 7.3	43
Protein $\geq 3.4\%$	42	Barley yield (top 10%) t/ha ≥ 7.8	29
SCC $\leq 200,000$ cells/ml	37	Barley costs (all)/ha $\leq \text{€}950$	20
Fat $\geq 3.95\%$	31	Barley costs (top 10%)/ha $\leq \text{€}900$	12
Single suckling		Wheat costs (all)/ha $\leq \text{€}1,100$	5
Concentrate feed/cow ≤ 438 kg	79	Wheat costs (top 10%)/ha $\leq \text{€}1,050$	5
Calves/cow ≥ 0.87	60		
Calving February and March $\geq 52\%$	29		
Mid-season lamb			
Ewes lambed $\geq 94\%$	76		
Lamb mortality $\leq 8\%$	68		
Concentrate feed/ewe ≤ 50 kg	32		
Weaning rate lambs/ewe ≥ 1.6	14		
Stocking rate ewes/ha ≥ 9	13		

Source: Teagasc National Farm Survey, Enterprise Factsheets

Bridging the technology "gap" – the role of the AKIS: While acknowledging the role of factors such as the characteristics of the technologies themselves, the characteristics of the farm work force, especially in terms of the skills and motivational levels of farmers, and the functioning of the AKIS, for the remainder of this paper we focus on the key role of an effective or "fit for purpose" AKIS in bridging the technology "gap". An effective AKIS is generally accepted to embrace an integrated system involving agricultural Research, Education and Extension components with Stakeholders at its core. A schematic representation of the Irish system is shown in Figure 1. This diagram depicts the relationship between the actors or nodes that are involved in the "internal" (to Teagasc as the lead participant in the Irish system) and the "external" knowledge innovation system.

The external actors are multifaceted, embracing both national and international dimensions, and include private research entities, private agricultural consultants and veterinarians, food processing companies and cooperatives, input supply and service companies (e.g. accounting and software), universities and institutes of technology, the Department of Agriculture, Food and the Marine and other government departments, public agencies such as Bord Bia, the Irish Cattle Breeding Federation, Animal Health Ireland, the Environment Protection Agency and the agricultural media which is particularly strong in Ireland. EU SCAR (2012) emphasises the diversity of the AKISs across the EU. Ireland is unique in having a substantial component of the AKIS within a single organisation, namely Teagasc, which should in principle lead to a more effective system.

Figure 1: The Teagasc Agricultural, Knowledge and Innovation System (AKIS)



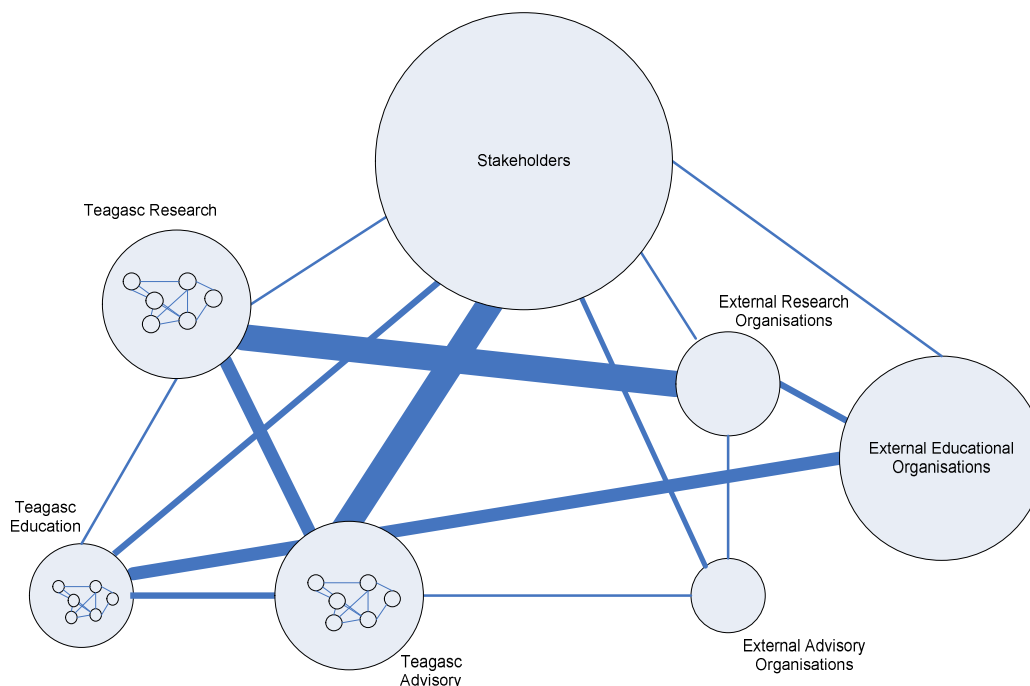
It is crucially important that there is a highly open flow of knowledge information between all elements of the system. There are several distinct information flows, namely, between the Research, Education and Advisory/Extension components; the flows between Stakeholders and these components; and the flows between externally available information and the “internal” system.

The components of the “internal” system need to be best in class with a persistent emphasis on innovation. The Extension component has evolved hugely over recent years from an exclusive emphasis on the imparting of knowledge to farmers to a focus on implementation support. The primary vehicle for this shift in emphasis has been the establishment of Discussion Groups (DGs). These groups have been greatly supported by policy measures such as the Dairy Efficiency Programme (DEP) and the Beef Technology Adoption Programme (BTAP). These programmes could be considered as classic examples of “nudge” (Thaler and Sunstein, 2008) measures in that they provide a relatively gentle encouragement to farmers to adopt technology through the medium of “peer to peer” learning. Over 10,000 farmers are now involved in Discussion Groups that are being facilitated by Teagasc and an additional 2,500 are being facilitated by private consultants. Research by Teagasc (Hennessy and Heanue, 2012) has shown that these programmes have proven to be remarkably effective.

Assessing the effectiveness of the Irish AKIS: An effectively functioning AKIS is key to maximising the potential adoption of technology and ‘best practices’. It’s useful to think of the AKIS as a social network system. To simplify the system we can visualise this network as involving a series of internal (to Teagasc) and external nodes embracing, Stakeholders, Research (internal and external), Extension (internal and external) and Education (internal and external). Each of these nodes in turn contains its own sub-network, e.g., the Teagasc Education node comprises a sub-network involving its agricultural colleges and regional education centres. The effectiveness of the AKIS can then be assessed by exploring the extent and quality of the linkages between and within these nodes. The discussion which follows is based almost completely on impressionistic evidence and personal observation and reflection. A more formal analysis would be beneficial. Figure 2 attempts to capture the strengths and weaknesses of the Irish AKIS in terms of a simple

network analysis. For simplicity it is assumed that the linkages are symmetric in influence. In other words, while all linkages between nodes are two-way, we are assuming, for simplicity, that the flows are equally strong in both directions.

Figure 2: Impressionistic view of the linkages between the Irish AKIS



Education nodes: Relatively strong external linkages are in place between the Teagasc system and the Institutes of Technology (IOTs). Recently linkages have been developed with universities but these are quite limited in both intensity and scope. The linkages between the internal education and research nodes are weak. Some efforts have been made in recent years to improve linkages which include the establishment of two significant research projects on Teagasc educational campuses (Ballyhaise and Clonakilty) and the development of University College Dublin's (UCD's) new Dairy Business Degree which has a significant research-based component in year 3 of the programme when students are based at Teagasc, Moorepark. The linkage between the daily educational experience of students and their exposure to research on Teagasc campuses, even on the two with research projects, is very limited and there is considerable scope for improvement.

The internal education-advisory network is somewhat more intense than the education-research network and linkages with the external research node are weak. Students at FETAC levels 5 and 6 are involved in Student Discussion Groups which introduces them to the role of advisory services (both public and private). The degree of student connectivity with the advisory service outside of the college context is, however, weak and the continuity between the student's college and post college experience is not well developed.

Research nodes: Within Teagasc there is a constant effort to improve the internal research-research network. Within the last few years we have re-organised our research management structure on a programme rather than a centre basis. This has enabled us to organise research activities on a research platform rather than on a commodity basis. For example, we now have a common grassland and genetics programme which embraces all ruminant livestock. In principle this new programmatic structure should reduce duplication and enhance internal opportunities for productive collaboration.

The internal Teagasc research-advisory network is critical to effective knowledge adoption. Here, Teagasc has revised its internal structures to enhance linkages. For instance, for each research programme the heads of research and knowledge transfer departments comprising subject matter specialists, now report to a single programme head. The aim is to facilitate greater interaction between researchers and subject matter specialists. The central role of subject matter specialists in providing a bridge between research and field extension workers or advisers is universally acknowledged to be of critical importance. The effectiveness of this 'bridging' role requires on-going review and innovation. The internal researcher-adviser network is inherently weak as it is a secondary network that is mediated through the research-subject-matter-specialist network. However, it may be of benefit if the direct linkage between research and field advisers were to be strengthened.

The internal-external research-research networks are probably relatively strong given that collaboration is now pretty much essential to win competitive research funding. The networks are often based on personal contacts. We have moved recently to formalise these networks in the hope of broadening and deepening linkages between Teagasc researchers and those in external institutions. This has been achieved by establishing formal alliances between Teagasc and University College Cork and UCD. The internal-external research-education linkages are relatively weak; the exceptions being the aforementioned UCD degree in Dairy Business and the Teagasc/UCD MAgrSc in Innovation Support, a 21 month study and training programme which combines taught modules, field research and advisory/education work experience. The internal-external research-extension linkages are very weak to non-existent.

Extension/advisory nodes: The internal extension-extension linkages are strong but there is always room for further improvement. The internal-external extension-extension linkages are, however, quite weak but recent initiatives to involve private agricultural consultants in servicing Teagasc farm clients have strengthened the network. There is also scope for enhancing the linkages between the Teagasc extension service and the technical services provided by input suppliers. Teagasc also enjoys very strong linkages with the agricultural media in Ireland. Apart from the regular publication of articles in the media by subject-matter specialists and advisers, Teagasc has also established formal programmes that involve the farming media as key partners. The most notable example in recent years is the Teagasc/Irish Farmers Journal BETTER² Farm Beef Programme which is a partnership involving Teagasc researchers, advisers, meat processors and the Irish Farmers Journal.

Stakeholder nodes: Formal internal (Teagasc) networks between farmer stakeholders and the extension, research and education pillars have been created through the establishment of so-called Stakeholders Commodity Consultation Groups. As their name suggests these groups have been formed for all of Ireland's main enterprises, milk, beef, sheep, tillage, pigs and so on. The membership of these groups comprises researchers, advisers as well as farmers. All groups are chaired by a farmer stakeholder and there are processes in place for the appointment of chairmen and the renewal of group membership. At face value these groups facilitate effective interaction between stakeholders and the other three pillars of the AKIS. However, a formal assessment of the quality of these networks would be of benefit.

Internal and external 'stakeholder-to-stakeholder' networks are facilitated through Discussion Groups (DGs) and, as noted above, these networks have increased significantly in recent years through the DEP and BTAP measures. Apart from facilitating 'stakeholder-to-stakeholder' linkages, these networks also provide an effective linkage with the extension pillars in both the public and the private sectors. There would be a general acceptance that while, at least on a *prima facie*, DGs have proven to be effective networks, an insufficient number of farmers are, however, involved as members of these groups. In addition to the opportunities presented through the DG system for networking by farmer stakeholders, farmers also engage in more informal and periodic networking through the organisation of "open days", "farm walks", conferences and workshops that are organised by Teagasc and other organisations

While 'stakeholders-to-research' and 'stakeholders-to-education' linkages are formally mediated through stakeholder consultation groups, it has to be acknowledged that only a small number of stakeholders, of necessity, can be involved in these networks. Whether greater involvement of stakeholders could and should be facilitated through these networks is a moot point. There is undoubtedly scope for embracing and implementing the notion of "open innovation" through the involvement of stakeholders more directly in the development of knowledge-innovation tools, e.g. grass budgeting. Apart from farmer stakeholders, Teagasc also enjoys important linkages with food-processor stakeholders through a series of 'joint programmes' involving virtually all of Ireland's main dairy processors. And, as already noted, in recent years Teagasc has also worked closely with beef processors.

Concluding Comments: EU SCAR (2007) came to what I consider to be an arresting conclusion regarding "... the growing challenge of knowledge failures and that European agricultural research is currently not delivering the type of knowledge needed by end users in rural communities". It is not that I accept that this conclusion applies to Ireland - far from it. But this conclusion from such an expert and distinguished body behoves us to reflect on what needs to be improved in our AKIS in the context of the "grand" challenges of food security, environment and energy sustainability and climate change. Understanding the strengths, and especially the weaknesses, of the AKIS is the first important step in enhancing its effectiveness. The key aim should be to improve the operation of networks within and between the nodes of the AKIS. The driving hypothesis is that by doing this, outcomes in terms of best technology and practice adoption, will be improved. My experience is that acceptance of this hypothesis cannot be taken for granted by the actors within the AKIS nodes.

Unless this hypothesis is widely accepted, however, it is going to be very difficult to affect linkages between nodes that hitherto have had weak to non-existent linkages. Teagasc as an organisation embraces all the key elements of the AKIS

² BETTER stands for Business, Environment and Technology through Training, Extension and Research.

within a single organisation and thus probably has a head start relative to other AKIS's. However, we who function within this AKIS, recognise that there are substantial opportunities for the enhancement of our internal networks. Persuasion of the value of these networks is constantly required. Different nodes operate with different historical legacies of both management structure and mandate. These legacies can create serious barriers to collaboration between nodes, even within the same organisation. Innovation is constantly required to overcome these barriers and there is an ongoing drive to devise and enhance the effectiveness of linkages between nodes using a variety of tools. Communication is essential to developing effective linkages and hence Teagasc devotes a substantial effort to devising effective communication tools. Increasingly, web-based tools are emerging as important complements to more traditional tools. Innovations in structures that enable network deepening are also essential but need to be constantly reviewed. Direct intervention by management is also required to leverage all opportunities for networking and collaboration e.g., programme development, conferences and open days. While the effectiveness of the Teagasc AKIS has room for improvement, the real potential lies in enhancing the extent and quality of internal-external networks. Here the barriers are largely similar to those that affect internal (Teagasc) networks but they are likely to be substantially more entrenched. Teagasc is involved with a number of very effective internal-external networks but their development in all cases involved substantial efforts from Teagasc and the external participating agencies. However, it has to be recognised that the creation of programmes or schemes was the critical impetus which provided the framework that led to the development of what are now highly effective networks.

This is also true for public policy measures, most notably the DEP and BTAP measures. The renewed interest within the EU on the importance of knowledge transfer as evidenced by the commitment to create an enhanced Farm Advisory Service, and especially the creative thinking evident in the Commission's proposals under the current round of CAP Reform for the establishment of European Innovation Partnerships (EIPs) as a Pillar II measure, bode well for the possible emergence of influential policy supports for the AKIS in EU countries. As noted by SCAR (2012): "The EIP should aim to promote a faster and wider transposition of innovative solutions into practice. The EIP should create added value by enhancing the uptake and effectiveness of innovation-related instruments and enhancing synergies between them. The EIP should fill gaps by better linking research and practical farming." Other measures that lie outside the remit of public policy, such as, the establishment of formal inter-institutional MOUs also can provide a critical "nudge" that can lead to the enhancement of existing networks and in some cases, the creation of new networks.

Teagasc is committed to developing and deepening its internal-external networks. Opportunities exist, for instance, to develop far more effective linkages with private agricultural consultants and with technical experts employed by input supply companies both within and outside of Teagasc. It's probably also the case that the linkages between all nodes of the AKIS, including Teagasc nodes, and the critically important stakeholder node, can be considerably broadened and deepened. What will be required are innovative "nudge" measures that will till the ground for the development of networks in these spheres.

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Development and Support Role of Extension Services for Sustainable Intensification in Agriculture: Moving from Extension to Innovation Intermediation

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What kind of innovation does ‘sustainability’ imply?: When thinking about the role of extension in supporting sustainable innovation, we need to ask the question what kind of innovations we are thinking about. Innovations differ in magnitude and scope. A farmer may, for example, optimise his or her farming system by making slight adjustments in the application of chemical fertilisers. In such a case we speak of ‘regular’ innovations: that is, innovations that do not challenge fundamentally the main technological and social-organisational characteristics of, in this case, the farming system (i.e. they remain within the rule set provided by the dominant ‘technological regime’). Such regular innovations occur gradually as an integral part of everyday farming practice. In contrast, ‘architectural’ innovations are those which require and incorporate a fundamental reorganisation of social relationships, technical principles and rules. Hence, they can be seen as ‘overthrowing’ the existing regime, and breaking out of the path dependence created by it. In innovation studies, there is wide agreement that innovating towards sustainability requires the latter kind of architectural innovations (also called, system innovations). In the context of agriculture, we can, for example, think of radically new designs for ‘animal welfare proof’ chicken farms, which, in order to be feasible, require new certification systems, new policies and coalitions, adaptation of planning permission rules and standards, re-direction of research, etc. In line with this, examples from the Netherlands show that sustainability innovations at farm level are dependent on simultaneous changes at the level of policy, food processing companies, supermarket chains, research institutes and consumers. This means essentially that innovation becomes a multi-stakeholder process.

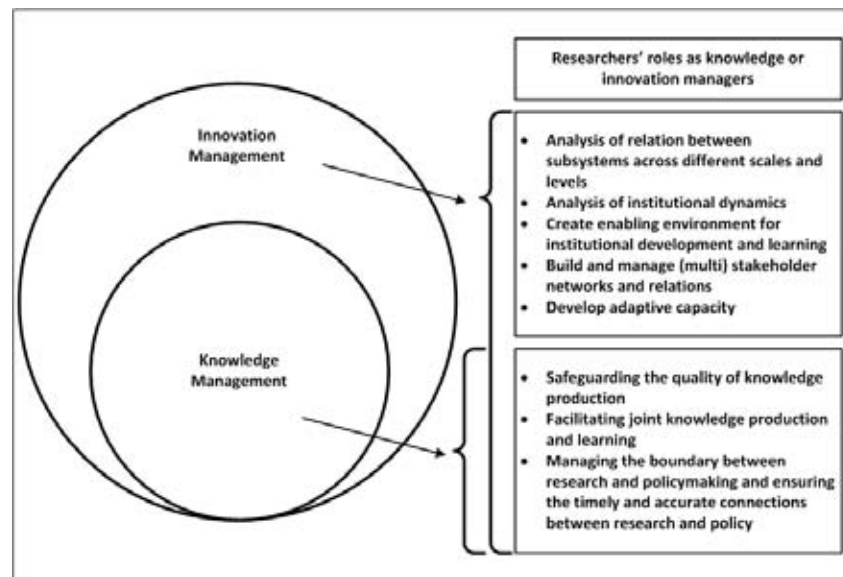
Changing theories of innovation: The above sketch fits in a broader and more general discussion about the nature of innovation and innovation processes. Some widely shared shifts in thinking about the nature and process of innovation are outlined in Table 1. In the past an innovation was regarded as a new technical device, principle or management practice that could be adopted by individual farmers. Nowadays it is recognized innovations do not just consist of new technical devices, but also of new social and organisational arrangements, such as new rules, perceptions, agreements, identities and social relationships. These are no longer considered as external conditions that influence adoption, but rather as integral parts of an innovation. This implies simultaneously, that there are often many stakeholders and networks involved in an innovation process, and hence that it is not very useful to look at ‘adoption’ as something that happens only at an individual level. We can thus conceptualise a system innovation as a successful combination of ‘hardware’ (i.e. new technical devices and practices), ‘software’ (i.e. new knowledge and modes of thinking) and ‘orgware’ (i.e. new social institutions and forms of organisation).

Table 1: Changes in academic thinking about innovation regarding different aspects (Leeuwis & Aarts, 2011)

Aspect of innovation	Linear model of innovation (dominant 1950-1980)	Later modes of thinking (dominant from 1990 onwards)
Origin	science and research	building blocks come from science, practice and intermediaries
Nature	new technical device	new successful combination of technological devices, modes of thinking and social organisation
Social conditions for application	are ‘outside’ the innovation	are an integral component of the innovation
Key processes	R&D, adoption	interactive design, co-evolution, learning
Adoption	is an individual process	is a collective process within nested networks of interdependent stakeholders
Steering	change can be engineered, predicted and planned rationally	change is an unpredictable, messy and emergent process
Role of science	designing innovations	delivering inventions that may be turned into innovations; responding to questions that emerge in the innovation process
Diffusion	happens after the innovation is ready; focus is on spreading of a product	starts already during design, while scaling out often includes contextual re-design; focus is on spreading of a process

What does all this mean for innovation support?: Both the assessment that sustainability innovations tend to be of an architectural nature, and the more general reconceptualisation of innovation processes, have major implications for the role of research and extension. In the past, extension was seen as an intermediary function between science and practice, and defined in terms of ‘knowledge transfer’ and/or ‘individual decision-support’ (Van den Ban & Hawkins, 1996). Later on it was recognised that extension could and should also play active feedback roles in the direction of research and policy, and hence play a central role in ‘Agricultural Knowledge and Information Systems’ (Röling, 1992). More recently, we tend to talk about ‘Agricultural Innovation Systems’ (Hall, 2005; World Bank, 2008) which, in contrast to AKIS, do not just involve players in the ‘knowledge infrastructure’ (classically: universities, strategic and applied research institutes, education and extension) but the whole network of public and private stakeholders on which innovation depends. At the process level, it is realised increasingly that innovation support is essentially about orchestrating and facilitating conducive interaction among interdependent stakeholders in networks. And when thinking about such orchestration, the focus has shifted more and more from ‘Knowledge Management’ roles to broader ‘Innovation Management’ roles (see Figure 1)

Figure 1: Knowledge Management as a sub-category of Innovation Management (Schut *et al.* 2011)



Another way of characterising the kinds of processes that need to be supported in innovation processes has been proposed by Leeuwis & Aarts (2012), who point to the significance of building new networks, supporting the development of complementary perspectives, visions and goals among stakeholders (social learning) and the management of tensions and conflicts which inherently go along with meaningful innovations that alter the status quo (see Table 2).

The role of extension: old or new style innovation intermediary?: The kinds of innovation support roles mentioned and proposed in Figure 1 and Table 2 may be performed by what Howells (2006) has labelled ‘innovation intermediaries’: “an organization or body that acts as an agent or broker in any aspect of the innovation process between two or more parties. Such intermediary activities include: helping to provide information about potential collaborators; brokering a transaction between two or more parties; acting as a mediator, or go-between, bodies or organizations that are already collaborating; and helping find advice, funding and support for the innovation outcomes of such collaborations.” (Howells, 2006:720).

In light of the above, a key question that research and extension organisations need to answer is what innovation support services they want to offer, and whether they want to stick to their old mandates and role perceptions, or take on board new ways of thinking about the roles that intermediaries can usefully play (Klerkx & Leeuwis, 2009). When talking about innovating towards sustainability, it is clear that innovation must be looked at as a multi-stakeholder process that involves the contextual re-ordering of relations in multiple social networks, and that such re-ordering cannot be usefully understood in terms of ‘knowledge transfer’ and/or ‘diffusing’ ready-made innovations. As suggested in the previous section, supporting innovation may benefit from a much broader set of roles and strategies in the sphere of communication and learning. Building on their long-term mandate as an ‘innovation intermediary’, public and private extension organisations might usefully seek to significantly extend the support roles they play.

Table 2: Examples of possibly relevant strategies for enhancing the basic processes relevant to innovation support (Leeuwis & Aarts, 2011).

Network building	Supporting social learning	Dealing with dynamics of power and conflict
<ul style="list-style-type: none"> - make an inventory of existing initiatives, complemented with stakeholder analysis; - build on existing initiatives for change and the networks around these; - arrange contact between disconnected networks who may have compatible interests (e.g. Chinese consumers and African farmers); - work towards 'coalitions of the willing' and exclude actors who do not feel interdependent; - mobilise pressures from outside (carrots and sticks) to enhance feelings of interdependence; - forge/broker contact between existing networks and outsiders and/or outside expertise; 	<ul style="list-style-type: none"> - demonstrate and visualise interdependencies among stakeholder practices; - explore and exchange stakeholder perspectives (values, problems, aspirations, context, etc) through discussion, role playing, dramatization, visits, filmed interviews, informality, humour, fun etc. - visualise invisible bio-physical processes with the help of discovery learning tools or simulation; - explore past and current trends and likely futures if nothing changes; - use visioning tools and scenario analysis to imagine (and find common ground on) possible futures - discuss institutional and other influences that reinforce existing patterns/problems; - organise contact with others who have encountered and managed similar problems; - elicit uncertainties that hinder change, and design collaborative investigation and experimentation to develop common starting points; - use practical actions and experiments as source of reflection and learning, rather than organising discussion and reflection only; - organise regular reflection on process dynamics and satisfaction with outcomes 	<ul style="list-style-type: none"> - identify and propose process facilitators who are credible and trusted by the stakeholders involved; - work towards process agreements, including dealing with media, mandates, etc.; - probe to explicate the interests and fears that underlie mobilised arguments and counter-arguments; - steer collaborative research activities (see other column) to questions relevant to less resourceful stakeholders; - make stakeholders talk in terms of proposals and counter-proposals; - ensure regular communication with constituents to take them along in the process; - translate agreed upon problems and solutions into storylines and symbols that are likely to resonate in society; - use media and lobby tactics to influence societal agenda's and advocate solutions (with the help of storylines/symbols)

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The European Innovation Partnership (EIP) “Agricultural Productivity and Sustainability” and the Proposals for the Farm Advisory System (FAS)

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Introduction: On 29 February 2012, the Commission adopted a Communication on the European Innovation Partnership "Agricultural Productivity and Sustainability" (COM(2012) 79). The agricultural European Innovation Partnership (EIP) aims to foster a competitive and sustainable agriculture and forestry that 'achieves more from less' input and works in harmony with the environment. It will contribute to ensuring a steady supply of food, feed and biomaterials, both existing and new ones in harmony with the essential natural resources on which farming depends. For achieving this aim, the EIP needs to build bridges between research and technology and stakeholders (farmers, businesses and advisory services).

The innovation model under the agricultural EIP goes far beyond speeding up transfer from laboratory to practice through diffusion of new scientific knowledge (referred to as a "linear innovation model"). The EIP adheres to the "interactive innovation model" which focuses on forming partnerships - using bottom-up approaches and linking farmers, advisers, researchers, businesses, and other actors in Operational Groups. This will generate new insights and ideas and mould existing tacit knowledge into focused solutions. Such an approach will stimulate innovation from all sides and will help to target the research agenda.

Funding of innovative actions of the agricultural EIP: For funding concrete innovative actions, the agricultural EIP will be implemented through actions that are mainly supported by two Union policies:

- Rural Development policy provides co-funding for innovative actions of "Operational Groups" involving farmers, advisers, researchers, enterprises, and other actors. The key measures include 'cooperation', 'knowledge transfer and information actions', 'advisory services', 'investment in physical assets' and 'farm and business development'. In addition, Rural Development Policy would provide the means for setting up of an EIP network facility at EU level.
- EU Research and Innovation Policy ('Horizon 2020') plays its key role in providing the knowledge base for innovative actions on the ground. Key actions feeding into the EIP include applied research projects, cross-border and cluster initiatives, multi-actor approaches, pilot or demonstration projects, as well as supporting innovation brokers and innovation centres.

Knowledge exchange - The EIP network: As a key instrument of the EIP, the network facility will work as a mediator enhancing communication between science and practice and fostering cooperation. It will encourage the establishment of Operational Groups and support their work through focus groups, seminars and workshops, the establishment of data bases (on relevant research results and good practice examples), support for partnering, and help desk functions.

In order to widen the knowledge base and sharing of experience, Operational Groups would report back to the EIP network about their innovation actions. The EIP network will facilitate the effective flow of information beyond the local and regional level of each Operational Group. The network facility will screen relevant research results and foster the sharing of good practice.

The network will animate activities, involving the EU, national, regional and local level, through informing interested actors, including programming authorities, about opportunities for innovative action and funding options. Thus, the network will help actors to use effectively the opportunities provided for by EU policies. Through collecting and communicating practice needs, it will add to giving orientation to the research agenda.

Operational Groups (OGs): Operational Groups will bring together farmers, researchers, advisers, businesses and other actors to implement innovative projects pursuing the objectives of the EIP for Agricultural Productivity and Sustainability. Operational Groups can be supported by means of research and rural development policies: both are providing opportunity to interested actors who can engage in actions on developing, testing and applying innovative approaches.

The complementarity of both policies results from the fact that actions under Rural Development Programmes are normally applied within a specific programme region, whilst research policy must go beyond this scale by co-funding

innovative actions at the cross-regional, cross-border, or EU-level. Other policies, namely Cohesion and Education Policy, might offer additional opportunities.

Actions under the Research and Innovation Policy ('Horizon 2020'): The undertakings of Horizon 2020 in support of "Operational Groups" will be translated into instruments and practical approaches via the annual work programmes and calls for proposals. Current thinking involves projects integrating a continuum from basic to applied research, cross-border and cluster initiatives such as thematic networks, multi-actor approaches, pilot or demonstration projects, as well as supporting innovation brokers and innovation centres as intermediates to connect farmers and stakeholders with research.

Actions funded under Rural Development: The EIP and the Operational Groups are described in Art 61 – 63 of the proposal for a Rural Development Regulation for the programming period 2014-2020 (COM (2011) 627-3): *"Interested actors such as farmers, researchers, advisers and businesses involved in the agriculture and food sector"* will participate in Operational Groups. Operational groups shall draw up a description of the innovative project and the expected results contributing the EIP objectives. It is up to the group to make decisions on the elaboration of the project, however, dissemination of the results, in particular via the EIP network, is expected.

Article 36 (cooperation) provides for financial support for Operational Groups: Support covers both setting up of EIP Operational Groups and funding of their operations. Furthermore, operational groups set up by the cooperation measure will be eligible for support offered by other Articles under the same Regulation, including in particular knowledge transfer and information actions, investment in physical assets, farm and business development and advisory services. Article 36 (2) (a) covers support for "pilot projects". Those pilot projects would pursue the testing and adaptation of technologies, processes etc. to "new" geographical / environmental contexts (i.e. contexts in which they have not yet been used). Article 36 (2) (b) provides for support for "the development of new products, practices, processes and technologies in the agriculture, food and forestry sectors". Support under the cooperation measure would also include the funding of studies of the area concerned as well as feasibility studies. The cooperation measure also supports the setting up of clusters and networks. Clusters will share knowledge and resources to improve performance and stimulate innovative activity. Clusters and networks could support and reinforce the actions of Operational Groups.

Whilst EIP Operational Groups owe their basic conception to the LEADER approach, there are important differences: EIP Operational Groups are not limited to a specific territory or contributions to a local development strategy but build themselves around concrete problems or opportunities, notably in the field of production and sustainable resource management, with innovative projects linking science and practice. The composition of Operation Groups may be much more limited than that of Local Action Groups as the latter need to be composed of local representatives of public and private socio-economic interests in a balanced manner.

The Farm Advisory System: The Farm Advisory System (FAS) was set up as a component of the CAP reform of 2003. Member States are obliged to have an advisory system in place, which can help farmers complying with cross-compliance requirements via the provision of technical advice. The establishment and use of the FAS is supported by the Rural Development Policy (see above). The advisory activity shall cover at least the Statutory Management Requirements (SMR) and the standards for Good Agricultural and Environmental Condition (GAEC) but may go beyond for the Member States who want to do so. Within the Commission proposal for the CAP towards 2020 it is envisaged to widen the scope of the FAS to the areas of climate change, biodiversity, protection of water, animal and plant diseases, innovation and farm management.

Supporting the Development Needs of Farmers

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Introduction: After studying agriculture in Scotland and gaining work experience on farms in France, Switzerland and Australia, I returned home to commence farming in 1995. The farm covers 120 hectares, is made up of mainly free draining clay soils and is in one block with a central farmyard, which lends itself to efficient livestock farming. Previously, the farm was run on a simple summer fattening system where bullocks (mainly Hereford and Angus) were purchased in the spring and slaughtered in the autumn having been fed an all-grass diet. A small flock of mid-season lambing sheep were also kept giving a stocking rate of less than 1LU/Ha. In summary, the farm had a very low output of production in terms of kgs/ha, and also very little capital was being invested in farm infrastructure.

Farm Development Plan: In consultation with my Teagasc adviser the following is a list of areas that were initially identified as in need of improvement, if the farm was going to support a full time worker into the future: 1) Increase the production in terms of kgs/ha, so heavier beef breeds mainly Charolais and Limousin were introduced; 2) Reduce the reliance on purchased cattle with their variable levels of profit margin. The decision was taken to start as suckler herd and therefore control more of the costs and also breeding in the beef production; 3) Improve and expand the housing facilities to accommodate the growing herd. This involved building a number of slatted sheds, silage pit, dung shed and lambing shed. 4) Boost and improve the quality of grass production on the farm. This has been achieved through a combination of reseeding, liming and the introduction of a paddock grazing system. Through the implementation of the advice received from my adviser the farm currently has a stocking rate of 1.6LU/Ha, which includes 65 suckler cows with all progeny brought to beef, winter housing for 220 cattle, and a flock of 180 ewes. The decision was also taken to join REPS and plant 5 hectares of broadleaf forestry.

Role of Adviser: As the farm business has grown and evolved over the last seventeen years so too has the role played by my adviser. Initially the advice centred on switching from an extensive based farming system to one focused on increased production, therefore areas such as suckler cow management, grassland production and farm building design were most focused on. With the increased number of EU farm directives and programmes, more of my adviser's time is currently being used to explain and implement the accompanying rules and regulations. More recently the financial part of the business has been more closely studied using the Teagasc Cost Control Planner. This enables expenditure to be properly allocated to each enterprise and a comparison can then be made over a number of years, it also serves as a benchmark against other farms with a similar type of production.

Communications for Extension: In my experience there are five main methods of communicating agricultural advice: one to one meetings with my adviser, organised group discussions, public events, agricultural publications and general farmer conversation. I will deal with the first three as these are relevant to the role of farm advisers. *One to one meetings:* These can be of great benefit as the focus is on the specific individual farm so a thorough investigation can be made of the business. Also problem areas can be discussed in a confidential manner. *Organised group discussions:* This allows farmers to learn from each others experiences and works best during farm walks when practical issues can be seen and discussed. It's important that groups are kept to a maximum of twenty members as talking in public can be challenging. These meetings can be further enhanced when group members allow a 'critical eye' to be cast over their business. *Public events:* A good way to showcase best methods of production and also have experts to demonstrate new techniques. Public events can be a victim of their own success when large crowds attend and reduce the time available for questions and answers.

Conclusion: Farmers gather knowledge and advice from many different areas but it's very important to have a source that is independent and not 'tainted' by commercial interests. This independent advice gives the farmer more strength and security when it comes to making practical on-farm decisions. It's also a fact that each farm and farmer is unique i.e. individual farmers may have different abilities in particular areas of farming, and different land may lend to suitability for certain enterprises. These factors can all be taken into consideration when the adviser is well acquainted with his client over a number of years. Finally, advice given to farmers must be of sound practical use and take into consideration constraints such as labour, finances and not least weather issues that farmers work with and at times against!

The Role of Professional Advisers

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Introduction: In providing Teagasc clients with a quality service, an adviser must form a close working relationship with his/her clients and interact closely with the complete farm household. As an adviser, working with farming clients in Kildare and Laois, I have a client base of 180 drystock farmers. The farming enterprises comprise suckling, beef finishing and sheep with some tillage enterprises. Approximately half the clients with a beef enterprise have suckler breeding herds, with the other half operating various types of trading systems. This wide variation in beef systems among clients, resulting in great variety in daily work programmes, creates a challenge when delivering targeted advisory support to meet the needs of clients. Reflecting the region in which I am operating, clients' average farm size is just about twice the national average, with half the farms over 50 ha and almost one in five farming an area greater than 100 ha. Farm size again dictates the type of advice and support required by clients. Reflecting the national average, only five per cent of my clients are aged less than 35 years. 102 of my 180 (57%) clients depend on agriculture for their primary source of income. though 75% of have sources of income other than from farming.

My Advisory Role: My role is multidimensional, reflecting the need to develop close working relationships with clients, to take a holistic approach to farm households, and to accommodate the broad diversity of beef systems represented in my client base. Overall, delivering the Teagasc Business and Technology Drystock Advisory Programme is central to my role. Main aspects of this work are assisting farmers' adoption of technologies and facilitating discussion groups. At a regional level, Teagasc delivers this programme through a planned series of events such as farm walks, information campaigns, livestock demonstrations at local livestock marts, public meetings/seminars, one-to-one farm visits, office and telephone consultations, discussion groups, and short courses.

Providing a customised, demand driven service to contracted clients: Requests from clients to advisers can be in relation to issues that are outside of the remit of national programmes. A critical part of the role of advisers is to provide effective responses to clients' individualised requests. Meeting such requests is the foundation for strong farmer/adviser relationships that are critical groundwork supporting the success of programmes such as Teagasc's Business and Technology Drystock Advisory Programme, the Beef Technology Adoption Programme and other such programmes. A major strength of the service provided by Teagasc advisers and the relationships they have with clients is they are impartial and independent. It is crucial that farmers receive information/recommendations from many different sources. However, the independent professional adviser has a significant role to play in facilitating the knowledge transfer process and assisting in the assessment of potential benefits vis-à-vis the circumstances and needs of clients.

A significant part of the knowledge transfer process is in facilitating farmers' interpretation and use of public information in formats such as press releases; media sources; newsletters and print information. Local advisory input is often essential to tailor messages and relevant, usable information to individual clients' needs. To achieve this local clinics, discussion group meetings, farm visits, one to one office/ phone consultations are vitally instrumental. Similarly, customised group and one-to-one facilitation methods are often required to achieve adoption/implementation of new technologies at farm level by illustrating potential results and feasibility of adoption. This essentially happens at one-to-one level and in local group meetings.

Future Directions: One to one consultations with clients are likely to remain a critical aspect of an effective knowledge transfer system. However, discussions groups, particularly in the context of programmes such as BTAP will be a growing source of support to clients providing localised and farmer-centred learning opportunities. Greater use of Information Technology within Teagasc, allowing effective means of accessing up to date research as well as information resources such as ICBF farm reports on fertility and herd performance will be more prevalent into the future. Monitoring and active use at farm-level of on-farm performance indicators such as cattle weights and profit monitor reports will be crucial and advisers will be instrumental in assisting farmers to access and use this information. Teagasc's in-service training in assisting advisers to remain at the forefront in this regard will remain vital, as well as Teagasc's interaction with commercial organisations in reaching industry-level goals. Similarly, a close working relationship with personnel in the Department of Agriculture, Food and Marine will be crucial for achieving policy-level objectives.

Knowledge Transfer in Northern Ireland

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Context: The Agri-Food industry makes the largest contribution to the Northern Ireland manufacturing sector. It is the one sector which has continued to grow during the recession and sales now amount to almost £4billion/year. The agricultural production sector in Northern Ireland is dominated by grass-based enterprises with grazing livestock accounting for over 80% of the land area. There are currently approximately 25,000 farmers which represents a decrease of 5,000 over the last 10 years. The change and rationalisation over this period has varied with the dairying and pig sectors moving to fewer but larger farms. However, the beef and sheep sectors have remained relatively constant in terms of average herd/flock size and as a result there has been an increased move towards part-time farming in these sectors.

Extension System: The College of Agriculture, Food and Rural Enterprise (CAFRE), which is an integral part of the Department of Agriculture and Rural Development (DARD), is the sole agricultural college in Northern Ireland and has the remit of developing the knowledge and skills of those entering and those already within the industry. CAFRE's Development Service delivers a range of programmes across each of the production sectors through Development Advisers and Technologists based at locations throughout Northern Ireland. They aim to "*Develop farmers to enable them to develop their business*". CAFRE's delivery of programmes ranges from one to one support, workshops with 15-25 farmers and large scale conferences/demonstrations attended by 500 plus farmers. The main programmes are:

1. *Development Planning* – CAFRE Development Advisers prepare development plans with farmers on a one to one basis to clarify their business objectives, identify their development needs and specify the support that CAFRE will deliver over a specified period of time, likely to be 2-3 years.
2. *Industry training* – this programme aims to develop the skills and competences of people within the industry. The training events/workshops are normally delivered to 15 – 25 farmers and can either be bespoke short courses (typically ½ day) or a nationally validated qualification known as a "*Challenge*" programme, delivered over 10-12 sessions.
3. *Knowledge and Technology Transfer (KTT)* – this programme aims to assist the adoption of the latest technologies and systems emanating from research programmes. The KTT model of delivery moves from awareness events (e.g. large scale open days, demonstrations), to specific workshops on-farm attended by 15-25 farmers, and then followed up on-farm by the Development Adviser.
4. *Benchmarking* – farmers within this programme can benchmark their physical and financial performance against best-in-class benchmarks within their sector. CAFRE Development Advisers analyse the raw data and issue reports identifying areas of improvement for farmers that will enable them to make informed business decisions.

Strengths of the System: The CAFRE programmes are farmer focussed and complement each other in that the base information from benchmarking assists the farmer to develop his objectives as part of his development plan and then in turn identify the training and/or technology adoption areas required to improve farm performance. There is strong stakeholder engagement in the development and delivery of programmes and this is supported by a team of technologists and advisers who are technically competent and locally based. CAFRE's KTT programme is supported by an excellent research programme funded by DARD through the Agri-Food and Biosciences Institute (AFBI). The outcomes of the research are relevant to local conditions and there is also excellent on-going stakeholder engagement to identify research priorities. A variation in delivery techniques from one to one to large scale demonstrations permits access for a wide range of farmers wishing to avail of the knowledge and technology.

Limitations of the System: CAFRE has a strong association with developing farmers in the top performing quartile but has had limited success with the middle band. As CAFRE is an integral part of DARD it can sometimes be perceived as having an inspection, compliance remit. There is potential to link EU/Government funding with development work carried out by CAFRE to maximise the impact of funding streams and encourage participation in programmes from the 'disengaged'.

Measuring Achievements: CAFRE has agreed internal targets within the business plan detailing the numbers of farmers participating on each of the programmes and an overall 90% customer satisfaction target to be achieved. Outcomes from the programmes can be measured through monitoring benchmark performance annually with the farmers CAFRE works with. Farmers are asked to complete evaluation forms following all KTT and training events. In addition, a number of KTT/training events are selected 6 months afterwards and an evaluation is carried out to determine if new knowledge or technology has been adopted on the farm.

Context, Strengths and Limitations of the United States Agricultural Innovation Support Model

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Context: The U.S. Extension System is structured as an outreach component of the Land Grant University System. Beginning in 1862 each state was granted land by the federal government from the Western US territory that was intended to be sold. The resulting funds were then to be utilised for establishing a Land Grant University in each state with the focus on agriculture and the mechanical arts. Later in 1914, states were allocated federal funds to establish the national Cooperative Extension System (CES). This system was created to aid in disseminating the latest education and research among people throughout each state. With the addition of the CES function, all US Land Grant Universities have a tripartite mission consisting of research, teaching and extension.

Funding for the CES has transitioned a great deal over the past 100 years. Initially, there were significant levels of federal funding to be leveraged with state and local funds; however, this has declined over time to where the federal component now composes less than 15% of overall funding in each state. The bulk of remaining funding is derived from state and local (county and city) sources. In the recent past, there is growing emphasis on grants, contracts, fees and cost recovery to fund extension programmes. It is important to point out that there is much variability in each state in regards to how state Extension systems are funded.

Programming in the US Extension System typically is focused on the broad areas of agriculture, natural resources (including water), family & consumer sciences, youth development, and community development. Educators based in counties work closely with campus-based specialists to provide educational programming focused on the latest issues facing people. The majority of extension programming is accomplished through teams of specialists and educators, which brings about close collaborations between research and education efforts. Programme needs are determined through assessments and the use of local advisory committees.

Strengths: The greatest strength of the US Extension System is the connection with the Land Grant Universities, which ensures a focus on education rather than on regulatory functions. Likewise, the close connections of research, teaching and extension have enabled a strong outreach function for the Land Grant Universities, which has resulted in high levels of public good. An additional strength of the CES is the connection among federal, state and local governments for funding and programming efforts, which has resulted in strong leveraging efforts.

Limitations: Funding for extension is a major limitation at this point in time. With the recent economic downturn, there have been some who are questioning funding levels for extension, resulting in major downsizing and restructuring of state Extension systems. With this change in CES funding, there is pushback from some extension clientele about moving more to fees and cost recovery. This reaction is particularly more evident among extension's traditional client base who have become accustomed to programming which has been free or of little cost to them personally.

Impact Measurement: Impact is measured via formative and summative evaluation processes. In addition to capturing the level of participation in extension programming, there is follow-up with clients to determine behaviour and practice changes that result from programme participation. Most significantly, there is an emphasis on longitudinal evaluation, which is geared toward determining the economic, environmental and social impacts of extension programming. These high-level impacts serve to document the overall public good of Extension programming.

One Lesson for Other Countries: The connection with the US public university system has been extremely valuable; however, there must be purposeful efforts to ensure understanding and valuing of extension efforts so that it does not become lost in the overall mission of university efforts.

Context, Strengths and Limitations of the New Zealand Dairy Extension Model

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Context: NZ Dairy industry has a long history of co-operative structures and collective action among farmers. Dairy extension in NZ is led from the ‘industry-good organisation’ – DairyNZ – which is owned by all farmers and funded by a farmer levy. Dairy NZ is based on a national network of consulting officers who primarily run discussion groups. In the past ten years, there has been increasing pressure for sustainable farming solutions that balance economic and profit imperatives with environmental outcomes. Recent policy developments highlight the direction of travel for farmers and on-farm skill levels will be key to success.

Strengths: DairyNZ has national coverage, but has a focus on both regional priorities and national imperatives. Strong alignment of investment and operations gives stability and strategic long-term focus on outcomes (vs. contestable model for funding). Farmer engagement uses a systems focus on business outcomes such as benchmarking (DairyBase), farm assessment and planning. The base skill set is now focussed on farm systems with overlaying specialties. Extension is supported by a substantial development team, media/web teams and science groups. Market research provides better targeting of solutions and services. Partnerships have been formed with private sector/commercial entities and farmer networks. Effective evaluation systems being developed include CRM tools. Emphasis is put on professional development for staff with clear career pathways including competency frameworks.

Limitations: The technical ability of staff to translate science into practice with a focus on systems and business performance, the ability to extend science outcomes can be compromised. In addition, there is the challenge of using extension approaches for voluntary whole-of-industry change without the power of market signals (e.g. dairy company milk price) or regulation (e.g. Regional Councils). Limitations also arise when the performance system rewards the extension of best-practice and scientific messages over co-development of solutions with farmers. Moreover, a strategic outcome based approach with on-farm targets tends to result in more ‘push’ – it is critical to find ways to stimulate co-development with farmers. There is always the tyranny of the urgent; proactive work gives way to reactive work when major issues arise (e.g. new farmer regulations or extreme weather events). More broadly, there is little extension-research culture and NZ is isolated internationally. Although NZ dairy farmers have a high internet usage (over 90%), the quality of rural broadband technology in NZ limits the use of new learning technologies.

Impact measurement – how we measure results: The ‘Strategy for NZ dairy farming’ has targets with measures that include on-farm outcomes. The critically important measures in extension include:

- Individual extension officer following – number and frequency of farmers attending groups;
- Farmer surveys indicating satisfaction with services;
- The presence of farmer action plans – and level of implementation of action plan activities;
- Project evaluation reporting – delivery to milestones and indicators of success;
- The number and frequency of website hits for on-line tools
- Profit attributable to extension interventions compared to non-engaged farmers (using DairyBase).

Key lesson for other countries: Align the strategy, investment and operations of extension and all adoption partner activities, to better deliver targeted industry benefits.

Context, Strengths and Limitations of the Australian Agricultural Innovation Support Model

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Introduction: Australia does not have one extension system, it has several. Not only is Australia a federation of states and territories, with confusion of responsibilities between various governments, there are extension providers for some but not all industries as well. A further problem is the separation between production and natural resource management interests by most agencies, leading to a disjointed approach in trying to influence farmers (Vanclay 2004). Changes in the national context in Australia over the last 20 years have led to a confused and underperforming extension system, which is affecting the production capacity of agriculture (Hunt *et al.* 2012). While there have been recent attempts at coordination (see SELN 2006), these have not been successful yet. Nevertheless, analysis of this system provides insights for extension around the world.

Context: Many things are responsible for the situation in Australia. What is particularly evident is that the fragmentation of extension in Australia made it vulnerable. Conflict between state and federal governments, disconnection between extension and research and education, together with the highly urbanised nature of Australian society meant that extension struggled to be nationally relevant. A high turnover of government staff, especially at senior levels, as well as a rapid turnover of politicians, meant that the relevant departments had little understanding of extension. Neoliberalism as a political ideology pervades Australian institutions, and neoliberalist rhetoric was used to justify cutbacks in funding for extension, especially with the competing demands for the limited public purse. A near decade of drought (2002 to 2010) severely reduced production and consequently the funding to the Research and Development Corporations. A final reason is the transition of rural and periurban areas away from agriculture to a multifunctional and diverse array of landuses, with a notable increase in amenity and lifestyle land uses, known in Australia as the ‘seachange phenomenon’.

Strengths: There is not much to praise about the current Australian extension system as it is institutionalised. However, the concern of a committed few to ensure that extension is improved has led to a deep analysis of the nature and purpose of extension, and the development of a business case for extension that expresses extension in modern policy speak (Vanclay & Leach 2011). One of the contributions of this process has been the national acceptance of a new definition of extension as being “the process of enabling change in individuals, communities and industries involved in the primary industry sector and with natural resource management” (SELN 2006, p.2).

Limitations: Analysis of Australia extension reveals many weaknesses. Primarily, the word itself is not widely known and has little intuitive meaning. Because the role of extension is to influence and support (not dictate), extension is not always recognised as being responsible for the changes that do occur. The declining social and political standing of the rural sector, and their discrediting from previous rent-seeking activities, means that there is limited urban support for public investment.

One Lesson for Other Countries: There needs to be a strong business case for extension – in other words, a politically-credible justification that gives legitimacy to ongoing public investment in extension.

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Workshop 1 – Factors Influencing Innovation and Decision Making on Farms

Moderator: Paul Maher, Assistant Director of Knowledge Transfer, Teagasc, Oak Park, Co. Carlow

Teagasc Tillage Crops Report – A Rapid Technology Update Tool

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Introduction: The Irish tillage sector is a high input, high output system where agricultural support is decoupled from production. Irish cereal yields are amongst the highest in the world (Spink, 2010) due to our cool maritime climate. The same conditions also greatly favour the development of foliar diseases which can reduce grain yield by up to 50%, therefore, Irish cereal crops require optimised fungicide applications to achieve high yields (Dunne, 2005).

Problem: Recently, the Statutory Instrument 155 of 2012 was enacted, transposing the Sustainable Use Directive (SUD) on pesticides, Dir 2009/128/EC, into Irish law. SUD is concerned with all aspects of pesticide use in Ireland and will impact on the pesticide decisions farmers and their advisers make. A review of pesticide action plans across five EU countries concluded that extension services were important players in implementing the respective plans (Barzmana and Dachbrodt-Saaydehb, 2011). At present there are over 30 cereal varieties on the Irish Recommended List (anon, a, 2012) as well as over 1000 registered pesticides making it difficult to both give good agronomic advice and remain compliant under the relevant legislation. Currently, farmers rely heavily on agronomist advice when making fungicide decisions. A recent survey of Teagasc tillage clients showed that 45 % received their agronomic advice from Teagasc advisers, 37 % received it from merchant advisers and the remainder received it from independent advisers (Irish, Wallace and O' Donovan, 2012). With cereal farmers receiving their advice from many sources, disseminating up to date and relevant research in a time critical manner, is a difficult task.

Extension system: The Teagasc Tillage Crops Report is a technical report giving up to date disease, pest and growth status of crops as well as recommendations for treatment based on the best available research. It also provides impartial, detailed comparisons of pesticides in tabular format as well as pertinent details of government schemes etc. It is written by Teagasc Tillage Specialists with input from Oak Park research staff. The Crops Report issues every 3 weeks during the growing season with appropriate supplements in the autumn. It is sent out by email to Teagasc advisers, paying trade customers and Teagasc tillage clients. It is estimated that 90% of Irish arable crops are serviced by an agronomist who receives the Crops Report. An abbreviated version is sent by email to media personnel highlighting current crop status and headline news. In addition, crop 'newsflashes' issue by email to highlight developing disease situations. Similar crop reports are issued to paying customers in the UK by the Scottish Agricultural Colleges and ADAS.

Discussion: Ever evolving legislation and customer demands for food assurance are placing increased demands on cereal farmers and their advisers especially when it comes to pesticide use. The Teagasc Tillage Crops Report meets the demands of its customers by providing time critical, relevant and unbiased information. Possible future developments may include issuing a 'tailored' Crops Report based on customer needs and an electronic version accessible by mobile devices.

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The Adoption of a New Forest Practice Needs More Than One Extension Approach

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Introduction: Forest owners in Ireland face many challenges once their forests approach harvesting stage: generating profits and adopting new technologies are two such challenges. However, the greatest harvesting challenge may be the lack of forestry skills and technical knowledge among forest owners, as forest operations are new to most owners. Many privately owned forests are only now reaching the stage where the owners need to consider whether or not to thin their forests. While thinning is not absolutely necessary, thinned forests provide a regular interim income stream and have the capacity to generate higher long-term returns. Thinning operations also generate employment and spending in the rural economy through the provision of raw material for the renewable energy and the timber processing sectors.

Literature Review: In Finland, where there is a strong tradition of forest harvesting, a survey of 119 forest owners found that they had all harvested at least once during a three-year period (Kuuluvainen *et al.* 1999). In Ireland, however, Ryan *et al.* (2007) found that only half of the 48 Irish private forest owners surveyed intended to thin their forests. Furthermore, they reported that approximately 45% of respondents intending to thin were unsure how to manage the work and market their timber. Most recently, Maguire (2009) outlined that only 13% of Irish forest owners surveyed had already thinned their forests. While there is little information on the impact of forestry extension in Ireland, there is substantial evidence of the effectiveness of both targeted courses and field events from the United States. Baumgartner *et al.* (2003) showed that forest owners who availed of extension services are more likely to manage their forests for timber production. Beach *et al.* (2005) also found that training of forest owners was a significant factor influencing timber production. It is conventional wisdom among Teagasc forestry advisers that forest owners are more confident in adopting technologies once they have seen the technology demonstrated.

Extension System/Practice/Tool/Challenge Examined: Participants at a forest thinning demonstration in Roscommon in October 2009 were surveyed as to a) their level of knowledge of specific issues before attending the demonstration; b) their level of knowledge after attending and c) whether they intended to carry out forest management operations as a result of having attended the demonstration. Analysis of a retrospective pre-test questionnaire showed that participants significantly increased their level of knowledge on key thinning related topics. A high proportion of the 35 participants also outlined their intentions to carry out specific operations (such as opening inspection paths into the forest) as a result of having attended the demonstration.

Two years later, a follow-up phone survey of these participants was conducted to a) ascertain if they had carried out these operations and b) if not, why not. Of the respondents, only 8% had thinned their forests and 5% were not going to thin. Of those who hadn't thinned, 58% of the forests were not yet ready thinning; 21% of owners were in the process of organising thinning and 16% were unsure/didn't know. Even though participants confirmed that they found the demonstration "useful", "informative", "valuable" and it enabled them to "meet other owners" and "compare forests", 58% of those who had not thinned felt they still needed further advice on thinning and many revealed that they had forgotten much of what they had learnt at the earlier event.

Discussion and Implications for Extension Practice: Once-off events, even though significant knowledge transfer is recorded at the event, may not be sufficient to ensure practice change. Subsequent targeted follow up, including events, one to one advice and/or group discussion may be needed to encourage practice change. This confirms evaluation studies of forestry extension methods carried out in Mississippi by Londo and Monaghan (2002) which found intensive forest workshops which included follow-on reports, to be particularly effective at knowledge transfer.

Summary: Forestry extension plays a key role in technology adoption but needs to be tailored to suit the Irish situation. Translating forest owner owners' intentions into actions is a slow process which will probably involve a number of extension interventions including demonstration, hands-on learning and follow-up information.

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The Use of Participatory Evaluation Methods in Agricultural Extension

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Introduction: Discussion groups are a critical component of Ireland's agricultural growth strategy, with the benefits clearly quantified (Hennessy and Heanue, 2012). Currently there are over 10,000 farmers involved in discussion groups and targets are set out in Food Harvest 2020 for increasing membership. Considering the pivotal role of discussion groups in agricultural policy, targeted and research-informed strategies are required to assist discussion groups to operate optimally. This paper proposes a strategy for application in extension that entails both evaluative and capacity building functions for discussion groups.

State of the Art: The professional practice of evaluation has diffused internationally to the extent that it is at the heart of modern governance (Pawson & Tilley, 1997). As principles of participation have become mainstream in state policies and procedures, there has been a clear undercurrent within evaluation scholarship and practice that represents forms of evaluation that are empowering, engaging and compatible with participatory governance (Preskill, 2008). In this context, participatory forms of evaluation such as 'self-evaluation' have gained prominence. High and Nemes (2008) suggest that participatory self-evaluation and external 'expert' evaluation are complementary and that evaluation strategies drawing on both modes are stronger and more effective. Self-evaluation is not only potentially effective as a tool for evaluation, but as a tool for capacity building as participants engaged in self-evaluation are encouraged to actively reflect on, assess and troubleshoot where necessary, aspects of their group's functioning. Without proposing a mechanism, Saraceno (1999) suggests that self-evaluation leads to enhanced external evaluation, which seems reasonable on the basis that groups given space and support to reflect on their performance are likely to be in a better position to engage with external evaluations. We suggest that participatory self-evaluation of discussion groups has the potential to optimise discussion groups' delivery of technology transfer and learning; improve Teagasc's capacity to support their work; and demonstrate the legitimacy of participatory modes of engaging with farmers.

Extension Practice Examined: Recently completed qualitative research identifies successful operational aspects of discussion groups under the following themes: organisational characteristics; emotional and social functions; security; solidarity; and learning drivers (Macken-Walsh, forthcoming). Using these categories as a broad structure, we propose the co-design (i.e. design involving inputs of end users, farmers and facilitators) of a template for use by discussion groups nationally to self-evaluate along the following lines: 1) An animation phase, facilitating discussion groups to reflect on their performance; 2) Open discussion/brainstorming of what successful operation of a group means, specifying performance measures based on the pre-defined categories; 3) Self-evaluation by group members of performance according to the categories selected, developing a visual 'scorecard' for overall group performance which is a record of the evaluation process; 4) Collective preparation of a development plan that identifies potential actions to improve weaker areas of performance.

Discussion and Implications for Extension Practice: The multi-stakeholder co-design of the template will itself be a learning process providing opportunities to learn more about co-design techniques for use in other projects. The project fits with other Teagasc initiatives involving advisers and learning how to do this form of evaluation will help with developing a more participatory style of extension and the underlying skill set and attitudes required. The use of the self-evaluation template will lead to an increased awareness by both facilitators and farmer members of the operational aspects of how discussion groups work, and how they can work optimally. The template will support increased ownership by group members of the group development process and will be available for groups to self-evaluate on a regular basis if desired.

Summary: In keeping with governance-based approaches to evaluation, self-evaluation has both capacity-building and evaluative functions that can potentially enhance the operation of discussion groups.

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Factors Which Influence Decisions/Adoption of Technologies: A Dairy Farmer's View

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Introduction: I took over a mixed farming enterprise in 2001 and started out on the road to achieve my lifetime ambition of running a profitable full time dairy enterprise. From starting out with 20 dairy cows on 14.2 ha, I am currently milking 93 cows on a 42.2 ha milking platform. Last year I won the FBD Young Farmer of the Year. I would like to think that some of the farm decisions I have taken and the new technologies I have adopted in recent years have been the correct ones for my farm and that I will continue to reap the reward from their implementation.

Discussion Group Membership: In 2007, I became a client of Teagasc and immediately joined the local discussion group. The biggest influencing factor on me taking on new farm technologies has undoubtedly been my membership of this progressive group of farmers. One of the requirements for group membership was that you must be milk recording; we had never milk recorded on our farm up to this point. Today, I feel milk recording is a vital component of any successful dairy enterprise.

A lot of my day to day farming decisions relate to grassland management, practically all the different technologies I have taken on in this area in recent years are as a result of being in a strong discussion group. Decisions around grass surpluses/deficits are based on weekly grass measuring/budgeting through the use of a Grass Wedge. The Spring Rotation Planner, the Autumn 60:40 plan, On-Off grazing, reseeding by minimum cultivation are all tools I now use after seeing them work first hand on the farms of my fellow group members. Along with grassland management, I put a big emphasis on breeding management. Over the years, I have adopted technologies such as tail painting, DIY AI, use of a vasectomised bull with chinball, Active Bull List, use of teams of genomic bulls and the Sire Advice Programme. There is nothing like teasing out the merits or otherwise of these technologies with your group facilitator and group members.

Information Sources: Outside of my adviser and group meetings, when it comes to day to day decisions, I generally get information from a range of different sources such as other dairy farmers who's judgement I respect; the Farming press including Irish Farmers Journal, Farming Independent, Irish Farmers Monthly, Today's Farm, Teagasc and Co-Op monthly newsletter, my vet, Teagasc Open Day/Farm Walks, Co-Op Milk results text and the internet. I strongly feel that there has never been more information available to farmers to assist them in decision making as there is today. How farmers use this information is what separates the average farmer from the Top 10% of operators.

Annual Decisions: Year to year decisions are again greatly influenced by the advice I get from my adviser, my group colleagues and my Co-Op. I feel our most important group meeting of the year is our profit monitor meeting in January. Here I see exactly how the farm has performed both physically and financially over the past year and more importantly it highlights the areas that I need to work on if I am to increase farm profit. The yearly reports from ICBF such as my Co-Op Performance Report, Herd EBI report, Calving Report and Final Fertility Report are all vital tools to aid decision making. In these reports, my own farm performance is benchmarked against some of the top performers in the country, giving me a clear target to aim for. Important yearly decisions in relation to on-farm investments are only undertaken after consultation with my accountant.

Strategic Decisions: When it comes to longer term strategic decisions for my farm and family, the person I depend on most is my wife Mairead. All major farm decisions such as large scale infrastructural investment or new long term lease arrangements are not undertaken without both our agreement. I feel it is very important for any young farmer who wants to succeed in farming, that he or she is well motivated and have lots of ambition. I have no doubt that this makes the progress of the adoption of new technologies much more likely.

Summary: A dairy farmer's working day involves countless decision making. From short term, day to day decisions to decisions that will have a lasting effect over the course of the year to strategic decisions that will determine the long term direction you and your farm take. Without doubt what has been and continues to be the driving force behind most of the farm decisions I make is membership of a progressive local discussion group. Most if not all the technologies I have adopted down through the years have been a result of seeing them successfully implemented by other like minded group members, who were willing to share their honest opinion of their worth.

Using Extension to Progress Genetic Improvement on Irish Dairy Farms

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Introduction: The Economic Breeding Index (EBI) is the index used to indicate the genetic merit of Irish dairy cattle. Teagasc researchers worked with the Irish Cattle Breeding Federation (ICBF) to develop the EBI while Teagasc's advisory service promoted the EBI using a wide variety of extension methodologies.

Literature Review: Adoption of any new technology, in this case EBI, is a five step process (Rogers, 2003). The initial stages, knowledge and persuasion, are achieved through mass communication methods. The later steps in the adoption process, decision, implementation and confirmation require a more intimate level of support and encouragement. Research on practice adoption by Irish dairy farmers found that Teagasc advisers and discussion groups significantly influenced the adoption of newer technologies (Kelly, 2011). Dairy production systems in Ireland are seasonal (Berry *et al.* 2006) and highly dependent on achieving high fertility levels in dairy cows (Shalloo *et al.* 2004). Until 2000, Irish dairy cattle breeding programmes focused on increasing milk production but underestimated the antagonistic genetic relationship between milk production and fertility resulting in a less fertile national herd (Evans *et al.* 2002). When such poorer fertility was accounted for, higher genetic merit animals were less profitable (Veerkamp *et al.* 2000).

Extension System: Adaptation of the principles of adoption was required to increase knowledge and use of the EBI. At its core was the incorporation of EBI targets into Teagasc's Dairy Programme. Mass extension methodologies were employed to create an awareness of the index. Breeding competitions, initially individual farmer based, were promoted by Teagasc advisers and publicised widely in the mass media. Each year in advance of the breeding season, Teagasc advisers meet with ICBF personnel and Teagasc dairy specialists and researchers to ensure that consistent EBI messages are promoted. In the early years of the development of EBI such meetings were held with AI representatives as well. Teagasc advisers in turn supported farmers in the early adoption of EBI by selecting AI sires. Farm walks and discussion group activities further persuaded farmers to adopt EBI. Teagasc specialist staff and ICBF personnel developed a suite of discussion group reports, available to their advisers, which allowed group members to compare their breeding information with that of other members of their group. Peer pressure helps to ensure that EBI is implemented on individual's farms. In the latter stages of the adoption process, the individual finalises the decision to continue using an innovation and may employ it to its fullest potential. Between 2008 and 2011 the breeding competition changed from being an individual farmer competition to a discussion group competition. During the three years 2008 to 2010, approximately 75 dairy discussion groups met a team of experts each year and had their breeding performance critiqued. The impact of this on members' performance both in terms of the number of heifers born in the following years and the average EBI of the bulls used was hugely significant. Winning groups hosted breeding events where most of the information was presented by group members rather than 'breeding experts'. Farmers attending the events observed that hearing the messages from other farmers was hugely effective in confirming the EBI message. To support farmers at this stage, Teagasc and ICBF personnel prepared tables showing the milk production and fertility performance of 'high EBI' and 'low EBI' cows from winning group members' herds at the national and regional events that took place following the competitions.

Discussion and Implications for Extension Practice: The results of this collaborative research and extension activity include a rapid rise in the EBI of sires used on Irish dairy farms, which in turn has resulted in a rapid increase in both the number and EBI of replacement heifers born in the national herd. The EBI of the dairy heifer calves born between 2000 and 2012 practically doubled to €120: the number of dairy heifer calves born increased by 70% to an estimated 360,000 over the same time period. The lessons for other extension programmes are the value of initially setting clear targets, ensuring that all agents who influence the adoption of the technology present the same messages to the target audience and the importance of changing the extension methodologies used at different stages in the life cycle of the adoption of the technology. While EBI remains a key performance indicator in Teagasc's Dairy Programme, the index, now widely accepted by farmers, is promoted through the individual and group reports used by Teagasc advisers during farm visits, at discussion group meetings and at farm events.

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Workshop 2 – Efficient and Effective Advisory Models to Deliver Services and Developments

Moderator: John Moloney, Regional Manager, Kilkenny/Waterford Regional Unit, Teagasc

The Impact of Discussion Groups on Farm Innovation and Performance

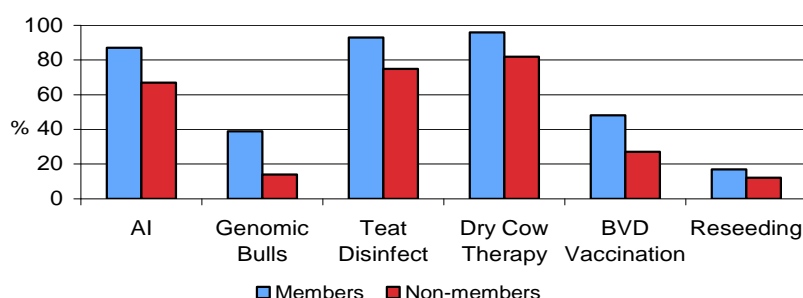
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Introduction: Discussion groups have been in operation in Ireland since the early 1980s and have become more prevalent in recent years, particularly under the auspices of the Dairy Efficiency Programme. Generally, discussion groups consist of 12 to 15 dairy farmers who meet several times a year to share ideas and information among themselves while examining different parts of the farm where the meeting is hosted. Teagasc economists have recently conducted research to quantify the impact of discussion group membership on technology adoption and farm performance. This paper summarises the results of this research.

State of the Art: The research summarised in this paper used Teagasc National Farm Survey (NFS) data and economic modelling techniques to evaluate the impact of discussion group membership on farm innovation and performance. Limited dependent variable models were used to identify the characteristics of discussion group members, i.e. to examine whether they are larger, more commercially focussed than non-members. Following this, econometric methods were used to examine the impact of membership on innovation and performance while controlling for the differences between members and non-members.

Discussion and Implications for Extension: Examination of NFS data showed that discussion group members were more likely to adopt new technologies. For example, 87% of discussion group members used artificial insemination compared to 67% of non-members, (see Figure 1).

Figure 1: Rates of technology adoption by discussion group members and non-members



However, further analysis of the data also showed that discussion group members tended to farm larger holdings in more advantaged regions than non-members. It is therefore possible that the higher rates of technology adoption may be due to the “types of farmers” participating in the groups rather than the actual knowledge gained through participation. Hence it is important to control for the initial differences between members and non-members. In relation to artificial insemination using genomic bulls, i.e. one of the newer technologies, the results show that even when the characteristics of discussion group members are controlled for, i.e. in terms of age, size and location, the effect of membership on the probability of adoption is still positive and significant at 0.21. In other words, taking two farmers of the same age, farming the same size holding in the same region, the discussion group member has 0.21 higher probability of using genomic bulls insemination than the non-member.

Economic modelling techniques were also employed to estimate the impact of membership on farm performance. Again the results of this analysis concluded that even when the initial differences between members and non-members were controlled for, discussion group members still achieved higher profits per hectare. The premium earned, as measured by gross margin per hectare, varied from €247 to €300 per hectare depending on the characteristics of the farmer.

Summary: The research summarised in this paper has produced evidence that discussion group membership has been delivering tangible benefits to farmers in terms of both technology adoption and farm performance.

€uroMilk– A Team-Based Approach to On-farm Mastitis and Milk Quality Control Issues

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Introduction: Mastitis, both clinical and subclinical, imposes significant costs on Irish dairy farmers and continues to be a challenge for many. In the past farmers may have sought help and advice from several areas of the industry, such as their farm adviser, veterinary surgeon or milking machine technician. However, communication between these groups of people in relation to farm issues remained limited. Despite the wealth of knowledge that exists on mastitis control, adoption of recommended practices is low. The objectives of this pilot study were to identify the motivations and obstacles to improving milk quality, and to see if a team-based approach to mastitis control was effective and feasible to implement on Irish dairy farms.

Literature review/State of the Art: The “MilkMoney” programme in Wisconsin, USA has shown that the formation of milk quality teams was successful in encouraging farms to adopt recommended management practices and improve communication between producers and dairy professionals (Rodrigues and Ruegg 2005). Similarly, the €uroMilk pilot programme centred on creating a communication network and a framework that facilitated advisers and service providers to work together as a team with the farmer.

Extension System Examined: 26 farmers were recruited to participate in €uroMilk. Each farmer then invited their preferred team members to participate, which included veterinarians, milking machine technicians, farm advisers and/or co-op milk quality advisers. No additional training or financial incentives were provided to participants. Each team was expected to meet at least five times between November 2008 and January 2010. Team meetings followed a cycle of investigation of the farm challenges, agreeing a limited number of appropriate actions, subsequent implementation of tasks and review.

Discussion and Implications for Extension: Analysis of the farm data from the year before, and the year of the pilot study showed that average bulk tank somatic cell count (SCC) of the pilot group reduced by over 100,000 cells/ml, from 350 to 250, and the average number of mastitis cases treated reduced from 35/100 to 20/100 cows. Farmers’ motivations to improve milk quality included the financial impact and stress of mastitis, as well as personal pride. However obstacles to that change included the normalisation of high SCC, the perceived stigma associated with mastitis, the difficulty of changing existing routines and lack of available resources. A poor understanding of subclinical disease and its impact on production were also obstacles. Many farmers felt that it was not possible to control mastitis and were often sceptical that the recommended changes would work. The multidisciplinary teams were very positive, providing an informative, objective and farm-specific viewpoint which instilled confidence in the farmers. Farmers have a very strong sense of identity and their inclusion in the decision-making process at the team meetings was empowering. The regular meetings created awareness and focussed farmers on the opportunities and solutions and allowed for continuity and follow-up. However, there was also the risk of creating dependency, and managing expectations of outcomes proved to be very important. The other team members found the team structure beneficial, providing an opportunity to meet, work with and learn from other professionals. For many, this was a first. It was an opportunity to upskill themselves and also realise the roles that other disciplines can play, and the strength of working as a team. €uroMilk also identified the problem of farmers receiving inconsistent advice. The team structure however made this situation less likely, as team members shared knowledge and came to a consensus. There was also concern over the time input required by team members for participation, which was coupled with a reluctance to charge for their service. A lack of a quality milk payment incentive was also seen as a mixed message from the dairy industry.

Summary: €uroMilk has provided invaluable insight into the factors that motivate and prevent improvements in milk quality on Irish farms. It has also shown that a team-based approach can be effective in improving mastitis control on Irish farms. It also identified industry requirements and challenges, if a programme such as this was to be delivered on a national scale.

Key References/Acknowledgements:

We thank Prof Pamela Ruegg for her guidance, Glanbia and all €uroMilk participants for their commitment and Dairy Levy for funding this work. We also thank Noel Byrne and Jim Flynn of Teagasc for their technical assistance.

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Development of Discussion Groups and Mobilising Farmer Participation

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Introduction: The concept of discussion group goes back to the 1970's when a number of advisers promoted and implemented the idea of motivating progressive farmers by meeting regularly and exchanging knowledge and experience on a collective basis with their peers. In 1978, MAgrSc research by adviser Oliver Dillon showed that farmers participating in discussion groups adopted new practices quicker and more frequently than non participants. This was not only due to the fact that participating farmers were, by and large, more innovative and motivated, but was partly due to peer-to-peer influence. Throughout the 1970's and 80's discussion group activity was largely driven by adviser commitment and client response. In the early 1990's Teagasc adopted the discussion group model as an integral part of their Advisory Business Plan. Group members increased, especially in dairying. During this time the dairy industry acknowledged the value of discussion group activity as an extension tool and collaborated with Teagasc in a number of joint programmes aimed at increasing the number of groups among their milk suppliers. All the main dairy co-operatives became involved including Glanbia, Kerry, Dairygold and N.C.F. The joint programmes resulted in significant improvements among participants, especially in breeding, yields and milk quality.

Incentivising group participation: The recent involvement of the Department of Agriculture, Food and the Marine (DAFM) in incentivising group participation among farmers through the Dairy Efficiency Programme (DEP) and the Beef Technology Adaption Programme (BTAP) was a significant milestone in the development of the discussion group as a key activity of technology transfer. Group numbers and participant numbers increased hugely. To coincide with the introduction of these programmes, the Teagasc Advisory Service carried out an active campaign to mobilise and encourage farmer participation. This was particularly critical in attracting beef farmers to group membership.

Mobilisation of farmers and training of facilitators: The recruitment campaign involved a mixture of activities including direct letters, texts, public meetings, advisory newsletters and, of course, advisers' personal contact with their clients. In a survey I conducted among the 18 advisers involved in groups in the Laois/Kildare/Meath/Louth/Dublin Advisory Region, they identified public meetings, direct letters and word of mouth as the most effective recruitment activities. Teagasc invested heavily in up-skilling Teagasc advisers in discussion group facilitation. In addition, private consultants facilitating discussion groups and farmer chairmen of discussion groups received training in facilitation from Teagasc. All participants had to reach minimum standards to qualify as discussion group facilitators.

Future of discussion groups: Today there are 351 dairy discussion groups involving 5,800 dairy farmers and 275 beef discussion groups involving 5,500 beef farmers. These groups are facilitated by over 200 dairy and beef advisers, all of whom participated in Teagasc's discussion group facilitation training programme. There is no doubt that discussion groups will be a key knowledge transfer activity across all farming systems in the Irish extension service of the future. This is borne out by the fact that over the past thirty years the service has evolved from largely one-to-one interactions with clients to the present day where up to 40% of advisers' time is devoted to this collective KT technique. While the future of discussion group will be client-driven, the need to maintain a world class extension service in Ireland with ever reducing resources will also drive the ongoing evolution of discussion groups in knowledge transfer in this country.

Extension as Part of an Agri-Environmental Research Programme

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Introduction: The Agricultural Catchments Programme (ACP) was established in 2009 to evaluate the effectiveness of the EU nitrates directive National Action Programme (NAP) in Ireland, currently S.I. 610 of 2010. The ACP investigates the socio-economic and bio-physical implications of the NAP, such as the impact of nitrogen and phosphorous on water quality, how these nutrients get into the water and where they came from in the first place. Six small catchments, approximately 10 km² each, have been selected across the country to represent intensive grassland and tillage farming on different soil types. A catchment boundary is a watershed with all the land inside the boundary being drained by the stream being monitored. Typically, each catchment has up to 40 land owners with 20 farmers having the majority of their holding contained within the catchment boundary. ACP farm advisers have a client base of two typically sized catchments each. Their role can be divided into three main functions, (a) providing an advisory service to farmers, (b) collecting and recording data for research and (c) facilitating the operation of the programme by developing and maintaining farmer goodwill towards it. This last point is significant given that in contrast to other programmes where agricultural research is carried out on hand picked farms, farmers in the ACP did not choose to partake in the programme. Thus the ACP works with a very diverse group, with efficiencies and scale ranging from tillage farmers growing over 550 hectares to a small dairy farmer with less than 20 cows who is also a fisherman.

Research and extension working together: Catchment advisers cover a wide range of topics including financial, agronomic and environmental issues. Nutrient management planning is one aspect I will examine in more detail here. Each catchment was intensively soil sampled at the start of the programme. These samples were taken to determine soil nutrient levels as these are a potential source of nutrients entering the water course. The results also provide the basis for detailed nutrient management plans (NMPs) and fertiliser recommendations for the farmers. The relatively low client to adviser ratio has allowed for these results to be explained in detail, on a one-to-one basis to all farmers in the catchments. The use of maps generated using a geographic information systems (GIS) further enhanced the understanding of these soil analyses and recommendations. Consequently, nutrient management plans have been created by the advisers and used by farmers for their own management. This approach has led to a much greater appreciation of the importance of nutrient management and matching fertiliser applications to crop requirements which contrasts with the low level of implementation of plans drawn up under pressure prior to a deadline to comply with regulations (e.g. derogation applications), as reported anecdotally by many advisers. Ironically, given that the ACP is an environmental programme, this nutrient planning advice has led to an increase in fertiliser inputs on a substantial portion of the farms sampled. In many cases the traditional fertiliser inputs were not replacing the nutrients removed and soil levels were being depleted. This became evident through the recording of fertiliser applications on a field basis, which is carried out on catchment farms. Due to the nature of the catchments programme there is a greater level of interaction between researchers, advisers and farmers. This has led to catchment farms being used for a number of field trials, some of which were initiated by the farmers themselves. Examples include (a) the impact on malting barley quality from different nitrogen rates and timing of application and (b) cereal yield response to differing phosphorous and potassium rates and application methods. These trials have many advantages such as providing a focal point for promoting good nutrient management. Also, in addition to demonstrating what research is currently being undertaken, the farmers, who are the ultimate end users of its findings, are more accepting of the results given that it was carried out in their locality. It is a pity that researchers often have a less than desirable level of contact with farmers that implement their results due to pressures to produce published peer reviewed papers.

Enhancing knowledge transfer: The most recent update of the “Farm Fertiliser Planner” spreadsheet, version 7, created by Stan Lalor, Teagasc is extremely useful to both advisers and farmers. It can produce individual field fertiliser advice for the whole farm on a single page in addition to a fertiliser plan that meets regulatory requirements. It is currently being developed into an online programme that will significantly enhance its usefulness. While such Information Technology (IT) applications are great tools they do not replace the need for one to one consultations on soil analysis. The value farmers put on the soil analysis following a consultation was always much greater than the actual cost of carrying out the sample and in many cases the sampling would not be done if it were not for the individual contact. It is surprising how often the soil index system is not understood and its explanation is greatly appreciated. In these cases soil results are translated into useful information.

Summary: The initial farmer reaction was at best cautious to the implementation of an environmental research programme evaluating the nitrates directive in their locality however they now see the ACP as a real benefit and would be sorry to see it finish. This change in attitude is a direct result of the integrated advisory and research approach.

Acknowledgements: I wish to thank the farmers in each catchment, colleagues in the ACP, existing Teagasc advisory staff in catchment locations and the Department of Agriculture, Food and the Marine for funding the programme.

Teagasc/Irish Farmers Journal BETTER Farm Beef Programme

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Introduction: The BETTER Farm Beef Programme is a joint programme co-ordinated by Teagasc and the Irish Farmers Journal with financial support from key industry stakeholders, Kepak, ABP, Dawn Group and FBD Insurance. BETTER is an acronym for Business, Environment and Technology through Training, Extension and Research. The overall aim of the programme is to develop a roadmap for profitable beef production through improving technical efficiency within the farm gate.

Challenge Examined: The programme focuses on boosting farm profitability on the participating farms by reducing production costs and increasing farm output. It was envisaged that based on the outcomes of the programme, Key Performance Indicators (KPIs) would be set at different stages of the production system so that farmers operating a similar system could benchmark the performance of their own enterprise. It was also thought that the programme would provide a better understanding of how and why technologies are adopted by farmers and lead to improved design and implementation of advisory programmes and provide clear signals for further research. Sixteen farms were selected in late 2008 to participate in Phase 1 of the programme which ran from 2009 -2011. Business and Technology (B & T) advisers in each county area were requested to put forward clients which they thought would be suitable individuals to participate in the programme. The management team then selected farmers to participate depending on their location, farming system, land type and most importantly the farmer's attitude to change. The sixteen farms cover a wide range in farm size, soil type, cow numbers and production system. Each farm was assessed at the beginning of the programme and the farmer was expected to work closely with his local B & T adviser and his BETTER adviser to draw up a 3 year farm plan and make agreed changes to his/her production system along with day to day management changes on the farm with a view to increasing the profitability of their chosen beef enterprise. Intensive monitoring during the year allowed for the impact of improved technical efficiency to be determined and the effect it had on profitability to be quantified and promoted. To further disseminate the information and messages being generated on the farms in the BETTER farm programme, all participating farmers are regularly featured in the Irish Farmers Journal and Teagasc publications such as Today's Farm.

Results: The results from the first phase of the BETTER farm programme are encouraging. By concentrating on four main areas, 1) Farm Output, 2) Breeding and Fertility, 3) Grassland Management and 4) Animal Health, the participating farms saw their farm output increase by 49%, which in turn improved their gross margin by 118%. The key messages and results have made a significant contribution in identifying where inefficiencies are and where change need to take place at commercial farm level. Table 1 below illustrates the progress made on the farms in the last 3 years and shows that technology transfer and the BETTER farm advisory model has made a positive difference at farm level.

Table 1: BETTER farm KPI's, 2008-2011

	2008 ePM Results	2011 ePM Results
Stocking Rate L.U./Ha	1.85	2.03
Kg Liveweight/Ha	536	717
Kg Liveweight/L.U.	292	353
Gross Output Value €/Ha	1016	1512
Variable Costs/Ha	630	668
Gross Margin/Ha	386	843

Summary: The BETTER Farm beef programme has clearly shown that with a targeted and focussed approach Irish beef farmers can significantly improve their gross margin by the adoption of simple technology. Simplifying the farm system, cashing in on the huge potential that grazed grass can have on beef farms and being more ruthless in culling poor performing cows from the suckler herd, are also key findings from the programme.

Acknowledgements: I wish to thank all the participating farmers in Phase 1 and Phase 2 of the programme, Teagasc advisory staff involved at a local level with each farm, the BETTER farm management team and the key Industry stakeholders Kepak, Dawn Meats, ABP and FBD Insurance.

Workshop 3 – Future Skills and Competencies for Professional Advisers

Moderator: Dr Karina Pierce, Lecturer, School of Agriculture & Food Science, University College Dublin (UCD)

Core Principles of Effective Discussion Groups

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Introduction: The transfer of knowledge/technology to farmers can be achieved through many methods. Acquiring knowledge for the farmer is easy. However, changing attitude and achieving adoption of technology is much more difficult. Teagasc has pioneered participatory tools for knowledge transfer in the Irish farming sector. The discussion group model is acknowledged to be particularly effective in knowledge transfer and adoption. This is largely attributed to its facilitation of a farmer oriented learning process. Farmers can become passive subjects in their learning especially if they are not active participants in the process. In a discussion group, a farmer is an active learner provided that the facilitator is true to their role. Three core principles guide the practice of facilitation: 1) Collecting valid and relevant information 2) Making a free and informed choice/decision 3) Ensuring commitment to those choices/decisions. Collectively, these core principles reinforce each other. To make an informed choice, people must have valid information to base this decision upon. When people make free and informed decisions, they become internally committed to them. When people are committed to a decision/choice they are much more likely to make sure that the decision/choice is implemented.

Literature Review: The overall objective of operating a discussion group model for technology adoption is to improve the competitiveness of the farming sector and help farmers achieve their goals. The benefits of being a member of a dairy discussion group have been examined by Hennessy and Newman (2010). This analysis clearly demonstrated that farmers who are members of a discussion group are more likely to adopt new technologies/best practices and increase levels of profit.

Extension Method Examined: To support the uptake of technologies by farmers, it is important to understand the process and key determining factors underpinning successful knowledge transfer and adoption. There is no doubt that economic factors have a significant role to play in how decisions are reached in relation to the adoption of technologies. The most focused farmers will typically embrace and make use of the most recent technologies and be involved in knowledge transfer processes. However, farmers that are less focused will have a slower uptake of new technologies. An important feature for these farmers is the impact of social and cultural factors (as well as economic factors) on how decisions relating to the operation of the farm are reached (Macken-Walsh *et al.* 2010). There are 3 forms of capital that are thought to influence farm decision making. These are economic, cultural and social capital. Cultural capital is based on the knowledge and skills people have. It is dynamic and can change over time but until that change occurs, cultural capital can be a cause of resistance to change. Social capital on the other hand is the value derived from social relationships and networks of people. Adoption of new technologies can depend on the opinion of a person's peers. Adoption of new practices can result in the social network/relationship being upset.

Discussion and Implications for Extension: Discussion groups allow farmers to be active participants and contribute positively to changing the cultural and social capital of decision making on farms. Allowing farmers to share knowledge and listen to other farmer's experiences of technologies helps break down the barriers that both cultural and social capital can create. However, it is critical that the facilitator ensures that this process happens. The adviser/consultant/scientist has more influence on the decision making process of economic capital than either cultural or social capital. As we enter an era of increased farmer participation in groups and greater influences of both cultural and social capital in decision making, the role of facilitators becomes ever more important. It is crucial that the facilitator is fully aware of this capital dynamic. One of the best practical measures of how effective the facilitation process is the amount of time the group is talking compared to the facilitator. When, the group is contributing more to the decisions at the group meeting, the greater the chance of changing the social and cultural capital decision making process.

Summary: The discussion group is the most effective knowledge transfer model available. It can achieve technology adoption faster than any other technology transfer method. However, the role of the facilitator is critical to the success of this model. With increasing farmer participation in discussion groups, overcoming the resistance to change in decision making due to social and cultural reasons becomes a serious challenge. A discussion group's greatest asset is the ability of farmers to influence change on each other to improve competitiveness. It is the facilitator's role to ensure that this asset is exploited as much as possible.

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New Mobile Phone Applications

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Introduction: Recent years have seen an explosive growth in smartphone usage, which is transforming consumer behaviour. A recent poll puts Irish smartphone usage at 49% of the population in 2011 but predicts it will accelerate to 71% by the end of 2012 (1). Monitoring of web traffic patterns indicate a phenomenal shift to mobile. As mobile technology becomes more sophisticated, mobile applications or ‘apps’ have increased in popularity and have evolved into highly capable tools which has implications for businesses and government who are targeting ‘always on’ consumers. More mobile subscribers are using apps than browsing the web on their devices with Irish smartphone users now downloading an average of one new *app* every week (1).

Literature Review/State of the Art: Most smartphones are already shipped with general information *apps* preinstalled e.g. weather, news or finance. *Apps* can be divided into two groups—mobile *apps* that run locally within the phone and mobile web *apps* that normally require an internet connection to access them. While the number of *apps* available specifically for farmers is relatively low, a search has revealed a growing list of agricultural *apps* (2, 3). The topics range from weather, livestock, grassland, dairy, grains, horticulture, irrigation and many more. They can be also be categorised as follows: management information *apps* are mostly mobile extensions of a farm management system, calculator *apps* are used to make in field calculations without having to go back to the farm office e.g. grassland management, information resource *apps* are used as lookup tools e.g. help to identify species of weeds or cereal diseases, or get specific information on a chemical/product or government regulation and agricultural news *apps* that are selected agri-media focused news events or up to-date market information.

Extension Tool Examined: The number of *apps* available specifically for Irish farmers is increasing. Teagasc have recently launched a Fertilizer Tracker *app*, which is a free *app* for general use by farmers in the Republic of Ireland. It is a interactive calculator that farmers can be used to track fertilizer usage against their fertilizer plan and ensure that they do not exceed their farm nutrient allowances, thereby avoiding possible financial penalties. Smart Farm Apps (4) have recently launched a suite of Dairy, Breeding and Grassland *apps*. Recently launched also by the Department of Agriculture and Rural Development in Northern Ireland (5) is a Nitrogen Loading Calculator and Aphis mobile *apps*.

Discussion and Implications for Extension Practice: The increase in smartphone usage provides an opportunity that could greatly benefit farmers to run their business more efficiently. As the list of *apps* and possible benefits to the user grows it is expected that demand will also develop, as will the interest from businesses and governments to provide access to content/data and developers to render that into user-friendly *apps*. The potential of mobile advertising is evident with location-based services, where geo-targeting allows consumers opt in to receive offers or services in their locality.

Summary: The emergence of the smartphone has created a new global industry in the last few years, which has changed the way people work, communicate and find information. The first point of contact potential customers has with a brand or company is through the browser on their smartphones, so it is important that websites are optimised for mobile usage. Mobile *apps* can be a major business opportunity and should have unique features that cater specifically for a mobile environment, rather than an adapted version of their online original. As farmers prefer to use mobile devices for carrying out their business than using a PC, the key to developing a useable *app* is simplicity with the end-user able to complete the task in less than one minute.

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Forestry Extension Services in Teagasc – Optimising the Use of ICT

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Introduction: The way people gather information, research their options and make decisions is changing rapidly. It is therefore essential that a research and knowledge transfer driven organisation such as Teagasc responds to this challenge by utilising the latest information and communications technologies (ICT) for effective and efficient knowledge transfer.

State of the Art: Teagasc's Forestry Development Department has developed new, innovative and cost-effective ways optimising the efficiency and effectiveness of knowledge transfer. By using and integrating ICT, the Department has developed more effective, efficient and user friendly forestry extension services. Technologies include: website, e-newsletter, Twitter, Facebook, YouTube, QR codes, Loc8 codes and interactive maps.

Extension System Examined: The Teagasc Forestry website currently holds about 400 pages, 300 pdf documents and 600 images. The three most visited sections are Downloads, Events Diary and Staff contact details. Visits to the website have doubled over the last few years. Users of Teagasc Forestry e-News receive e-newsletters regularly in their email inbox keeping them informed of the latest forestry news, events, etc. People can sign up via the website. Loc8 codes and interactive maps facilitate people attending events. The number of young farmers who use smartphones as their primary tool for gathering information is rising rapidly. Technologies such as QR codes, YouTube, e-News, social media channels and the website are particularly suited to such phones. Twitter and Facebook can deliver up to the minute forestry news. QR codes are very useful tools to direct smartphone users to a relevant webpage. Online video such as YouTube has become an essential knowledge transfer tool: young farmers are more likely to watch a short video than read a brochure. For instance: the hurley making video has been viewed more than 5000 times – more than twice the second most viewed Teagasc video.

Discussion and Implications for Extension Practice: The Teagasc Forestry website is an important source of unbiased information for many users including colleagues. On the one hand, many internet users searching for specific forestry information are introduced to Teagasc via the Teagasc Forestry website. Having researched a particular topic, many make contact with their local Forestry Adviser asking focused questions. This advance knowledge assists the Adviser in having a more in-depth, productive discussion with the client and is more likely to result in action. On the other hand, forestry researchers, advisers and outside agencies refer to the Teagasc Forestry website for further information, download applications forms, relevant publications, etc. The above mentioned ICT methods are effective and efficient communication tools. However, it is essential that these tools should work seamlessly together: while the website is central to the Forestry Development Department's ICT policy; other ICT tools such as QR codes, e-newsletters, social media, etc. improve overall effectiveness. ICT must be developed with target groups in mind: the key to effective ICT is that it should be relevant to the user. For these ICT tools to be effective; continuous time commitment, immediate response and joined up thinking are required.

Summary:

The way farmers are researching their options, gather information, establish relevant facts and make decisions is changing rapidly. It is essential for a research driven organisation such as Teagasc to respond to the changing needs of its customers in a timely and effective way. That is why Teagasc's Forestry Development Department started developing a range of integrated ICT tools. This has been a successful strategy as demonstrated by the rapid increase in traffic to the website: the last two years saw a doubling of traffic to the website. People use the website mainly for advice, details on upcoming forestry events, forestry grant details and staff contact details. The positive effect to the forestry development programme has been twofold: on the one hand, knowledge transfer from research to farm practice adoption improves as more and more people are making use of the different ICT services offered by Teagasc's Forestry Development Department. On the other hand, more and more people discover Teagasc's forestry advisory and research services through the Teagasc Forestry website. The Teagasc Forestry website cannot replace professional advisory and training services. However, what it can do is to facilitate effective and efficient knowledge transfer placing the Forestry Development Department in a key position delivering enhanced integrated forestry research and advisory services.

Key References/Acknowledgements: Developing such services cannot be achieved by one person or by one Department. Support, contributions and advice of so many people is very much appreciated: especially Dr Nuala Ni Fhlatharta, Head of the Forestry Development Department, Teagasc allowing me to develop this service. She saw the potential immediately. My colleagues who keep feeding me with new information making our ICT services what they are. The cooperation of Eric Donald, Head of PR, Teagasc and Dan Cleary, ICT Security/Continuity Specialist, Teagasc is also very much appreciated.

The Teagasc/UCD MAgrSc in Innovation Support Programme

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Introduction: In recognition of the new challenges and opportunities facing Irish and EU farming and the key role of extension and education services in enabling farm households to make changes that will strengthen their viability, Teagasc and University College Dublin have developed the MAgrSc in Agricultural Innovation Support Programme. It is a 21 months study and training programme which combines taught modules, field research and advisory/education work experience. The Programme was piloted in 2010 with four students, registered 10 new students in 2011 and a further 12 students in 2012.

Rationale/ Aim: The MAgrSc Programme aims to equip graduates with the skills and knowledge to be effective in building the capacity of farmers to adopt new practices and technologies. The experience gained through the programme aims to equip them for future roles in advisory services, technical consultancy and education delivery. The experience and learning is also of value to Teagasc, UCD and the agriculture industry in advancing the specific knowledge required for modern and effective innovation support systems.

How it works: Research topics explored by students of the programme are initially identified by advisory and education staff based on the issues they feel are most important to their work. Topics selected range from a 'determination of learning outcomes from teaching methods' to 'assessment of the effectiveness of dairy discussion groups' through to an 'examination of the uptake of financial tools by tillage farmers and advisers'. While the topics are diverse in nature all projects set out to address the following core research questions:

1. What influences farmers' decision-making and behaviour?
2. How to change farmer's level of knowledge and competency?
3. Which knowledge transfer methods are appropriate for different situations?
4. What are the knowledge and skill competencies of current and future innovation support service providers?

The research topics are assigned to the students who, after spending the first semester at UCD undertaking taught modules in statistics and research methods, spend the next 15 months based at advisory/ education offices where they research their assigned topics while working closely with the local advisory/ education team. Local Teagasc staff is typically involved as members of an advisory group, which guides the design of the research project and comments on initial findings. The result is the generation of information, which is of immediate relevance to the work of the local advisory services. In tandem with their research work, the MAgrSc students spend up to 50% of their local office-based time working closely with the local Teagasc staff on delivery of services to farmers. This work is mentored by local staff and results in the development of a skills set and experience for the students in their future careers.

Outcomes to date: To date this programme has fully completed 4 research projects, with 10 mid-stream and a further 12 projects to begin early 2013. The integration of the advisory and research activities coupled with the local-focus of the research projects themselves through this programme has provided new insights into the effectiveness of current advisory and education practice. It is also contributing to the development of skills and experience of a new crop of agricultural graduates who can contribute to supporting the innovation necessary to meet the challenges and possibilities that lie ahead for Irish farming.

The Agricultural Science Association Ireland – Skills for Professionals in the Agri Sector

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Introduction: The Agricultural Science Association of Ireland (ASA) is the professional body for graduates in agriculture, horticulture, forestry and food science and technology. Its members operate across the entire industry, covering government departments, research, advisory, consultancy, education and training, agri-business, rural organisations and the media. Founded in 1942, the ASA is one of Ireland's longest established professional associations. It is recognised by the government as a negotiating body and has played an active role in policy development and in ensuring that the expertise of its members is utilised fully in the national interest and that the professional interests of its members are promoted and protected.

Role of the ASA: Members of the ASA have been to the forefront in guiding change and helping the industry to increase productivity and innovation and to enhance Ireland's reputation as a producer of quality, safe food. In their diverse roles, members are in contact with every farmer, food processor, input and service provider as well as students at all levels of the education cycle thereby giving the ASA a unique feel for the pulse of the agri-food economy and rural Ireland. Enabling members to get access to the latest technical, business and policy information and facilitating debate and interaction between members on new developments and technologies is at the core of the ASA mission. The appointment of a full-time Manager in 2008 combined with active and energetic Presidents and Councils and incessant demand from members has resulted in a dramatic increase in the number of ASA technical and business events.

In-Service Training: In the past 12 months, seminars, farm tours, workshops and discussions were held on issues such as dairy expansion and efficiency, CAP reform, technologies for profitable beef production while special meetings were held to update members on trends in agri-food and the broader economy. The large attendances at these events reflect the demand from members for well-focused in-service training.

Professional Development Activities: Many ASA members work as sole traders or in companies and organisations where there are limited resources for updating on new technologies and policy and business developments. The ASA events schedule is an important outlet for personal and professional development for these members. It is also a valuable networking opportunity. Therefore, the structure of the event is crucial. Reaction from members has informed us that a combination of indoor presentations and discussion followed by afternoon farm or factory visits is the preferred structure for most events. The quality and relevance of the expert presenters has a big bearing on attendance and satisfaction levels, as is the competence of the facilitator. The following are examples of successful events we ran during the past year.

- A half day workshop on dairy expansion involving New Zealand agri-business consultant Ivan Lines. Members benefited greatly from Ivan's forthright presentation on the lessons learned during the explosion in the Southland dairy herd, from 20,000 to 500,000 cows, in a 20-year period.
- One of Ireland's top dairy farmers hosted an ASA in-service day on expansion from an efficient base which featured Kerryman Professor John Roche, one of New Zealand's leading dairy experts.
- Leading technologists from Teagasc, UCD and Animal Health Ireland addressed a special beef technical update seminar followed by a tour of a meat factory and a high-performing suckler beef farm.
- Chief executives of Ireland's leading agri-food companies outlined prospects for their companies, the agri-food sector and the economy.
- A seminar on in-depth analysis of the CAP reform proposals from Ireland's most senior negotiating official.

Skills Development: Training in skills development is another important component of the ASA range of services to its members. A recent example is the organisation of courses in sales training for members who would find it difficult to access such courses in their own right. We are also in the process of establishing a 'Mentoring' programme aimed at assisting members in securing employment or in planning a career change. Future members of the ASA are a vital target audience. Large resources are devoted every year to equipping under-graduates to prepare for the world of work. This is done through a special careers event where established graduates share their experiences and give guidance on career planning and through mock interviews conducted by ASA members. Every year the ASA also sponsors four under-graduates to travel overseas to undertake the professional work experience of their degree programme. Many of these activities are run in partnership with companies involved in the agri-food sector.

Skills Provision for the Future: The high point in the ASA annual calendar is our national conference. It has established itself as one of the premier events for information and debate on the big issues affecting our sector. Our experience in recent years has shown that ASA members value the range of updating and personal development services provided by their association. Ensuring that our activities and services are relevant to the needs of our diverse membership base is a continuing challenge. We are committed to doing our utmost to deliver.

Workshop 4 – Working with Industry Partners to Make Change Happen

Moderator: John O'Callaghan, General Manager, Kerry Agri-Business

Teagasc/Dairygold Milk Quality Programme: Working with Industry Partners to Improve Milk Quality

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Introduction: In 2006, Dairygold in conjunction with Teagasc initiated a programme to deal with milk quality issues such as Total bacteria counts (TBC's), Thermophilic Bacteria and primarily Somatic Cell Count/Mastitis. It was clear to Dairygold who introduced the balanced score card bonus payment system that milk quality had to be tackled and resolved in a practical, focused and cost effective manner.

What was required from the Programme?: It was agreed that the programme had to be available to all farmers of the Dairygold cooperative. Milk quality issues represent a multi-factor problem so knowledge for the programme was pooled from all disciplines within Teagasc, from research personnel, dairy advisers, and industry. The objective of the co-op was to target farmers with milk quality issues who were not engaging with advisers or attending open days and who were generally unreceptive to help or guidance which the co-op and Teagasc had made available through the Monitor Farm model. The co-op compiled a list of farmers with SCC issues on a monthly basis and specialist Teagasc Advisers would provide targeted support to these farmers in conjunction with co-op milk advisers.

Initiation of Programme: With a new initiative it was important to have a positive start so we engaged with farmers who had problems but who were also willing to accept and work with the advice and programme drawn up. This was an important part of the programme as these farmers acted as promoters of the programme to their peers at discussion groups and in public forums. It was decided that the best way to approach farmers who were not looking for help but required help, that contact from a co-op milk adviser and Teagasc adviser would be established and that a farm visit would be made. It transpired that all of these farmers accepted the visit and were delighted we made the approach. This approach was a huge factor in achieving results.

Addressing the Practical Needs of the Farmer and Adviser: Attending the farm at milking time was the single biggest impact on the success of the programme. The advisers committed to be present during milking time. Milking techniques could be evaluated, teat condition could be evaluated, the Californian Mastitis Test (CMT) kit could be demonstrated and results interpreted. Checks of milking machines during milking were carried out to see if optimal performance was obtained. Farmers often commented that they liked the independence of the investigation and they felt an objective approach was promoted. Nothing was assumed. Where attendance at milking was not an option the farmer would keep back 5 to 10 cows for examination, i.e. teat condition scoring, CMT kit examination etc.

A one-page report was provided to the farmers identifying the strengths and weakness of milk parlour, milking routine, quality of records and recommending issues needed to be dealt with over the short, medium and long terms. It was important that the language used was farmer friendly and was specifically directed to the case at hand. It was important to give time to a particular visit: as more discussion developed, usually around the kitchen table, clarity was established and misunderstandings were ironed out. A lack of accurate records was the biggest weakness at farm level and it represents a significant challenge for an adviser to analyse and correct the problem. Having access to bulk tank records through the milk adviser was a significant resource.

Barriers and ways of Enhancing the Programme: All advisory methods were used to disseminate the knowledge gathered: farm walks, milk quality clinics, one-to-one calls, discussion groups, training of co-op milk quality advisers and radio interviews. This technology can be transferred to other contexts, as shown with the Kerry Group Milk Quality programme. A weaknesses of the programme was at the start where monitoring and follow-up on cases was not easy. This was tackled by the milk adviser monitoring bulk tank SCC figures on an ongoing basis. Availability of milk recording was a limiting factor as a number of problem herds had little or no individual cow information. It is important to get more professionals trained to give a clear and consistent message to the farming community. The farming community are willing to embrace new concepts and technology even if it means an extra work load once the benefits are clearly identifiable and a consistent message is delivered. A significant bonus for the co-op was that co-op figures improved significantly with an increase in the amount of milk under 200,000 SCC.

BVD Eradication - Towards a National Programme

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Introduction: Animal Health Ireland (AHI) was established in 2009 as an industry-led, not-for-profit partnership between livestock farmers, processors, service providers and government, with the goal of improving the profitability, sustainability and competitiveness of livestock farmers and related industries through superior animal health in relation to non-regulated diseases (More 2011). Shortly after its formation, a Delphi study of national animal health experts and surveys of dairy and beef farmers were undertaken (More *et al.*, 2010). As a result, bovine viral diarrhoea virus (BVD) was identified as one of several bio-secure diseases prioritised for action.

Literature review/state of the art: It has been demonstrated elsewhere in Europe that BVD control at regional or national level is possible (Lindberg *et al.*, 2006, Presi *et al.*, 2011). However prior to the current programme, control in Ireland has essentially been conducted in an unsystematic manner at farm level.

Extension system/Practice Tool/Challenge examined: in 2009 AHI established a technical working group (TWG) on BVD that developed consistent guidelines on how to deal with BVD at the individual farm level. To develop options for national control, a BVD Steering Group was established in 2010 to review epidemiological aspects relevant to its control, the economic impact of BVD and best practice in terms of eradication programmes elsewhere in Europe (Barrett *et al.* 2012). Building on this, a national consultation process was launched in December 2010 to gather views on support for an industry-led national BVD eradication programme, supplemented by extensive stakeholder discussions. The results of the consultation process were collated in the spring of 2011 and indicated strong support for an industry-led national programme using tissue tags as the primary testing method and delivered through a short term intensive programme. AHI also commissioned a study that for the first time estimated the annual national losses due to BVD and showed a clear cost benefit for control. In June 2011 a BVD Implementation Group (BVDIG) was convened. This drew members from across industry, with representatives from farm and veterinary organisations, breed societies, the Irish Cattle Breeding Federation, Teagasc, the School of Veterinary Medicine at University College Dublin, AHI and the Department of Agriculture, Food and the Marine. Based on available information the BVDIG took the decision to proceed with the design and implementation of an industry-led coordinated national BVD control programme and has met regularly since then to progress this goal. Key challenges for the group related to the design and communication of the programme. This programme has been implemented voluntarily in 2012 with the intention of progressing to a compulsory phase in 2013.

Discussion and Implications for Extension Practice: a structured, logical progression has led to the development of a national BVD programme. Stakeholder engagement and involvement in the BVDIG were key facilitators of progress to date. Prior to January 2012 significant efforts were put into developing a comprehensive communication strategy that included the farming press, information leaflets, digital media, website, stakeholder channels of communication and regional meetings for farmers and vets. Based on this approach, sufficient tissue tags have been ordered to test over 25% of the 2012 calf crop, establishing a strong foundation on which to progress to a compulsory programme in 2013. A detailed review of the 2012 programme will provide further information for development and communication of this phase.

Summary: AHI represents a new approach to control of non-regulated diseases such as BVD in Ireland. Significant progress has been made to date showing the potential of industry-led programmes built on consensus to deliver real progress.

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Teagasc/Germinal Seeds Grass Roots Project 2008-2010

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Introduction: The Grass Roots Project took place on 17 host farms from 2008 to 2010. Over 200 support farmers across 11 counties took part in the project on host farms. The main objective was to show and teach dairy farmers how to measure and manage grass weekly. Both the host farmers and the support farmers paid Teagasc a service fee in order to participate in the project. While farm size and soil type differed among all farms, the basic grass management principles applied to all farms.

Practice: Each host farm was visited every 3 weeks by the project leader (14 visits per year). Up to 15 local support farmers walked the farm with the host farmer, the project leader and the local Teagasc adviser for the measuring and decision making process. After walking, the group returned to a teaching room on the farm. The group reviewed the management decisions made at the previous meeting (three weeks earlier) before interpreting the results from the most recent farm walk. Key grassland management decisions were made by the group for the host farm at each visit. Every host farm was walked weekly by the host farmer.

Discussion: Herd size on host farms increased from 94 to 146 over the 3 year period. The average milking area stocking rate was 1.95 cows/ha in 2007 and 2.75 cows/ha in 2010. It ranged from 1.77 to 3.67 cows/ha in 2010. The average meal fed was 419 kg /cow during the project. This was a decrease, in spite of two bad weather years and an increase in stocking rate. Since the host farmers joined the project they measured grass weekly by walking the farm, estimating yield and making decisions. This resulted in better grassland management and gave the farmers confidence to expand herd size and feed more cows to produce more milk from grass. Grass grown per hectare increased by 3 tonnes Dry Matter (from 9 to 12tDM /ha). There are average daily growth rates available for each of the 11 counties in the project. There was little or no variation in growth rates between the different counties. All farmers now know how much grass their farms are growing per year and per paddock. On average 30% of the farms were never reseeded. A better reseeding plan is required as herd size increases. The average days at grass over the period of the project were 304 days.

The number of cows not in calf averaged 13% after a 16 week breeding season. This shows the potential of well managed, grass based spring milk production farms to achieve successful in calf rates during an expansion phase. The average start date of calving was the 1st February while the mean calving date was the 27th February. The milk solids produced per hectare increased by 203 kg milk solids/ha on average for the group to 1,013 kg MS/ha. Milk solids per cow dropped as the stocking rate increased. Milk solids per cow dropped for 3 reasons; (1) less meal being fed, (2) two years of very wet weather, (3) expanding herds hence not mature herd production. The average percentage butter fat and protein increased by 0.17% and 0.13% respectively on the host farms. The amount of nitrogen spread over the 3 year period increased. All of the host farmers had derogations and were all within the Nitrates limits. The average pH is 6.1 on the farms. The average phosphorus (P) and potassium (K) status of host farms was at index 3. More attention has to be given to soil fertility. On average the difference in net margins of the host farmers was 2.02 c/l above the comparable industry standard. This shows good grassland management delivered an additional €93/cow for the 17 host farmers.

Summary and Implications for Extension: The host farmer, support farmer and adviser benefited from the experience gained in walking the host farms every three weeks. This gave the support farmers the confidence to use the agreed targets on their own farms. The support farmers brought their own key grassland measurements to the meeting for discussion. The process allows the adviser use a good host farmer to deliver key messages to groups of other farmers.

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Teagasc/Kerry Agribusiness Joint Programme

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Introduction: Since 1994, Teagasc in conjunction with Kerry Agribusiness have collaborated in a joint programme “Focus on Profit”. At the launch of the programme (2008 – 2010) the General Manager of Kerry Agribusiness said *“The success of previous programmes was mainly due to farmers, processors, advisory and research all working together with a common goal of improving the standard of living and quality of life of dairy farmers”*. This is compatible with Massey (2000), who states *“as complexity in the environment increases, a move from technology transfer to human development and a shift from science-based knowledge generation to co-learning by all stakeholders is necessary”*

Benefits of a joint industry programme: Some of the benefits of a joint industry programmes are as follows: 1) a considerably wider network of contacts to promote the activities of the joint programme e.g. public events on monitor farmers; 2) use of management principals commonplace in private industry e.g. economic sustainability measured and benchmarked through the profit monitor advisory tool; 3) the Teagasc dairy technical programme receives a much higher profile in a joint programme due to better use of resources (people and information); 4) the key objective of sustainability is aligned so that vital principals are consistently promoted e.g. grass based dairy systems and herd breeding compatible with the system; 5) continuous learning for everyone as circumstances change e.g. setting realistic targets for milk production expansion based on local conditions and experience.

Challenges: Some of the challenges of joint industry programmes are as follows: 1) building and maintaining trust are critical to success when two organisations embark on a joint partnership; 2) this requires keeping lines of communication open at all times; 3) divergent expectations/goals of two organisations can occur; 4) takes time and compromise to reach agreement.

Best Practice: Elements of best practice in a joint industry programme are as follows: 1) clear agreed objectives; 2) clear responsibilities; 3) realistic and clear objectives of what can be achieved. 4) an end goal with commitment to achieving it; 5) objectives aligned with other goals of the extension organisation.

So how does industry partnership enhance the potential for positive change at farm level? 1) measures of success e.g. practices associated with the achievement of milk protein targets at farm level are clearly linked to farmers achieving a greater standard of living; 2) the achievement of key business principles, as measured by farm profitability targets, is enhancing the quality of life of participants; 3) the progress of monitor farmers serve as a recognised key benchmark for all farmers because research-based practices are employed in local conditions e.g. local soil type, weather, land fragmentation; 4) a wider profile of suppliers participate in joint programme events due to the active promotion by the industry partner e.g. through their phone texting service and farmer contact with industry personnel; 5) industry partners working directly with extension organisations enhances the prospects of success in delivering relevant messages and of those messages being embraced by the farming community; 6) successful outcomes to joint initiatives have recently been undertaken e.g. soil fertility campaign, milk quality campaign, dealing with ongoing challenges e.g. winter feed deficit.

Summary

The experience from the joint dairy development programme “Focus on Profit” illustrates the benefits of a team approach to making positive change happen in a complex industry with many challenges and some resistance to change typical to all walks of life. Continuous refinement of best practice in relation to the clarity of objectives, expectations, and areas of responsibility can further enhance the benefits to all stakeholders.

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Working Jointly to Provide Services to Farmers

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Introduction: Over the past forty years, vast improvements have been made in all sectors of Irish agriculture. The impressive progress that has been made is largely attributable to the research, training and advisory services provided by Teagasc and its predecessors. As well as targeting technical performance, emphasis has always been on financial efficiencies to ensure the ability of producers to compete internationally. With increasing world demands for food, Teagasc must continue to provide the required personal training and knowledge transfer whilst surviving the impacts of recession.

State of the Art: Teagasc imparts knowledge to farmers by way of education and training, discussion groups, open days, informative literature and individual consultations. General agricultural advisers are supported by specialist enterprise advisers. A proportion of advisers' time is spent assisting farmers comply with the requirements of EU Schemes such as the Single Payment Scheme, and Environmental Schemes. The Agricultural Consultants Association (ACA), established in 1979, has about 150 members plus ancillary staff distributed throughout Ireland. These consultants tend to supply services primarily towards EU Schemes, and also offer general agricultural consultancy services.

Challenge Examined: Teagasc could provide a valuable role in the training of Agricultural Science Graduates to become confident and competent advisers/consultants. This training would be provided by research workers and specialist enterprise advisers. Training is required in the areas of livestock production, arable crops, environmental schemes and accounting/financial matters. This would benefit Teagasc, the ACA and farmers in the following ways:

1. Experienced Teagasc advisers would be making optimum use of their professional training.
2. Private consultants would integrate more closely with Teagasc advisers, and be in a better position to offer contract services to specified standards.
3. Farmers would have greater access to agricultural advisory services.

Discussion: Satisfactory transfer of knowledge to farmers requires direct liaison with a competent agricultural scientist. The adviser/consultant must have adequate training and knowledge to convey the relevant message in an authoritative manner. The advisers' role is becoming increasingly demanding as farmer expertise continues to improve. There is an ongoing requirement for adviser support services. As Teagasc adviser numbers have been decreasing, ACA adviser numbers have been increasing. Teagasc have started sub-contracting some work modules to ACA. There is potential for significant expansion of this strategy with benefit to all parties involved. The opportunity for sub-contracting of services is present in areas such as student teaching, EU Schemes consultancy, legal consultancy and preparation of environmental impact statements.

With increased fertiliser prices, and strict EU regulations applicable to the use of Nitrogen and Phosphorus fertilisers, there is a greater requirement for advice to farmers on nutrient management. The majority of farmers need assistance with interpretation of laboratory soil analyses to optimise fertiliser allowances for the farming enterprises that are in place. Advisory services are similarly required with the interpretation of analyses of forages and feedstuffs.

There is a need for greater liaison between dairy and suckler cow farmers with agricultural advisers and veterinary practitioners in matters relating to herd fertility and farm biosecurity risk assessment. This entire area is becoming of increasing importance as herd sizes expand and the standards applicable to milk and meat production are constantly growing. Teagasc is in a good position to establish the required advisory services, using their own resources and engaging the services of private consultants as required.

Summary: The transfer of knowledge to farmers is becoming more demanding and specialist oriented. Teagasc has the structure to generate knowledge, and provide specialist training. This knowledge can be transferred to farmers by trained private consultants, who also deal with agricultural matters regarding EU Schemes, legal cases, accounting and financial requirements.

Poster Exhibition

Promoting Health and Safety Legal Compliance on Irish Farms through Extension

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Introduction: Improving health and safety among the farming community presents a major challenge both in Ireland and worldwide. In Ireland, approximately 30% of workplace deaths and an estimated 2,500 accidents causing serious injury occur on farms each year. This paper reviews the principal components of a national extension project being implemented in Ireland which is aimed at assisting farmers to effectively manage on-farm safety and health.

Literature Review: A review of the scientific literature by Rautiainen *et al.* (2008) indicates that a limited number of reports of effective farm safety interventions have been published worldwide. Furthermore, the reports of interventions published are generally short-term and subject to limitations. In Ireland, Finnegan and Phelan (2003) reported that 5% of farmer in Ireland annually sought advice related to occupational health and safety (OHS) suggesting limited engagement with this issue. In the USA, a national study of OHS extension programming indicated that it was limited and that a deficiency existed in support materials available (Pierson and Murphy, 1996). Thus the literature indicates a need for enhanced extension programming and associated evaluation of OHS in farming.

Extension System: Statutory changes in Ireland in 2005 require farmers to complete a Risk Assessment (RA) for their farm. A RA format (available at http://www.teagasc.ie/health_safety/) was prepared jointly by Teagasc and the Health and Safety Authority as part of their Joint Initiative and circulated to all farmers in year 2006. A half-day training programme on completing the RA format was devised and made available to farmers nationally from year 2006 onwards. Thus an extension system related to OHS was devised and implemented in Ireland since 2005. Circulation of the RA format and provision of training was preceded by an evaluation of both the RA format and training among a sample of farmers (270). Eighty seven percent found the RA format easy to understand while 100% found attendance at training worthwhile (McNamara *et al.* 2007). An examination of completed RA documents (473) found that 74% were completed satisfactorily. Scoring of farms (66) for OHS standard and practices found that 76% were satisfactory. Unsatisfactory scores were associated with non implementation of the controls specified as required by the farmer in their RA document ($P=0.0$) and with Dairy farming ($P=0.039$). No significant difference for both RA document completion and farm safety score occurred between farmers attending and not attending training. In 2012, preliminary data from the Teagasc national farm survey indicates that 55% of farmers have now completed the RA document and 22% have attended a half-day training course. As data is also available from this survey on the rate of farm injury, further evaluation of the efficacy of the Irish OHS extension approach may now be possible.

Discussion and Implications for Extension Practice: Implementation of the OHS extension approach adopted in Ireland indicates that it is possible to increase engagement of a high proportion of farmers in OHS in an efficient way. Regarding effectiveness of implementation of OHS at farm level, the evaluation conducted indicates a satisfactory evaluation on about 75% of farms in the study. The implications for extension practice include engaging with OHS non-participating farmers, further evaluation of the role of training and how to further support non-adopting farmers.

Summary: An OHS extension programme, including an evaluation component, is being implemented in Ireland.

Acknowledgements: The input of Teagasc and H.S.A. staff and participating farmers is acknowledged.

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Pesticides-Related Challenges Facing European Advisers

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Introduction: 'New Advisers' project is a pan-European collaboration to define and transfer some effective methods for advisers and trainers for use in agronomy, particularly concerning pesticides. This European Leonardo da Vinci funded project encompasses eight countries and two transnational advisers' networks. The countries and networks participating in the programme are Portugal, Spain, Ireland, Germany, Sweden, Hungary, Slovenia, France, European Chambers of Agriculture, International Academy of Agricultural and Home Economics Advisers.

Rationale: The structure of agricultural advisory services in Europe is diverse ranging from government supported integrated agencies, consumers associations, private entities to emerging advisory bodies. The Common Agricultural Policy 2003 established the Farm Advisory System (FAS) as a major mechanism to achieve its aims through Cross Compliance measures. However the implementation of FAS is varied across European members (Labarthe, 2010). European policies after 2013 could further strengthen the Cross Compliance regulation and may substantially change the FAS. Recently, the Statutory Instrument 155 of 2012 was enacted transposing the Sustainable Use Directive (SUD) on pesticides (Dir 2009/128/EC) into Irish law. SUD is concerned with all aspects of pesticide use in Ireland. All other European countries will also have to enact this Directive by preparing National Pesticide Action Plans. Against this background, the project will work on adapting the skills deployed by the agricultural advisory networks to address the requirements under the SUD Directive.

Method: Increasingly advisers and trainers have to consider complex issues which are not specifically agricultural such as protecting water, biodiversity and global warming. The combination of a traditional adviser's role with these new complexities requires the adviser to have a strong scientific background, knowledge of local soils and climate, and other socio-technical, regulatory, organisational and institutional knowledge. The project will develop 'learning by doing' approaches enabling farm advisers and trainers to efficiently build local solutions around pesticide issues. The project departs from the idea that ready-made technological packages need to be mechanically transferred wholesale from sources of knowledge to end users. Rather, it embraces the view that complexity, rapid and permanent change, the uniqueness of each individual farmer's situation, perceptions of multiple stakeholders and human factors such as trust-building, all need to be taken into account. The 'New Advisers' project combines agronomic advice and training with inputs from other disciplines such as education and sociology of organisations to equip trainers and advisers with new tools and methods that can be adjusted according to the audience and local circumstances.

Extension System: In each country selected advisers will identify problems and resources/tools to help solve pesticide related issues. These select advisers will then test identical tools to solve agronomic problems situations. The tools will be assessed against their ability to enable mobilisation of expertise and skills, access to scientific knowledge, integration within information chains and confidence regarding delivery of quality advice. It will test, evaluate and fine-tune *Discussion Groups*, *Clear Vision* and *Problem Based learning* methods in all the countries covered by the project.

Outcome: The outcomes from the project will be varied. Information will be hosted on a transnational network website (Endure Network) and will include manuals for advisers on phytosanitary topics (references, pesticide characteristics, comparative experiments, etc), handbooks for training advisers to a high level (in relation to ECVET), and descriptions, results and testimonials for all tools tested. The site will continue as a platform for methodological and cognitive resources in agronomy after the project. The results of the project will also be disseminated in all participating countries and extended to other states in southern and Eastern Europe through conferences, etc. The project will also interact with policy makers at national and European (FAS) level.

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Endure Network: <http://www.endure-network.eu/>

Adopting Best Management Practices: The Influence of Farm Routines and Capabilities

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Introduction: This research examines how capabilities of the individual and routines of the firm influence the adoption of nutrient best management practice. Specifically it contributes to an understanding of how practices are incorporated into existing routines of the firm through capabilities. This paper uses empirical evidence to apply the evolutionary theory of the firm to the adoption of a key decision making tool – soil testing – by Irish farmers. This is a mixed methods study which uses complementary data. It uses quantitative data and a binary logit model to analyse soil testing from a nationally representative survey of 231 Irish farms. The organisational characteristics of the farms that use soil tests are identified using this analysis. Then, qualitative data derived from interviews explores actual usage of soil testing as a component of the farmers' nutrient management capability. Information on the different constituent routines underpinning nutrient management capability is outlined. There are eleven nutrient management routines in total. These routines were used to identify a selection of farmers for interview. Analysis of interview data illustrates the on-farm use of soil test information for planning and decision making purposes and the relationships between the use of soil test information and nutrient management routines and capabilities.

Literature Review: The purpose of regular soil sampling is to determine the nutrient status and the PH of the soil (Gallagher and Herlihy 1963). Soil testing is a component of a wider nutrient management routine. It informs the activities on the farm surrounding other nutrient management routines in terms of application. Based on discussions with agricultural experts there is consensus around the importance of soil testing. There are few, if any, universal variables that explain technology adoption (Knowler and Bradshaw, 2008). In general, studies in this area use tangible observables to explain differential adoption. Informed by the evolutionary theory of the firm this paper examines whether managerial capabilities of the individual and routines of the firm influence the adoption of key farm level practices. Differential management capability is a common explanation for differences in farm level efficiencies. However, studies of such capability differences rarely go beyond the addition of a biographical variable such as education into the analysis (Rougoor *et al.* 1998). Competencies and capacity are not considered in any further depth in terms of drives and motivations, abilities and biography (Nuthall, 2001). The qualitative data allows for the exploration of why such practices are used and in what way they are used on each farm. Learning at farm level takes place at a micro level (the individual) and at a macro level (the firm routine).

Challenge Examined: Two conflicting motivations for adoption of soil testing may exist – production and environmental motivation. Firms are production-motivated but they also must be environmentally aware in the context of EU and national legislation. To achieve a balance between these two is the challenge. Targets set by Food Harvest 2020 to increase milk production by 50% pose an environmental challenge for the Irish Dairy industry. There is a need to increase production in a sustainable manner through more efficient utilisation of resources. However, to achieve these dual productivity and environmental targets, relevant farm level capabilities and routines need to be understood.

Discussion and Implications for Extension: The requirements of extension agents differ greatly in accordance with their clients capabilities. Best management practices generally are a “one size fits all” solution to problems which, at farm level, have different dimensions and contexts. In other cases, data from other sources is required. Qualitative data from the study revealed that the use of highly specialist external knowledge for some on-farm decision making, for example suppliers advice on the purchase of liquid nitrogen or new varieties of grass seed, is important. For other decisions, farmer knowledge of on farm conditions and embedded management routines are the key drivers of production decisions.

Summary: It is important to recognise the differential levels of capabilities which exist among farmers. In order to improve farm routines, research must identify ways to create new capabilities by building on existing capabilities. This means acknowledging the different sources of knowledge that farmer use for various farm level decisions.

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Evolving Innovation Support Arrangements: A Focus on Innovation Brokering

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Introduction: A prevailing challenge for the Irish dairy sector is the incidence of mastitis in the national herd. A focus on innovation can help control the problem. From an innovation system's perspective cooperation among stakeholders is key to delivering innovation. Thus, agricultural innovation support arrangements are required to move beyond increasing the supply of new knowledge and technologies to a focus on stimulating multi stakeholder interaction. Recent innovation studies emphasise the significance of broker activity to initiate and operate such networks. Positioned as a third party member of an innovation system, brokers act a liaising role between stakeholders.

Literature Review: Innovation brokering extends beyond the role of traditional agricultural extension from that of on-to-one intermediary concerned with transferring knowledge to that of an intermediary that creates many to many relationships concerned with finding ways to negotiate working relationships (Klerkx and Gildmacher, 2012). The generic brokering functions include articulating demand of clients, searching and linking actors for cooperation and guiding the subsequent innovation process Batterink *et al.* 2010, Klerkx and Leeuwis, 2009). The literature distinguishes between brokering undertaken by specialised broker organisations and as a by-product of principal activities of an organisation.

Challenge Examined: Mastitis imposes substantial costs on the Irish dairy sector. The problem affects farm and processor activities as well as the national reputation of Irish milk quality. One approach to tackling the problem is CellCheck - the national mastitis control programme which commenced in 2009. The success of CellCheck rests on industry stakeholders working together. To overcome prevailing low levels of interaction in relation to mastitis control CellCheck established a brokering function. Representatives from the milk processing sector are undertaking broker activities as part of milk processors' support of CellCheck and have core responsibility for stimulating and sustaining engagement with the programme at local level. The functions include acting as a CellCheck point of contact at local level, coordinating trained service providers and farmers for forthcoming farmer workshops and operate in the future as a bridge between skilled service providers and farmers that require group problem solving or one to one farm specific help.

Discussion and Implications for Extension: The case study of CellCheck indicates the presence of innovation broker activity in the Irish dairy sector. The innovation brokering effort identified strives to build coalition between stakeholders in the support and management of the innovation process. The role is undertaken as a side activity by an existing stakeholder. The brokering functions fulfilled are identifiable in the broker literature and include demand stimulation, formation of networks and innovation process management. This case study finding of innovation brokering activity points towards a development in agricultural innovation support arrangements in the Irish context which has implications for extension activities. The innovation support extends beyond facilitating access to knowledge and technologies to focus on bridging relationships between stakeholders to deliver innovation. Extension already with the skills of intermediation could undertake brokering role to support links in the agricultural innovation system.

Summary: To reduce the incidence of mastitis in the national herd a focus on innovation is important. By highlighting one approach to tackling the problem the study identifies a new innovation support activity in the Irish context – innovation brokering. Broadening extension practices to include brokering activities could support multi stakeholder interaction for improved delivery of innovation.

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Forty Shades of Green: Implications for Knowledge Transfer under a Changed CAP

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Introduction: It is increasingly recognised that a ‘bottom-up’ participatory approach to extension is required to cope with the integrated economic, social and environmental dimensions of the European Union’s Common Agricultural Policy (CAP). Forthcoming changes to the CAP include supplementary measures to Pillar One intended to improve the environmental performance of agriculture. There is a challenge to develop innovative extension approaches to assist the implementation of these measures, that are effective in garnering ‘buy in’ of farmers, as well as satisfying the scientific and policy related aspects of good environmental practice (Hart and Baldock, 2011). This research involves the use of a Participatory Action Research (PAR) approach to collaborate with key stakeholders in the development of novel extension models that will have application in the Teagasc context.

Literature Review/State of the Art: It is broadly accepted that the challenge of implementing further greening measures will be complex, and indeed “will be cumbersome and costly to implement” Matthews (2012, p.2). However, if the CAP is to react to emerging environmental challenges the measures must be realised (Hart and Baldock, 2011). In such a context where there are multiple stakeholders and interests involved, a PAR approach to developing extension methods has a specific type of potential, as it provides an uncontested atmosphere where knowledge sharing can occur. PAR allows participants to learn and problem solve together. The literature recognises that genuine participation by stakeholders in knowledge creation produces extension practices that are more likely to be adopted (Pretty, 1995). ‘Buy in’ from farmers and other stakeholders would significantly ease the responsibility of implementing a greener CAP.

Extension System/Practice/Tool/Challenge Examined: PAR links participation, social action and knowledge generation and will be used in this project to develop ‘conversational’ (Talbot, 2004) “spaces for learning” (High, 2002). Stakeholder participation is an essential component of a learning system and a requisite for meaningful change to be affected by the system (Pretty, 1995). Stakeholder participation helps build consensus and has been observed to have specific application in assisting the implementation of environmental policy (Doody *et al.* 2009). The PAR approach allows farmers, advisers and other relevant stakeholders to be co-drivers in developing a novel extension process, which leverages different knowledge types, perspectives and interests, thus enhancing stakeholder ‘buy-in’ (Macken-Walsh *et al.* 2010; Triomphe, 2012).

Discussion and Implications for Extension Practice: This doctoral research project will over the next three years use PAR to create an open space for learning, where multiple stakeholders will consider and suggest how the forthcoming greening measures could be implemented to best balance farm operations and environmental sustainability. The information gathered will feed into Teagasc’s Knowledge Transfer programmes.

Summary: This doctoral research uses PAR to develop novel extension approaches for application in Teagasc’s Knowledge Transfer service that will facilitate the implementation of a greener CAP.

Key References/Acknowledgements: This research is a collaboration between Teagasc and the Open University.

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New Dairy 2020: A Multidisciplinary Study of Technology Adoption among New Entrants to the Irish dairy industry

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Introduction: In anticipation of milk quota abolition in 2015, the Irish government have initiated a New Entrant Scheme which allocates ¼ of the 1% annual increase in national milk quota to new entry dairy farmers from 2009-2014. Over three hundred new entrants have now successfully received 200,000litres of milk quota within the first 4 years of the scheme, providing insight into the initial evolution of the Irish dairy industry post-quota. The objective of this study is to evaluate the experiences of new entrants to the Irish dairy industry in terms of setup challenges and the influence of breeding, grassland and financial technologies on the success of these new dairy businesses.

Literature Review: The New Dairy Entrant scheme has allowed a young and highly educated group of farmers to convert their existing beef and mixed enterprise farms to dairy farms (McDonald *et al.* 2012). The application of new management technologies will be essential in developing more efficient, low cost production systems for the Irish dairy industry in the future (Dillon *et al.* 2006) and there is potential for technologies such as pasture budgeting (O'Donovan *et al.* 2002a), financial management (Jackson-Smith *et al.* 2004), and improved animal breeding strategies (Coleman *et al.* 2009) to increase production efficiency. Previous studies have identified the significant impact of perceived usefulness and perceived ease of use of a technology on the adoption rate of new technologies (Flett *et al.* 2004).

Challenge Examined: The experiences and factors affecting new entrant technology adoption were examined using survey methodology to investigate the perceptions of new dairy entrants to the main dairy management technologies. The objective of the analysis was to determine new entrant farmers' attitudes, knowledge and experiences with dairy technologies in the initial new business set-up period and to pinpoint key focus areas for future dairy farmer education in preparation for the development of a new or expanding dairy enterprise.

Discussion and Implications for Extension: Respondents reported cash flow challenges due to higher than anticipated development costs, thus affecting the day-to-day running of the enterprise and in most cases leading to higher loan repayments than intended for their initial years of dairy farming. The realisation that grassland management is critical to a new and vulnerable dairy business was prominent from the initial survey analysis. New entrants sourced their information mainly from a relative or friend involved in dairy farming, while 90% claim to have an adviser or consultant. The survey also indicated that the overall adoption rate of the principal breeding, grassland and financial technologies is relatively high among new entrants (66%, 69% and 67%, respectively) in comparison to National statistics (Hennessy *et al.* 2011). In addition, results indicate that financial technologies such as annual financial accounting and cash flow budgeting are generally poorly understood with only 35% of respondents describing these financial technologies as easy to understand (compared to 60% and 57% for grassland and breeding technologies, respectively). Gloy and LaDue (2003) found that although financial technologies were in use they were often misunderstood and underutilised, and that some technologies were only used in order to become members of a local business organisation. While the results of this survey indicate that new entrant dairy farmers are adopting the relevant technologies adequately and it is acknowledged they will become more familiar with these technologies through repeated use, the lack of understanding of financial technologies in particular is of concern within highly debt financed farm businesses where stringent financial control and cash flow monitoring is essential.

Summary: The financial aspects of setting up a dairy farm are found to be the most challenging in the initial years of development. Although the majority of new entrants have converted from other enterprises, certain universal technologies still remain unutilised due to the perceived difficulty regarding their use. Using qualitative methodologies, the challenges related to new dairy farm set-up will be further examined in the coming months in addition to the main influential factors underlying the relatively high rate of technology adoption among new entrant dairy farmers.

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An Examination of how Teagasc can engage with New ICT to Better Communicate with Clients

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Introduction: Information and Communication Technology (ICT) developments across the world have advanced rapidly with wider availability of information dissemination devices at reduced costs. This allows commercial enterprises such as farming to access information relevant to their businesses in a more efficient and effective way (UNESCAP, 2005). Organisations servicing the agriculture sector, such as Teagasc, must understand the information seeking behaviour and the current media use patterns of their farmer clients, if they are to successfully engage with them.

Literature review: An Irish consumer ICT survey (Comreg, 2010) found that mobile phone penetration increased from 37% to 96%, from the second quarter of 2000 to the second quarter of 2010. The same survey identified an increase from 44% to 80% in the overall penetration of PC and/or Laptop ownership over a shorter timescale from the fourth quarter of 2006 to the second quarter of 2010. In 2011, 30% of broadband used was mobile, while fixed broadband usage had decreased from 60% in 2010 to 50% and cable broadband was responsible for another 15% (Comreg, 2011). CUITA (2010) reported that Irish farmers were lagging behind both the national and international population in terms of ICT adoption in relation to computer and internet usage. This research highlighted educational levels and facilitating conditions such as broadband connectivity, perceived usefulness of technology and the influence of family as barriers to adoption in Ireland.

Extension Practice Examined: This present study seeks to evaluate current usage of ICT by Irish farmers and analyse how Teagasc can engage with new ICT to better communicate with clients. This encompasses the aforementioned barriers to adoption as well as identifying and assessing new forms of ICT applications for use in the farming sector. This information is needed to assist in developing customised tools and strategies to increase the uptake and usage of ICT by farmers. A detailed survey of Irish farmers is currently in progress. Preliminary results (n=209), indicate that approximately 90% of farmers surveyed have a computer in their homes in 2012 of which 65% indicated its use for farm business. All of the farmers surveyed indicated that they use mobile phones, 30% of which are Smartphones. Ninety five percent of the farmers stated that they use their mobile phones on a daily basis primarily for text messaging and phone calls.

Discussion and Implications: Early indications from a survey of farmers suggest that ICT usage is strong within Teagasc discussion groups. Farmers are more readily contactable on their mobile phones, a fact which needs to be considered for future communications. A third of those surveyed indicated they had a Smartphone which may in the future open up new ways of communicating information to farmers.

Summary: The use of ICT is a priority for the diffusion of information to the farming community. Teagasc as an extension service is well positioned to engage with new ICT to better communicate with clients. The current study should enable Teagasc to develop an ICT package suitable for their clients.

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Identifying the Success Factors of Milk Production Partnerships with an emphasis on New Entrant/Parent Partnerships

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Introduction: Milk production partnerships were introduced to Ireland in 2002. Currently this is the only type of formally registered partnership available to Irish farmers. Ten years on, 620 such partnerships are operating nationally, comprising around 6% of dairy farmers in the country (Macken Walsh and Roche, 2012). This take-up of partnerships is low compared to other countries, and hence policy makers in Ireland have committed to removing obstacles under government and EU schemes to farmers involved in, or who wish to set up, farm partnerships. Furthermore, in the context of the Food Harvest 2020 report's ambitious target of a 50% growth in the volume of dairy output, the Department of Agriculture, Fisheries and the Marine has identified farm fragmentation and the age profile of Irish farmers as two significant factors which could hinder the achievement of this target. Farm partnerships have the potential to help address these potential limiting factors, in addition to achieving other benefits, such as improving the lifestyles of farm families (DAFM, 2011).

There is, however, a general lack of knowledge about farm partnerships in Ireland with regards to what a partnership involves, and indeed a lack of awareness of partnerships among farmers. Where farmers obtain information on partnerships, and the quality of that information, needs to be evaluated. Moreover there has been very little systematic research regarding how economically successful to date partnerships have been. This study, which currently is very much work in progress, aims to contribute towards filling these knowledge gaps. Its objectives are: (a) to identify the success factors and challenges in Irish farm partnerships, with a focus on new entrant/parent milk production partnerships; (b) to determine and demonstrate the benefits and costs that farm partnerships have brought to new entrants and the family; (c) to create a profile of the type of farmer best suited to being in a farm partnership; (d) to provide user friendly information on the success factors and challenges in establishing and running a farm partnership in Ireland, in particular by creating a checklist for farmers starting or thinking of starting a farm partnership.

Literature Review: Farm partnerships fall broadly into two groups, one group involving parents and new entrant sons and daughters, and the second group involving at least one dairy farmer with one or more other farmers. New entrant-parent partnerships currently comprise two-thirds of all the registered milk production partnerships in Ireland. Partnerships are a popular option and have been successful in other countries such as France, Denmark, Norway, New Zealand, Canada and the Netherlands. Indeed half of all the milk produced in France is produced under partnership arrangements. In Ireland the limited literature to date cites many benefits including social/lifestyle improvements, facilitating farm succession, management synergy, improved skill sets and a model of entry for young farmers. A number of challenges have also been identified such as single farm payment issues, personality clashes and loss of independence (see, inter alia, Macken Walsh and Roche, 2012; NRN Farm Partnership Working Group, 2012).

Practice under Examination: All milk production partnerships must register through the Teagasc registration office. Sixty questionnaires from a random sample of established new entrant-parent partnerships from the Teagasc register, and five detailed case studies of new entrant partnerships also randomly selected from the register, are being conducted. The data collection covers the types of issues outlined above. Farmers who are considering going into a partnership, young farmers looking for a means of farming in their own right, older farmers considering cutting down on their workload, the traditional family farm unit, Teagasc, its advisers, agricultural researchers and policy makers should all benefit from this research when it is completed.

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An Assessment of the Potential of a Grass Budgeting Service for Beef Farmers

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Introduction: At present the average Irish beef farm utilises less than 5 tonnes of dm/ha (O'Donovan *et al.* 2011). The objectives of this research project are to identify the barriers preventing beef farmers from grass budgeting; to establish the services that need to be provided to successfully increase and maintain grass budgeting on beef farms; and to identify any support that advisers need to facilitate these services.

Literature Review: In 2010 less than 10% of cattle-rearing farms were economically viable (Hennessy *et al.* 2011). Murray (2011) states that although price is often blamed for poor profitability on beef farms, farmers must target areas over which they have control, which includes better grass utilisation. Hennessy and Heanue (2012) found that discussion group membership is associated with increased technology adoption and higher farm profits while Garforth *et al.* (2006) reported that farmers tended to follow the advice of other farmers (mentorship) rather than that of institutions.

Extension Challenge Examined: Two existing grass budgeting groups in Wexford and Waterford were surveyed to investigate the benefits members feel are associated with group membership. Ninety four beef discussion group farmers in the South East of the country also completed a survey. This survey provided an overview of grassland management on their farms. It also provided an insight into the farmers' willingness to participate in a grass budgeting service. Sixty nine percent of farmers said that they would be interested in a grass budgeting group and 67% of farmers reported that they would be interested in a grassland mentoring service.

Discussion and Implications for Extension Practice: The results from the survey with the beef discussion group farmers show that there is a demand by beef farmers for both grass budgeting groups and grass mentoring services. In relation to a mentoring service, experienced grassland managers willing to participate in the service will need to be identified and given training in the relevant skills. Future work will involve case studies to gain a more in-depth knowledge of grass budgeting practices on farms and barriers to grass budgeting on beef farms.

Summary: This project aims to identify the barriers preventing beef farmers from grass budgeting and to establish the services needed to increase and maintain grass budgeting on beef farms. The results to date have shown a strong interest in grass budgeting groups and in a grassland mentoring service among beef farmers. The majority of farmers in discussion groups walk their farm regularly to assess grass covers. A common reason cited by farmers for not taking the next step to budget grass is that they feel there is nothing to be gained from this extra effort.

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Nutrient Management: Critical Evaluation of Existing Advisory Practices

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Introduction: Soil is a vital non-renewable resource requiring sustainable management for food and fibre production, nutrient retention and recycling and filtration of water (Creamer *et al.* 2010). Aggregate results of over 100,000 agronomic soil-tests by Teagasc show that soil nutrient statuses have been declining for P and K in the period 2008–2012. Optimal use of N and P, according to recommended guidelines in feed and fertiliser are essential to maximise farm outputs and profits (Teagasc, 2011). The implementation of the EU Nitrates Directive into Irish law (SI 101 of 2009) also regulates the management of these nutrients and is aimed at maintaining productivity whilst reducing the water quality risks associated with losses from soils and farmyards to water courses and groundwater. On a four-point scale, soil index 3 is the optimum level for P and K, providing sufficient for growth, without environmental losses. Reducing the number of soils in index 4 (excess levels) will help reduce losses to water; However the introduction of the nitrates directive, combined with the dramatic increases in fertiliser prices have resulted in rapid declines in soil fertility. While the reduction in index 4 P soils is a positive, the trend towards substantial increase in Index 1 and 2, if not halted will lead to soil nutrient levels below optimal levels for plant growth. This will directly impact on the potential achievement Food Harvest 2020 objectives.

Nutrient Management (NM) advice and practice systems examined: A farmer survey was carried out. 375 paper surveys were returned from 22 counties. The survey asked farmers 17 questions on their awareness and method of practicing NM on their farm. The primary reason for NM planning is compliance with schemes and regulation, developing a whole-farm fertilizer allowance. Agronomic reasons are secondary. 25% of surveyed farms had no MN plan. Teagasc advisers completed 145 electronic surveys. Every county was represented. The majority of soil samples were undertaken for non-agronomic reasons. The advisers requested simpler user-friendly NM tools and planners. A 50-farm case study survey in progress will determine NM practice on intensive farms.

Discussion and Implications for extension practice: Nutrient management will be key to optimising productivity, quality, and environmental sustainability. Survey results show the relationships of age, location, enterprise, and farming intensity on NM practices. This knowledge will support the development of decision support tools and a more targeted knowledge transfer effort leading to more effective uptake of the technology.

Summary: Bridging the gap between advice given to the farmer and NM practice on Irish farms through improved knowledge transfer is where the improvements can be made. Improved NM delivery methods and tools along with training sessions and discussion group meetings will be the main drives of improved NM efficiency.

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An Assessment of the Potential for Online/Electronic based Teaching in Agricultural Training

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Introduction: On-going developments in technology, the changing nature and structure of agriculture in Ireland to a more scientific, labour-intensive system and the need to compete on a global scale have led to an increased demand for agricultural education. Information Communication Technology (ICT) and e-learning have been identified as essential approaches to adapting education and training systems to meet the Lisbon objectives to 'make Europe the most competitive and dynamic knowledge-based economy in the world' (CEC, 2003). Internationally, the growing interest in online/e-learning has been phenomenal, with the evolution of the World Wide Web now being considered as the 'new pedagogy of learning' (Williamson and Smoak, 2005). Online/e-learning is used in numerous disciplines bringing courses into a new technological era but these developments thus far have not reached agricultural education, especially education aimed at young farmers.

Literature review: Williamson and Smoak, (2005) suggest that education through e-learning is more effective because it enhances the learning process, increases retention and saves both time and money. With consistent lecture content, no limit on the number of learners and flexibility in terms of schedule, ICT tools, particularly web-based ICT's, allow for richer instructional strategies and thus offer many new opportunities for the online learning environment (Anderson and Elloumi 2008). A predominant challenge to the introduction of new media in education has been the dominant force of the instructive pedagogy that historically placed emphasis on the teacher's one way delivery of subject matter. This stands in contrast to the cognitive pedagogy that places emphasis on the psychological engagement with students, teachers and subject matter for cognitive and affective performance. Anderson (2004) suggests that by providing increased access to a vast body of content and human knowledge, diversified interactions between teacher, learner and content, and a curriculum that is learner centred, knowledge centred, assessment centred and community centred, e-education allows learners to extend their experiential learning spaces.

Extension practice examined: An online pilot was created to highlight issues and problems in relation to e-learning in a 'live' situation. This aided in the development of online materials, which will be tested in an educational setting and will allow for recommendations to be given on how online learning can be incorporated into agricultural training. Pre, post and re-testing will be carried out. Attitudes and behaviours of students and teachers in relation to ICT in general, e-learning and technology enhanced learning will also be addressed.

Discussion and implications for Extension: E-learning is described as a new pedagogy of learning. Well-designed educational approaches that appropriately apply technology are said to stimulate active learning, critical thinking, and problem solving. An important implication for Teagasc is to ensure more young farmers engage in a high level of agricultural education. E-learning has the possibility to increase the effectiveness of agricultural education through supporting and training young farmers (students) with varying needs and abilities.

Summary: The technological developments which have occurred worldwide to date have been phenomenal. These developments have the potential to improve and assist students' level of understanding in existing programmes and also allow the opportunity for equal access for students that require adapted and innovative forms of teaching from those of traditional methods in order to succeed in education. This research project aims to assess the potential for online/electronic based teaching in agricultural training, an area which thus far has been unexplored but is an area which has the potential to expand and improve on an already successful agricultural educational system in Ireland.

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Contract Heifer Rearing and Related Support Services within the Munster Region

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Introduction: Donnellan *et al.* (2009) concluded that in order for European Union member states to sustain current milk production levels they will be largely dependant on the efficient transfer of resources between exiting farmers and those wishing to expand production. Growth opportunities are anticipated for Irish dairy farmers post-quota abolition, but dairy farm growth may be limited by the availability of land suitable for milk production and heifer rearing (Hennessy *et al.* 2010). The aim of this study is to identify a means whereby Teagasc can supply an effective support service to farmers desiring to enter, or maintain involvement in, contract heifer rearing agreements. The study has four objectives: First, to assess the impact service providers have on decision making by farmers currently involved in contract heifer rearing; second, to gain an insight into the operation of contract heifer rearing in the Munster area and to gauge its persistence as an enterprise in the Irish farming environment; third, to determine the current knowledge pertaining to contract heifer rearing arrangements amongst Teagasc advisory staff and fourth, to examine the role of service providers/ knowledge brokers in contract heifer rearing operations abroad.

State of the art: In the USA, 9.3% of dairy operations have contract-reared replacement heifers whilst in Australia, there are approximately 10,000 heifers under contract at any one time (AAHS, 2005; USDA, 2007). In New Zealand contract heifer rearing is in widespread use (Donworth *et al.* 2009). Within these countries there are support services for contract heifer rearing. The support services provided within Australia and New Zealand can be described as logistical with private companies brokering agreements (TAC, 2009). In the USA, associations represent heifer rearers and display an inward focus on knowledge and skill development among its members and provide accreditation, certifying rearers as having achieved specified standards of heifer rearing (TAC, 2009).

Challenge examined: A case study method is being used to address objectives 1 and 2 and a survey is being used to address objective 3. Objective 4 will be addressed through a literature review.

Discussion and Implications for Extension: Preliminary results indicate that a trend is emerging whereby contract heifer rearing agreements are discontinued due to dairy farmers securing leased land. The early indications are that a secure directory of available heifer rearers and interested heifer owners could have beneficial effects. There are also early indications that 'practical know-how' pertaining to the benefits and issues regarding contract heifer rearing can be improved greatly through increased exposure to practical working examples, i.e. case studies at local level.

Summary: Building on work done previously which placed a structure on how a contract heifer rearing agreement can operate, this study will investigate how agreements are operating at farm level. The assembled case studies will add a 'first-hand account' knowledge resource to the previous knowledge base. Further to this, Teagasc advisory staff will be able to accurately assess their current knowledge base relating to contract heifer rearing and identify how this knowledge base can be developed into the future.

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An Assessment of the Potential of Drystock Discussion Groups as an Effective Extension Tool

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Introduction: The 2010 Teagasc e-Profit Monitor Analysis found that the top 1/3 of suckler farms in Ireland generated an average gross margin of €596 while the bottom 1/3 had an average gross margin of just €65. These results clearly demonstrate that there is huge potential for increased profitability for suckler farmers in Ireland. Garforth *et al.* (2003) and Byrne (1997) found farmer discussion groups as an effective means of promoting the adoption of new technologies as farmers learn from their peers about the costs and benefits associated with particular technologies. Drystock discussion groups have been supported and promoted by Teagasc since the late 1990s and the aim of this research project is to assess how effective drystock discussions are in terms of knowledge, attitude and practice change on farms. The study also aims to examine improvements to the farm discussion group programme. The study findings (2011-2013) presented for this paper are derived from the early work of this study.

Literature Review: Irish farmers have rated discussion groups as the best available source of information on new technologies (Byrne, 1997). Hennessy and Heanue (2012) found the effect of discussion group membership on the probability of adoption is still positive and significant on dairy farms, even when the characteristics of discussion group members are controlled for, i.e. in terms of age, size and location. An Australian study of farmer knowledge in group learning by Millar and Curtis (1997) found that farmer knowledge can remain dormant unless critical factors in group learning and development are addressed. One of these critical factors is effective facilitation to allow time for dialogue among farmers and having effective facilitation skills to draw out farmer knowledge.

Extension Practice Examined: Nine drystock discussion groups from the North West Region of Ireland comprising a total of 142 farmers were surveyed to identify why they were involved in discussion groups and how effective group learning has been. 71% of farmers said the reason they joined the group was to “learn from other farmers” while 16% indicated that they became members because of the €1,000 incentive provided. The majority of the 16% had joined the discussion group within the past year. To determine if drystock groups were effective a set of questions were asked on changes in knowledge, attitude and practice. The results show that farmer involvement in their discussion group lead to higher level of knowledge on and adoption of key aspects of grassland, animal breeding and financial management. Also their attitudes were found to be more positive to new and improved practices. To determine what training and support drystock facilitators require, an online survey will be carried out further on in this study.

Discussion and Implications for Extension: Results to date from the farmer survey are indicating that discussion groups as an extension tool used by Teagasc on drystock groups are effective in terms of increasing farmers’ knowledge and changing attitudes and farm practice. An important implication for Teagasc is to ensure more farmers engage in discussion groups and to increase the effectiveness of this method of extension through supporting and training advisers in their group facilitation work.

Summary: The results of the study would indicate that drystock discussion groups in the North West Region are effective as farmers’ knowledge and attitudes have improved as a result of involvement of the discussion group. Group involvement has also contributed to adoption of certain practices that increase farm profitability. As previous research has found effective facilitation skills to be vital for the success of discussion groups, a strong emphasis on good facilitation skills continues to be required.

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An Examination of the use of Profit Monitor/Financial tools by Tillage Farmers

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Introduction: The Irish tillage sector is a high-input, high-output system. In an environment characterised by increasing volatility in output and key input prices, farmers operating these systems need to be especially attentive in monitoring production costs and margins. Analysis of enterprise costs and margins can be facilitated by a range of financial tools such as the Teagasc eProfit Monitor. The eProfit Monitor is a benchmarking programme that allows farmers to gather and compare physical and financial information at enterprise level. Key outputs include crop gross and net margins per hectare and cost per tonne of grain produced.

Problem/Objective: The research problem is the low adoption rate of Teagasc financial analysis tools by tillage clients. There are a number of key objectives for this study: (1) to establish the current level of usage of specific financial analysis tools among Teagasc tillage clients; (2) to establish the key socio-economic and attitudinal factors which influence the adoption of financial tools and (3) to ascertain the perceptions of farmers regarding the benefits and limitations of available financial analysis tools.

Methods: A survey was designed to address the objectives of the study. The survey consisted of 41 qualitative and quantitative questions and was completed using both face to face and by phone with 100 Teagasc tillage clients in the Carlow, Wexford and Wicklow areas.

Results: The average farm size was 146 hectares. 15% of farmers were less than 35 years; 31% were aged 35 to 44; 26% were aged 45 to 54; 21% were aged 55 to 64 and 7% were older than 65. Regarding education, 80% of farmers had received an agricultural qualification. 20% of farmers had some level of off-farm employment and 38% engaged in farm machinery contracting. 33% of farmers are members of tillage discussion groups and a further 7% of farmers had previously been in a discussion group but are no longer members. 52% of farmers rated themselves as being experienced or advanced at using a computer and 17% of farmers said they use their computer for farm planning or budgeting. Table 1 demonstrates farmers' main sources of advice and Table 2 demonstrates farmers' awareness and use of the key Teagasc financial tools.

Table 1: Main source of advice for:

N = 100	Farm planning and financial decisions	Crop management decisions
Private Consultant	1%	15%
Accountant	42%	0
Merchant	0	37%
Teagasc Adviser	23%	45%
Bank Manager	6%	0
Other	28%	3%

Table 2: Awareness and use of financial tools

N = 100	Aware	Used
eProfit Monitor	70%	7%
eCrops	46%	17%
Crop margins calculator	32%	7%
Crop costs and returns book	75%	50%
Share farming calculator	16%	2%
Tillage cost control planner	8%	0%

Discussion: The results from Table 1 highlight the important role of Teagasc tillage advisers in providing technical expertise to farmers and the important role accountants have in providing advice on financial decisions. The results from Table 2 indicate varied levels of awareness and low rates of use of the Teagasc financial tools. Farmers are more willing to use the financial tools which require the least effort, such as the Crop Costs and Returns Book. The number of farmers using eProfit Monitor is very low in comparison to the numbers that are aware of it. Therefore, it is not surprising to see that two thirds of farmers conduct only basic financial analysis using pen and paper. This is despite over half of farmers rating themselves as being experienced or advanced at using a computer. Robust benchmarking of performance is hampered by the lack of uniform and comprehensive recording of farm data. Two thirds of farmers surveyed who are not discussion group participants said that they would join if similar terms and conditions to the Dairy Efficiency Programme (DEP) applied. In the DEP, farmers are given €1,000 per year to attend group meetings and complete a set list of tasks. Since the DEP began, there has been a three-fold increase in the number of dairy farmers in discussion groups and increased use of profit monitors. This highlights how successful a similar programme could be for the tillage sector.

Summary: In a volatile market place and with new CAP proposals in 2013 which may remove/reduce the level of income support for farmers, awareness of crop costs and margins is vital if they are to remain viable. Overcoming the gap between awareness of a financial service and its adoption by farmers can be addressed by improved knowledge transfer techniques, such as increased participation in discussion groups.

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An Assessment of Learning by Agricultural Students during Practical Learning Periods

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Introduction: Most agricultural courses today include a period of practical training on an approved host farm for students. This practical learning period (PLP) is an important and mandatory element of the course programmes. An evaluation of the students learning and host farmers satisfaction with the student within this period of training is essential to its success and future part in agricultural training of students. The objectives of this research project are:

1. To determine the attitudes, preparations and backgrounds of the students prior to the PLP and to evaluate the outcome of their learning during the PLP
2. To evaluate the strengths and weaknesses of the PLP from the perspective of the host farmers and college lecturers
3. To analyse previous graduates perception of work placement and how useful the PLP is to them in their farming careers
4. To identify any potential innovations that will enhance and/or improve the operation of the PLP within the Teagasc agricultural training courses

Literature Review: Agricultural education developed during an era when the “doing to learn” and “education through experience” philosophies were prevalent in America (Barrick, 1989). It was Dale (1946) who classified the “doing” experiences as direct experiences, contrived experiences and dramatic participation and indicated that these experiences were the bedrock of all education. The PLP philosophies are based on learning through real life contexts and learning by doing and draw largely on the work of Dewey (1916) and Seaman A. Knapp (cited in Lever, 1952).

Challenge Examined: The past five years have seen a significant increase in the number of students enrolling in agricultural courses. The number of students enrolled for the Level 5 FETAC agricultural course has increased from 479 students in 2008 to 616 students in 2012. The need for new innovation in educating these students is now greater than ever. Providing the best possible education and training for these enthusiasts will be vital to the future growth and viability of the Irish agricultural sector. As part of this research, a pre and post PLP survey was carried out with all Level 5 FETAC agricultural students in the 2011/12 college year. In early February an online pre-PLP survey was conducted on all Level 5 FETAC agricultural students. 389 out of a possible 616 students completed the pre-PLP survey. A post-PLP survey was carried out on the same sample population in early May, with 504 students completing the survey. The main advantage of producing a pre and post PLP survey is that it allows us to compare student's attitudes to the PLP before and after completing the programme. Results from the pre-PLP survey found that 14.4% of students felt they could have been better prepared by their college prior to the PLP. This figure grew to 23.3% in the post-PLP survey. Also in the pre-PLP survey, students ranked getting the chance to apply in a real farm environment the husbandry skills they had studied as their top ranking priority. Preliminary results from the post-PLP survey showed that students felt that they learned on average 1.9 new skills each during their PLP. They felt that they improved on at least 7 existing skills each during their PLP. Also when the students were asked to rank from 1 to 6 what they considered was the most beneficial aspect to their overall agricultural learning experience, the majority of students, approximately 42% ranked knowledge gained from the practical learning period as number one.

Discussion and Implication for Extension Practice: The PLP is a vital component of agricultural training courses. It is seen by students as being the most beneficial aspect of the agricultural training received. However, findings from the post-PLP survey showed that 34.1% of students felt they would have benefited from more teaching of practical skills in College prior to the PLP. It was also interesting to see that 56% of students either strongly agreed or agreed that their College should allow them to organise a farm for the PLP themselves. It is envisaged that the findings from this study will have important implications for the design of future agricultural education and training in Ireland. Ultimately this study will contribute to new innovations that will enhance learning outcomes and improve the operation of the Teagasc practical learning programme.

Summary: The combination of these objectives set about the hypotheses of this research, which is to determine if the practical learning periods (PLPs) meet the requirements of today's further agricultural education.

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A Study of the Design of an Alternative Business Planning/Financial Management Programme for Irish Farmers

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Introduction: There is a considerable degree of variability in the returns to dairy farming (Donnellan 2012). These low returns are in part due to the large variances in the cost of production across farms. Donnellan (2012) stated that in 2010, on high cost dairy farms the cost of production was 29.5 cents per litre while the cost of production on the low cost farms was 18 cents per litre. This represented a difference of 11.5 cents per litre or €28,000 on a 250,000 litre dairy farm. Given the large variance in income, it is obvious that farmers must improve their farm financial management practices. The main objective of this study was to gain a better understanding of why the current uptake of farm financial management tools is so low and to ascertain whether or not there is a need for a simpler financial management tool for farmers. The specific objectives of this study were to: 1) Identify the needs and types of financial advice and farm business planning support required by farm businesses; 2) evaluate the current systems provided by various actors both home and overseas in helping farmers to manage their finances; and 3) design a prototype Entry Level Business Planning/Financial Management system for farmers to be used as a component of the main survey.

Literature Review: The literature review highlighted that farmers as a group are heterogeneous and that they can have a diverse range of characteristics and a variety of factors which motivate farmer behaviour and decision making. A number of barriers to farmers adopting new technologies were also identified including the cost of the technology, ease of use, time consumption (Vanclay 2004) and farmers education levels (Läpple *et al.* 2004). Farmers who use financial management tools are typically found to be between 35 and 50 years of age, display a positive attitude towards agriculture, are computer literate and own medium sized farms with some level of debt (Kilpatrick 1999). Hennessy and Heanue (2012), Kelly (2011), and Creighton *et al.* (2011) all noted a positive association between technology adoption and discussion group membership. Research by Jackson-Smith *et al.* (2004) has shown that farmers who participated in farm financial education and training are more profitable than those farmers who have not attended farm financial education and training.

Extension Tool Examined: The current financial management tools offered by Teagasc were examined to ascertain why there is currently a low uptake of the tools and what can be done to encourage a greater percentage of farmers to use these tools. Interviews were conducted with an elite group consisting of Teagasc Advisers, Bank Representatives and farmers who were all familiar with the current tools on offer. A new Entry Level Farm Business Planner was designed to be used as part of the main survey of 108 Teagasc dairy farmer clients. The survey sought to obtain the views of farmers as to their current financial management practices and of the current Teagasc financial management tools on offer.

Discussion and Implications for the Extension Practice: The Teagasc financial management tools were viewed by 57 % of respondents in the main survey as time consuming. Farmers familiar with existing tools, Teagasc dairy advisers and Bank Representatives who were interviewed believed there should be a simpler farm financial management tool available for new adopters. Responses to the Entry Level Farm Business Planner were positive with respondents particularly pleased that the format was similar to the annual accounts.

Summary: The uptake of current financial management tools offered by Teagasc has been low. There is a need for a new approach to encourage greater levels of adoption of these tools on Irish farms. Farmers surveyed expressed satisfaction with the format of the Entry Level Farm Business Planner. This indicates there is a need to introduce a more basic form of business planning tool to encourage farmers to begin business planning and financial management and to help them progress to using the currently available tools such as the Profit Monitor.

Key References:

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Enhancing the Professional Support and Knowledge Transfer of Cross Compliance Regulations to Irish farmers

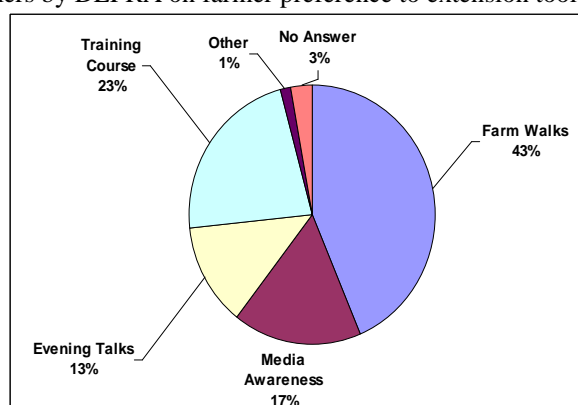
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Introduction: This project sought to develop new advisory tools for Teagasc to assist Irish farmers in meeting their Cross Compliance obligations. Farmers' knowledge of Cross Compliance regulations, which have been a mandatory requirement for receipt of direct payments under the single payment scheme since 2005, could be improved on significantly. Advisory tools to aid farmers in gaining enhanced knowledge of relevant requirements, and helping them develop good farming practices, were not readily available at the beginning of this project. This was an area that Teagasc advisers, specialists and farmers felt there could be improvement in their service.

Literature Review: The theoretical literature on knowledge transfer, and the various extension practices related to environmental regulations and sustainable farming practices in the EU were examined. A variety of forms of advice in regard to Cross Compliance are available to farmers in different EU Member States, ranging from a self assessment checklist to telephone helplines, and the different tools used to assist farmers were investigated to ascertain if they might be suitable for adoption in Ireland. Using data from the Department of Agriculture and other sources, the main Cross Compliance issues for Irish farmers in terms of non-compliances were quantified. The main problem areas are Animal Identification and Registration, Nitrates directive regulations, Pesticide regulations, Good Agricultural and Environmental Condition (GAEC) and Animal Welfare. Research carried out at the farm walk in Ballyhaise College also demonstrated farmer's views on the delivery of farm advice, which can be seen in the graph below. This emulated research carried out on UK farmers by DEFRA on farmer preference to extension tools.



Extension Tool: Three tools were developed after considering information obtained from a questionnaire survey of 64 farmers at a farm walk in Ballyhaise College and discussions with Teagasc specialists, advisers and client farmers, as well as information gathered during the literature review. The tools created have a range of information from a basic self assessment, contained on a single A4 page, to a complete self assessment booklet. The basic self assessment tool takes the major non-compliance areas for the three main enterprises (cattle, sheep and tillage) and outlines the main issues for these specific types of farm. The Cross Compliance booklet is a comprehensive guide to all regulation areas for all types of farming system. These different levels of detail and information will give advisers options when dealing with farmers of various levels of pre-existing knowledge and education. Both tools follow a self assessment guideline which makes the farmer tick off when he or she understands the regulation and when they are sure that their farm is compliant. This type of active, self-learning approach is viewed in the literature as being best practice.

Summary: Cross Compliance as a set of regulations can be somewhat confusing for farmers, despite their crucial importance as a requirement for receipt of direct payments under pillar one of the Common Agricultural Policy. The objective of this research was to assist farmers and advisers alike to develop a structured programme and new tools to be used on the farm, or in a workshop environment, to educate farmers on their obligation to the regulations and help them remain cross compliant. The extension tools developed won a Teagasc Open Innovation Award in 2012, and are now being utilised.

Key References: Evaluation of the Implementation of the Farm Advisory System, (2009), Analysis for Economic Decisions (A.D.E).

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A Study of the Effectiveness of the Dairy Efficiency Programme in the Teagasc Cork East Area Management Unit (AMU)

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Introduction: The current study was carried out to establish the change in knowledge, attitudes and practices (KAP) of dairy farmers in the Teagasc Cork East AMU as a result of the Dairy Efficiency Programme (DEP) and the effects of discussion group activities upon their farm practices. There were four objectives of the study: (i) to determine the level of practice change among farmers in the DEP; (ii) to determine the level of knowledge change by farmers in the DEP; (iii) to determine if farmers' attitude to technology is changing as a result of the information being received through the DEP; and (iv) to determine farmer's attitude to continued participation in discussion groups once the economic incentives to the DEP cease. Information was gathered using questionnaires and case studies.

Literature Review: The literature review documents work on farmers' objectives, knowledge, attitudes and practices. The literature identified that not all farmers are alike and that there are five categories of farmers based on their rate of innovation adoption. The literature also looks at various methodologies of capturing KAP and many studies used likert scales to capture farmers' knowledge and attitudes, which could be used for this study.

Extension System Examined: As the DEP is a three year public policy commitment to the sector, it is important to establish the effectiveness of the programme. As Teagasc is committed to delivering and expanding the programme throughout the country, the study looks at the impact of discussion group membership upon dairy farmers' KAP.

Discussion and Implications for Extension Practice: The study highlights that the DEP has had a significant impact upon farmer KAP. Discussion group members' practices have changed significantly as earlier turnout dates are being achieved, grass is measured on a more frequent basis, and Autumn Grassland Management has become a lot more structured. More calves are being registered online and discussion group members are using more financial aids to analyse the financial performance of their dairy farm business. The level of practice undertaken by the discussion group members was also significantly greater than that of the non discussion group members.

Discussion group members knowledge of grassland, breeding and financial management has also increased. The study also showed that farmers with greater herd size had greater knowledge on the three aspects. Similar to the recorded practice increase, discussion group members had greater levels of knowledge than non-discussion group members. Discussion group members' attitude towards various practices has increased as a consequence of discussion group membership. The study highlights that farmers' attitude towards grassland and breeding management changed substantially over the time period of the study. However, attitude change towards financial management was not significantly different, highlighting an area where focus and resources are required. The change in discussion group members' KAP during the study highlights that discussion groups are an effective method of knowledge transfer. The study also looked at continued participation in discussion groups once the DEP ceases.

The study indicates that significant numbers of farmers will remain in their discussion groups. The farmers are very positive about the influence the discussion group has had upon their farming practices and see the monthly discussion group meetings as an important part of the running of their dairy farm business. Knowing that high levels of farmers will remain in their groups will help Teagasc to identify the resources required post DEP.

Summary: The study looked at the effectiveness of the DEP in the Cork East AMU through questionnaires and case studies. The results of the study highlight that the DEP is having a positive impact upon farmers' KAP. The study also shows that discussion groups are an effective medium of knowledge transfer and should continue to be used in the innovation adoption process. A continued effort should be made to increase discussion group numbers to support the transfer to dairy farmers of technology and knowledge that will help them to adopt best practice in the running of their enterprises. Improved on-farm efficiencies through the adoption of best practice will enable the realisation of the Food Harvest 2020 targets.

Acknowledgements: The study would not have been possible without the help of all the staff in the Teagasc Cork East AMU and my supervisors within Teagasc and UCD.

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