A Report for the

Nuffield Farming Scholarships Trust

"Knowledge Transfer of Science and Genetics to Farmers"

With grateful thanks to

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The Trehane Trust

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Introduction

After 5 years gaining a HND in Agriculture and Animal Production and a BSc Honours in Animal Science at Harper Adams University College, my first appointment took me to Holstein UK, as the Animal Breeding and Research Analyst. Over the past 6 years, my job has developed through a managerial role to drive forward the research and breed development activities at Holstein UK.

I was promoted once more in early 2006, to my present joint position as the Holstein UK Research and Development Executive and also Executive for the Centre for Dairy Information, the UK's single national database. The communication of data and output from research has become critical in achieving our main goal, which is to help farmers to access, understand and apply information and knowledge to achieve improved profitability and sustainability.

The past two decades have seen rapid advances within the cattle breeding industry, primarily focused on the improvement of production, health and welfare to differing degrees. This knowledge development has given rise to some of the most advanced and accurate tools available for the general improvement of dairy cattle.

The UK in particular, has demonstrated world leadership in the areas of measuring and breeding for health and welfare indicators through Locomotion and Condition Score, traits that can have a profound impact on long term dairy farm profitability. Both of these traits are known to have high correlations or 'associations' between lameness and fertility respectively. The most basic question must therefore be asked – why have lameness, mastitis and fertility levels in the UK not dramatically improved as this knowledge became available?

This report aims to investigate and identify some of the key barriers that either prevent the uptake of knowledge from genetic or scientific developments, or that hinder this process. Recommendations are presented to suggest solutions to help overcome these challenges in the future.

Background

During my career so far I have become frustrated with the lack of knowledge flow between research scientists and farmers. This becomes acutely apparent through the work I do every day, right at the farmer interface where they access and absorb information. The areas of communication and collaboration will be vital for the future of farming over the next 10 years and is something that I feel we have been poor at developing in the UK. Scientists can find it difficult to communicate with farmers and farmers are sometimes suspicious of scientists or geneticists and of important scientific innovations, simply because they are difficult to apply or difficult to understand. This long established situation has led to an element of mistrust between many dairy farmers, scientists and geneticists.

Condensing a labyrinth of scientific jargon into simple messages a farmer can apply on farm is vital if we aim to increase the uptake of any new technology. Methods of communication have to be simple to use, easily understood and most importantly, readily accessible. I wanted to understand how this situation could be improved in the UK and identify the key methods of achieving this.

Aims of the Tour

I decided that it was important to visit those countries with a reputation for developing innovative and effective communication networks. I wanted to understand what methods of communication already exist and how effective they are. One of the largest issues for farmers in the UK is *trusting* the information – is this an issue for other countries? Who is involved in the flow of information? Does the way that research is funded have an effect on what is researched and the way it is translated? Who is responsible for the 'translation' of research into a language that farmers understand? Who is responsible for delivering information to the industry? Do other countries have a coordinated and cooperative approach to this?

Former Nuffield Scholars have studied methods of deliverance at farmer level and the relationship between researchers and farmers. I hope to identify if there is a missing link because in my experience, the funding mechanisms in the UK set out for dairy research can create a blockage in knowledge transfer.

The Approach

In order to ascertain the breadth and scope of the issues surrounding the subject of knowledge transfer of science and genetics, it was important to meet a wide balance of researchers, farmers using a variety of approaches and systems, service providers - including breeding companies, genetic evaluation units and extension/advisory organisations - universities and government.

Meeting with key people and discussing these issues right from the 'lab to the field' was vital if I was to understand the complexities of the challenges involved. Using a combination of the Nuffield Scholarship network and a range of personal contacts, a tour of North America and Canada soon took shape. It became clear that those countries with an excellent reputation for extension and knowledge transfer appeared delighted to discuss their development, failures and successes. The first North American tour certainly took this shape, with invitations to meet with some of the key industry innovators in extension and communication flooding in. This gave me an excellent grounding and benchmark to go forward to meet other organisations on the tour and compare/contrast these different approaches and their effectiveness.

By the time the tour headed to Australia, New Zealand and Ireland, I was beginning to build up a clear picture of the key issues. This grounding enabled me to take a constructive approach ahead of the meetings I had arranged, particularly in Australia, whose challenges are very similar to those of the UK. This approach made the discussions a great deal more two-way which meant that those I met in Australia and New Zealand were extremely forthcoming and also keen to learn about what I had already discovered. This was personally rewarding but importantly gave something back to those who had been so kind to host me.

So the approach to the task was simple: listen, learn and most importantly discuss.

Brief overview of the United States of America & Canada

United States of America

I chose to start in the State of Wisconsin, USA to examine their world renowned national State Government-funded Extension service which is run through a network of Land-Grand Universities.

Knowledge Transfer Mechanisms

The US 'Extension' system has a "state specialist" for each commodity group, (dairy will have a nutritionist, physiologist, geneticist etc), located at the major agricultural university in that state, as well as a "county agent" (there are 72 counties in Wisconsin). The extent to which this model is followed depends on the economic importance of any crop or species in each state and county. In Wisconsin, they are fortunate to have state specialists in every discipline of dairy science. The same situation exists for beef cattle, pigs, chickens, crops, vegetables, etc. The extremely broad base that exists in Wisconsin enabled me to spend some time with the genetics, reproduction, milk quality and nutrition specialists, as well as the Wisconsin Youth Academy.

Much of the US extension work is carried out by the corresponding allied industry workers, especially in genetics. Employees of the AI studs, breed associations, etc have contact with far more farmers than those served by the Extension system, so there is a very important "train the trainer" aspect to their programs. In the US, most of the Extension specialists, particularly those involved with dairy, come from a farming background and have since studied science. This has given them the unique skill of understanding what influences farmers and the ability to communicate science fluently. The Extension specialists focus on 'synthesising' research output such as papers, conference proceedings etc, from as many sources as possible to ensure that the conclusions and recommendations which are translated to the industry are accurate and representative of all science in that subject area. This is a vitally important concept, as the availability and open-access to the scientific research can impact heavily on the effectiveness of the Extension translators. In the US, they appear to have much more open-access to new research and papers, rather then having them tied up with Intellectual Property Rights (IPR) following commercial funding or locked away in 'member access only' digital libraries.

Canada

I also met a wide range of people whilst visiting Canada, including the University of Guelph, farmers, the National Central Database and Genetic Evaluation unit, breeding companies, breed societies and the CanWest Dairy Herd Improvement milk recording company.

This diversity gave me a strong picture of their industry which clearly revolves around 'service'.

Most companies had farmer and customer needs right at the top of their agenda, especially the research and evaluation unit. They have taken the attitude that involvement and consultation is the key to building trust. Most of those involved in the pathway from science to farm are stakeholders in the process. This seemed to deliver a very professional outlook and technology transfer strategy with everyone working towards the same goal.

Knowledge Transfer Mechanisms

As with the US, Canada have communication specialists who are well placed to translate the technical research output into usable information for both farmers and the wider agricultural community. Likewise they tend to have some type of agricultural background and have moved on to learn scientific principles.

Funding

Canada has a very structured approach to research priority setting, especially within the field of quantitative genetics. This helps to reduce the effect caused by research funding competition. The main evaluation unit generates funds from those who utilise the data and who benefit from its output the most. This income is then used to finance the evaluation unit's running costs and also fund key elements of research which are deemed to be of highest priority. They are not therefore funded by a compulsory levy from the farmers but by those who gain most financially from the data – which tends to be those advising farmers i.e. consultants and commercial companies.

Prioritisation

The research priorities are set by taking a very open approach. Essentially, regular industry open meetings are held, where information is presented, issues highlighted and everyone has an opportunity to comment and make suggestions. The work is then prioritised and completed with the results being communicated back to all via a specialist translator. The producers are always keen to know the results because they had a part in both setting the priorities and choosing the

research in the first place. Canada really does appear to listen to the needs of their industry which helps build their strength and influence through trust.

The following figures illustrate some of the key approaches and structures in place in North America which have helped shape one of the best examples of effective Extension in the world.

Figure 1: Examples of the key differences between Extension approaches

Two main types of Extension Programme	
Re-Active Extension	**Pro-Active Extension**
✓ The Industry/County Officer identifies an issue within the dairy sector ✓ They invite the Extension Specialist along to do a talk or write some literature on the specific problem topic	✓ Arrange and hold major conferences ✓ Larger and fewer frequency of County meetings ✓ Allied industries get involved ✓ Unbiased, novel, new information ✓ 50% of audience will be industry ✓ Larger producers struggle to get to small meetings therefore, ✓ Would rather go to fewer large, high profile, national events ✓ Many larger farmers who won't come to these small meetings will get information taken directly to them

The knowledge transfer approaches are implemented depending on the circumstances and selected on the method that will best suit the topic and farmer audience

The following **figure 2** is designed to give an overview of how the Extension specialist and Outreach programmes are structured in the US, with examples of how the information flows from a scientific base, down to the farmer and back.

Figure 3 has been included as an example of a simple, yet effective bright idea for knowledge Transfer seen in the US, known as 'Wisline'. This communication network was established in Wisconsin and has worked for over 35 years.

Wisline is a teleconference network where farmers can either dial into a conference call individually, or attend a 'site' group meeting which is set up in each of the 72 counties in Wisconsin State. Each site group meeting is run by the County Agent who listen to a 35-40 minute talk by an expert on a specific subject. This approach gives access to unlimited numbers of interested parties.

All County Agents have an MSc and have to be both generalists and specialists in a specific area. They are not exceptionally well paid, however they are given other opportunities of training and travelling. This type of system helps the movement of scientific theory to basic applied research.

Figure 2: Example of how the US Extension Specialists and Outreach programmes are structured

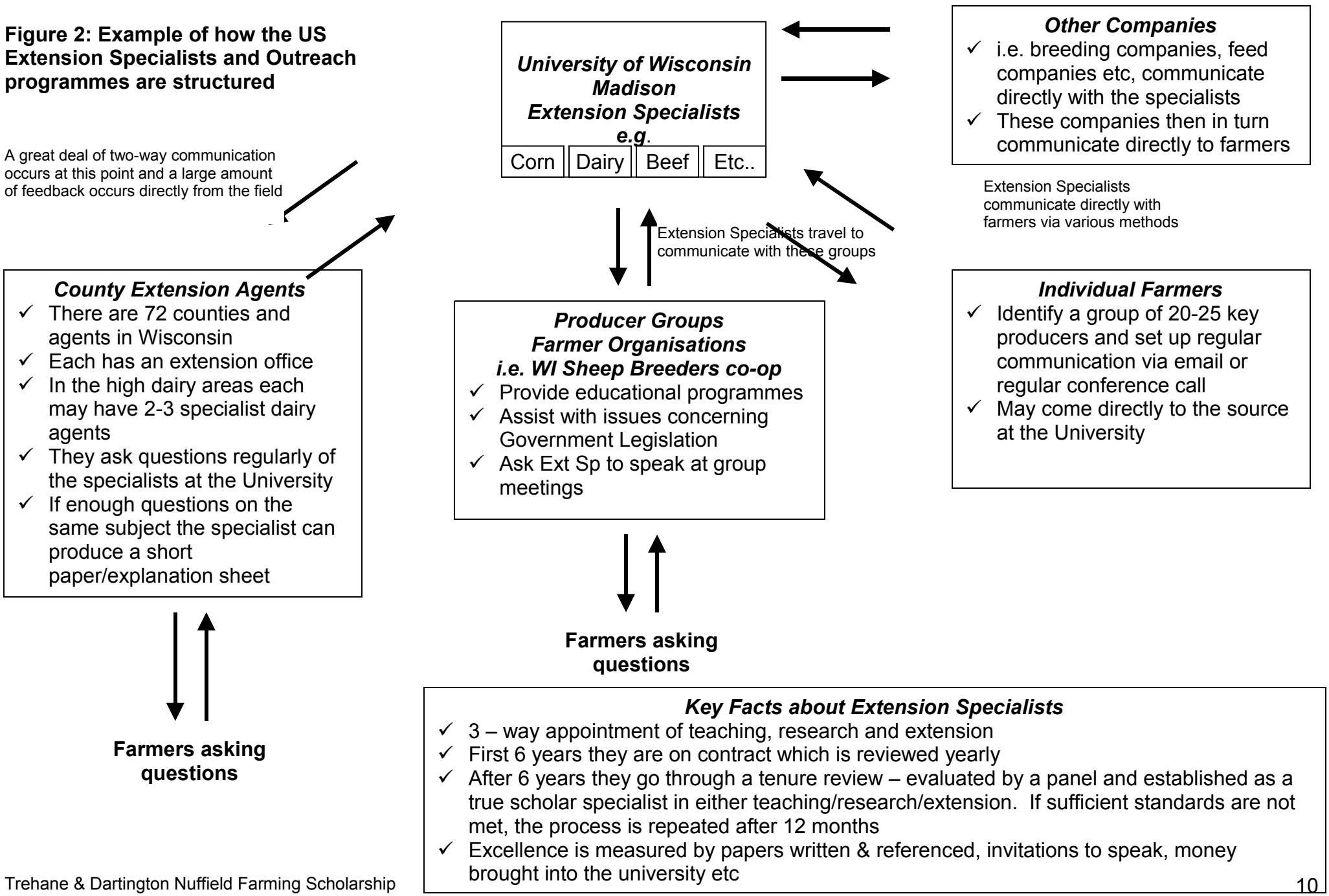
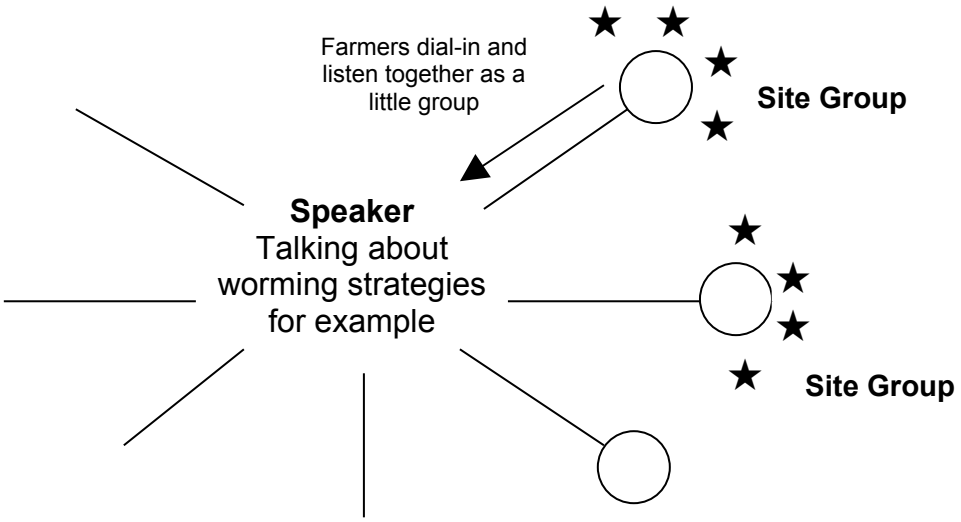


Figure 3: Example of a really effective and novel approach to communication



Key Facts about 'Wisline'

- ✓ The speaker sends a paper through which the County Agent downloads and copies for the group
- ✓ All material is archived onto the website www.uwex.edu/ics/wlw/
- ✓ The group dial-in and listen to the presentation
- ✓ The Site Group still gives the opportunity for them to interact with each other and share ideas
- ✓ Once a month the Dairy/Sheep specialists etc have a Wisline conference with all County Agents who can download and join in if required. This helps keep them up-to-date with new developments and gives valuable feedback from the field
- ✓ Next aim is to have farmers in their homes listening and watching powerpoint presentations over the web
- ✓ Many still don't have high speed internet access at home however

Why was 'Wisline' created?

- ✓ It was created firstly for sheep producers because there are small numbers of producers so 1-1 meetings are not effective

Relevance to the UK of the methods of knowledge transfer used in North America

The US and Canadian knowledge transfer mechanisms illustrate important methods of achieving a cohesive and integrated structure. In the UK, limited extension services are available with limited resource for extension activity, whilst in the US and Canada, industry cooperation is paramount and has played an important and structural part in agriculture for over 100 years.

The key seems to be the specialist Extension Officer who can speak both the language of farmers and that of science extremely well, situated between the researchers, the County Agents and the farming community. Whilst these Extension Specialists get directly involved with presenting the results of research and innovation to farmers through meetings and seminars, they are also heavily involved with the development of Extension literature. This literature is then used to train up others with a much greater outreach capability, including many industry organisations that the farmers trust.

This part of the tour made me realise that there does appear to be a missing link in the UK's technology transfer mechanism, namely the lack of enough independent and skilled translators, to deliver the results of research projects to farmers.

The overriding message that I brought home with me is that transparency, consultation and cooperation works – it builds trust. The US and Canada have the huge benefit of a more integrated system with less fragmentation and competition between associated organisations than we have in the UK. This allows them to work together more easily, sharing resource and skills to aid translation. This is to the benefit of all the industry.

Australia, New Zealand & Ireland

Australia

I found the Australasian part of the study tour the most fascinating. Although Australia is 10,509 miles from the UK, the similarities between the challenges we face with science and farmers is startling.

Knowledge Transfer Mechanisms

Whilst their extensive research programs are evident, there is very little communication or cooperation between the different sectors of the industry. Research scientists seem concerned that if they embrace the industry to aid the dissemination of the results, commercial companies may attempt to skew results and mislead farmers into buying more product. A great deal of mistrust is evident and more concerning was that no extension service is available at all for genetics. This is left up to the genetic evaluation unit that struggle to manage the entire communication effectively on such sparse resource. Likewise, the scientists do not appear to want to listen to the views of those out in the field, especially those in allied industries, as they feel that the messages they get back have a commercial spin.

Prioritisation

Scientists believe they know what the on-farm issues and priorities are because they do 'regular surveys' and have 'farmer representatives' on their Boards. Most of the Australian farmers don't have the time to attend the meetings or fill out the surveys that they base all of this evidence upon. This results in a huge level of distrust within the dairy sector in Australia and little or no cooperation between different sectors of the industry.

Subsequent problems

Farmers are frustrated and as herd sizes go up and labour goes down, they are becoming more reliant on either advice from other farmers or are simply letting the consultant make the decisions. The family pictured above are a fine example of incredibly forward thinking and progressive farmers. The lady pictured explained to me that she had attended several workshops and meetings

where the higher level decision makers seemed keen to hear what their priorities were. She also explained how disheartening it was to attend these meetings, fill out all of the survey forms and then receive absolutely no feedback. I am fascinated by how Australia will progress in the future simply because I see so many similarities between their challenges and our own. Work has started on a review of the industries needs by Dairy Australia; I for one, shall be keeping a close eye on their progress.

New Zealand

In New Zealand the situation is completely the opposite. They have a fully integrated national database controlled by the Livestock Improvement Company. After spending time in New Zealand with the LIC, Breed Societies, Evaluation unit, Dexcel (Dairy Excellence) and farmers, it became clear that the 'monopoly' style approach that LIC have taken is really working for them (95% of farmers in New Zealand use some or all of the LIC services).

Knowledge Transfer Mechanisms

The LIC approach to translation is 'trust'. They have built up an extremely strong brand containing all the elements, including R&D, that a dairy farmer would need to manage his herd. They continually develop services, updating farmers on any new innovations or technical developments through an enormous external public relations programme and a large sales force who are trained regularly. My main concern with this structure was the rules in place for other organisations operating outside of LIC's direct control.

Funding

Although LIC are a farmer owned and run, profit-making organisation with a shareholder structure, all other organisations within the industry who collect data on animal performance have to, by law, submit this data into the central LIC database. This is essentially as a result of how LIC was born. It was developed from their equivalent of our Milk Marketing Board, which disbanded. In its place a central database was set up as part of de-regulation which is controlled and managed by LIC. So, in summary, a profit-making organisation with its own suite of products, genetics and advisory network manage all of the animal performance data for all other competing companies, including the independent herd books, that are required to supply all of their pedigree data (used in the evaluation of performance) and then also have to pay an extraction charge if they want any of it back.

I was very impressed by the professionalism of LIC and of course they are bound by data use clauses and confidentiality agreements to ensure that incoming data is not used to provide LIC with commercial advantage. However with that said, I still found this issue of a profit-making company maintaining central database independence a little tricky to get my head around. Perhaps it is no

wonder that LIC spend a fortune on the promoting themselves in order to build and maintain trust within their industry.

Additional Resources

I spent an extremely interesting day with another New Zealand research body – Dexcel. This is an organisation which is funded by a central levy, not just to perform small scale research, but also to 'translate' that information into simple language. Dexcel do not claim to perform 'extension' in its purest form, but encourage the uptake of their output via existing communication channels in the industry. Information is then given out to those in the industry who are best placed to speak to and influence farmers. Likewise, they actively promote participation and try to steer research priorities based on farmers' needs relevant to the current and future economic environment. Figures 4 & 5 illustrate the integrated nature of information flow through Dexcel.

Figure 4: A diagram of the simple New Zealand Dexcel structure, illustrating how the flow of information from research and genetics is 'integrated' right through to the farmer via a group of 'translation' specialists.

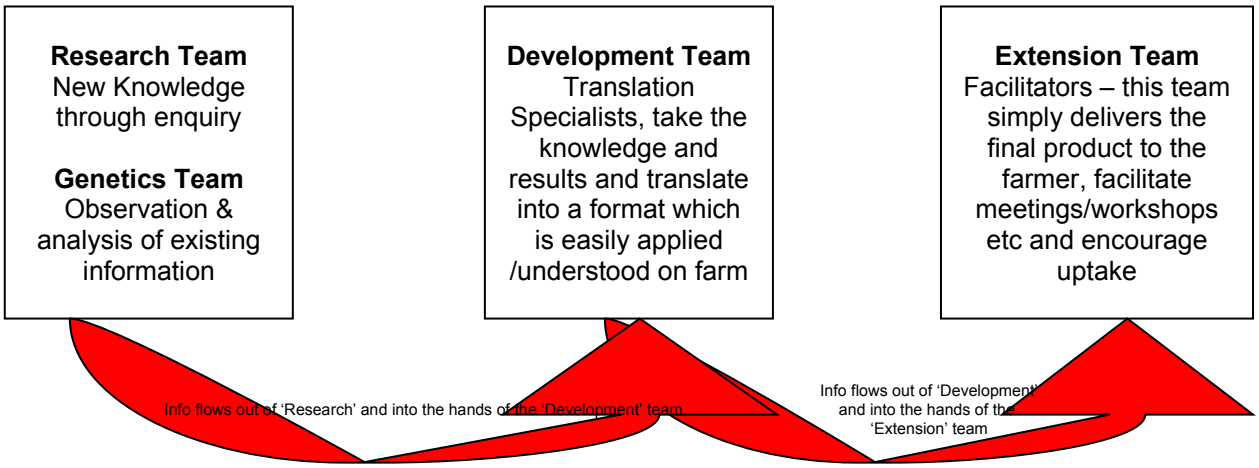
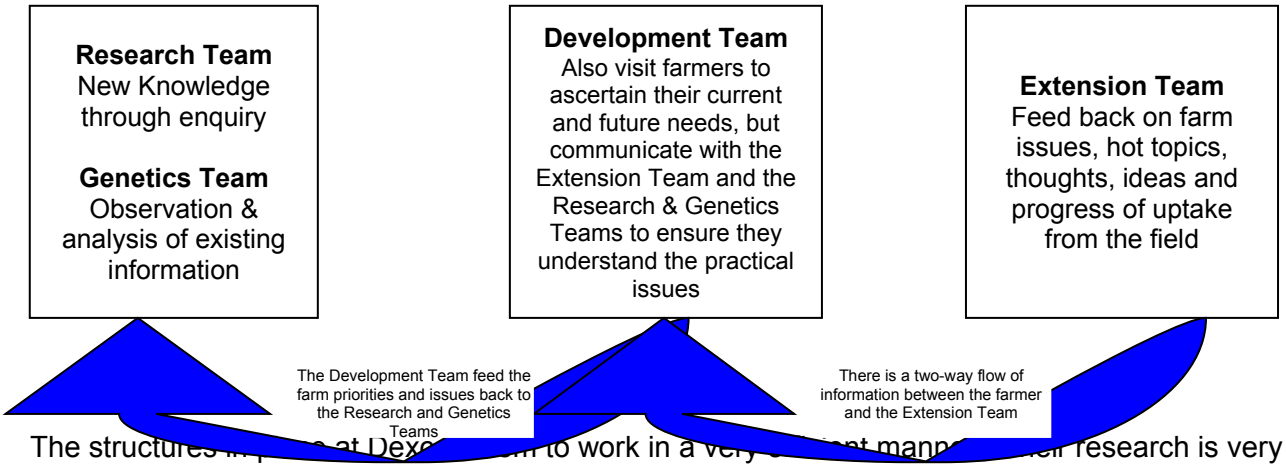


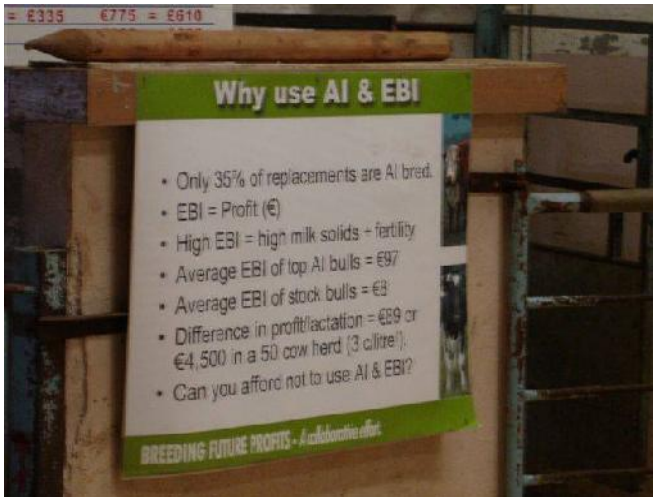
Figure 5: Illustrates how the same simple structure aids the flow and communication of farm issues and concerns right back to the research team via the same translation development team.



The structures in place at Dexcel seem to work in a very efficient manner. Their research is very small scale, however the good thing is that they appear to draw upon a great deal of work already

published and readily accessible. They group and synthesise this information to build a really great picture for the farmer, which includes a wide spectrum of elements surrounding one topic.

Republic of Ireland



Within the Republic of Ireland, cooperation is beginning to drive their industry forward. They have always had strong links to research institutions like Teagasc, the Irish Agriculture and Food Advisory Authority who provide integrated research, advisory and training services for the agriculture and food industries. Irish farmers are almost all aware of this programme and they take a great deal of pride in their research.

Knowledge Transfer Mechanisms

After creating a central national database, the Irish Cattle Breeders Federation (ICBF) have taken up the challenge of communication and use a much more 'hands on' approach. This includes extensive consultation with farmers to set research priorities within the breeding sector – a similar structure to that seen in Canada. A transparent process is building trust both up and down the chain. Having researchers with a strong practical background seems to work when it comes to translation of the information. This was never more evident that what I witnessed at a calf sale, which had been organised by ICBF to help promote the principles and benefit of owning and breeding an animal with a high EBI (Economic Breeding Index). Farmers with high EBI calves were identified and invited to sell these animals through a set of specially organised sales throughout Ireland. ICBF had attained sponsorship to cover a first prize of 2000 euros for the highest EBI calf at the sale. This alone attracted a large number of entries for the sale and commanded attractive prices. Before the sale began, Dr Andrew Cromie, who is a geneticist working for ICBF, gave the crowd of over 120 farmers a 3 minute talk about what the EBI actually meant. The picture above really sums up farmer communication at its rawest level. Genetic information, on a printed out powerpoint slide, being held up by a fencing post, in a cattle auction ring with a three minute presentation from a guy who understand both the science and the farmers well. For me, this was a real joy to witness.

Relevance to the UK of the smaller systems in place in Australia, New Zealand and Eire.

A central database appeared to make a huge difference in pooling together information and resource that farmers gained trust in, especially evident in New Zealand and Ireland.

It seems clear from the existing program in Australia however, that an Extension service is ineffective on its own. We should also be looking at bringing together all of the well established, reliable communication channels that farmers trust, and utilise these for extension. Again, the missing feature is the ability to 'translate' the information. The key issue in Australia was a lack of trust between many of the organisations involved in the diary sector and the farmers. It will be interesting to study how their industry tackles these issues in the future as I believe we, in the UK, not only have the most in common with this situation through lack of cooperation, but also the most to learn from how they turn this situation around.

Simple Summary of the Overseas Tour Findings:

- ***USA***
  - Had over 100 years of high level support from government
  - Integrated extension service linked strongly to Universities
  - Many geneticists who have practical agricultural backgrounds and speak both languages of the scientist and farmer well
  - Financial support now moving from agriculture into human health and genomics
  - Genetics students preferring to major in genomics rather than population genetics
  - Now must find alternative ways to communicate developments to farmers and back
    - Relying now on consultants etc to deliver
    - Discussion groups ↓ = more specialisation

- ***Canada***
  - Love co-operating – like giant magnets!
  - Integrated industry (born from government control)
  - Self governing and financing (research still part funded by government and also, importantly the industry)
  - Independent organisation working for the industry
  - Have the ability to translate information extremely well – heavily used resource
  - Have a structured approach to industry consultation
  - Linked strongly to university to 'look after' young scientists
  - Rely heavily on industry service providers to communicate genetics

- ***Australia***
  - Largely divided industry
  - Strong political influence versus Industry service providers
  - Extension is a service – however genetics not a part for over 30 years
  - Evaluation service funded by Dairy Australia via levy
  - No mechanism for communication of this information – rely on industry
  - Open to commercial spin
  - No feed-back mechanism as the industry service providers are not listened to
  - Lack of translation, trust and co-operation

- ***New Zealand***
  - Highly integrated industry – recent deregulation
  - Born out of 50 years of co-op mentality
  - LIC - Large corporation control ~95% of the market share for genetics and herd recording
    - Supported by continued aggressive marketing – as now a 'profit driven' corporation
    - Steeped in history – farmers trust the service
  - Dexcel – industry resource funded by levy
    - Provides both a science resource, translation and extension in one place
    - Most importantly held together by a 'development' glue
    - This bridges the gap

- ***Ireland***
  - Integrated industry – especially research and genetic evaluations
  - Central database for dairy and beef
  - Long standing and renowned research programmes
  - Farmers proud of their research which increases trust
  - Use the allied organisations to help communicate key messages
  - Key translators employed who can understand the farmers issues
  - Keen to hold open meetings with farmers to help set research priorities
  - 'All in the same boat' approach

Summing up the Main Challenge for Knowledge Transfer using the Good Old Fashioned 'KISS' Method: 'Keep It Simple Son'

Having completed the final section of the tour, I curled up wearily in my seat on the plane home considering how to sum up all I had learnt about the challenges surrounding the lack of communication between scientific research and the producer. I realised that it was ultimately funding, translation and subsequently the available knowledge transfer mechanisms that were the primary issues, not the lack of available science or people willing to help with the extension or delivery of the message.

The best way I can describe the problem is as a language barrier. Farmers and scientists /geneticists speak two completely different languages. The industry should provide a means to a symbiotic relationship and translators who speak both languages fluently.

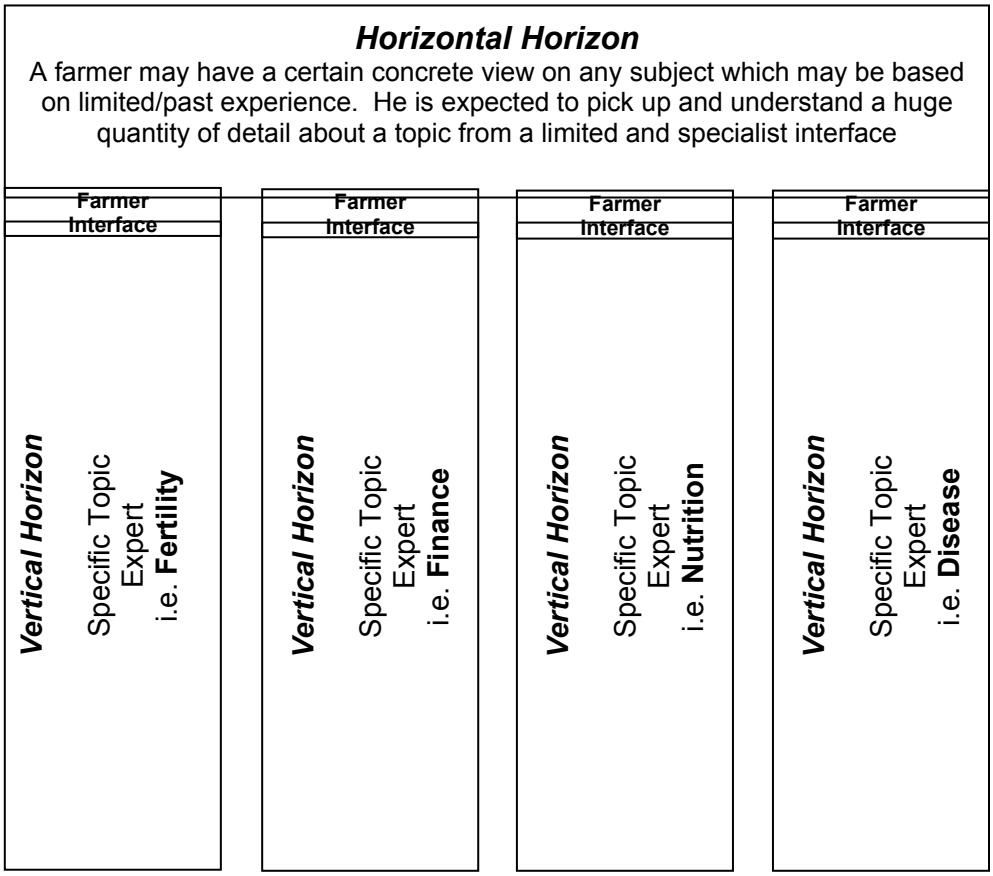
This is where the skill of the Extension specialists really did shine through in the US. These people generally come from a farming background however they then go on to study specialised subjects. They will often then complete a PhD with part of their research tied into extension.

It was also clear, that throughout the world, competitive research funding structures seem to drive the 'specialist' approach to research which can make it even more difficult to relate the output of the research to the farmer.

Possible Solutions

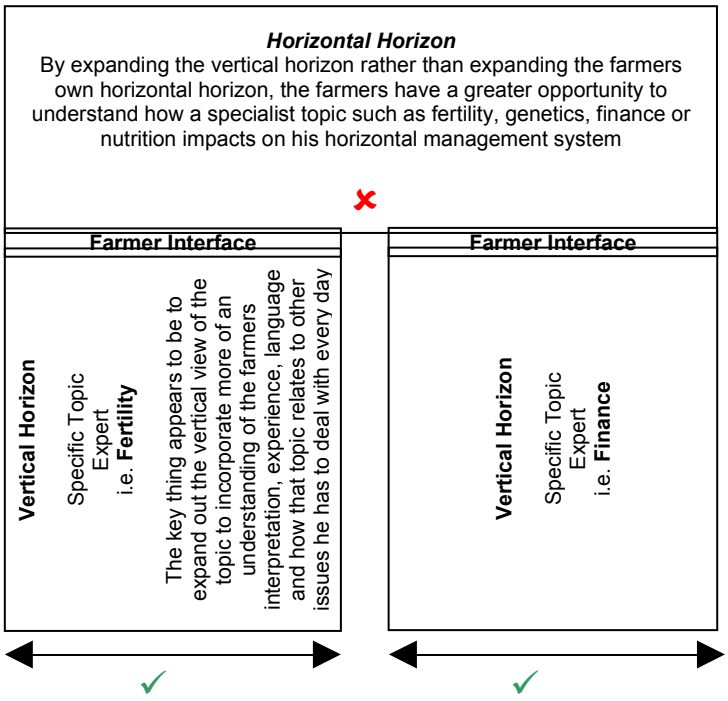
It was at Dexcel I was hit by a further concept, which may go a little way to explain why it would appear a language barrier is in place between farmers and scientists. It was after talking to a researcher there called Chris Burke, who explained that the only way he could describe the issue was that just as with a television, in order to create a clear picture, you need vertical and horizontal tracking. This principle could also be applied to the difference between scientific and farmers' knowledge.

Figure 6: Main Principle is the Vertical V's Horizontal Horizon



Many times, the farmer can accept and trust the knowledge he receives from the specialist, however he may not believe that the specialist is relating to all the other aspects he has to manage and consider. The management of a dairy farm is a highly complex job and often a farmer will have his own specialist knowledge in many of the areas but perhaps not all. As farms are getting larger and labour is decreasing, the farmers knowledge is becoming more stretched. He is maybe moving from being a manager of cows to becoming a manager of people! This increases the need for input in specific areas from an expert. How well that expert can relate their specialist subject to all the other aspects in what is essentially a difficult balancing act, will often be the deciding factor of knowledge uptake.

Figure 7: How a farmer's perspective and knowledge base differs from that of the specialist



How do these findings relate to the UK Situation?

It is vitally important that following on from the findings of the Nuffield tour, the strengths and weaknesses of the UK industry be investigated in order to identify areas of required improvement. I found three clear examples within the UK industry of 'Extension' or 'Knowledge Transfer' in operation. The first example is a non-profit making organisation owned by a number of institutes, universities and organisations. The other two examples I looked at are both arranged by, and financed through levy bodies. This can prove beneficial as producers are paying for the service that they receive so the main extension activities in the UK are 'industry funded and driven'.

Conclusions

The next question therefore must focus on how effective each of these systems are at delivering a knowledge transfer programme for the genetic and scientific resources in the UK?

Example 1: Pig Development Centre

Pig Development Centre (PDC)

The National Pig Development Centre (PDC) is a strategic partnership between top researchers at the Universities of Leeds and Newcastle and the Veterinary Laboratories Agency, and the British Pig Executive (BPEX). It aims to link academics with pig producers and help restore the UK's pig industry to its previous position as a world leader.

The PDC provides the largest facility for pig research, development and knowledge transfer in the country. The centre includes a team of knowledge transfer specialists from BPEX who will be working with the researchers to ensure their work is disseminated to industry. This team will liaise with farmers to identify issues where research is needed to solve industry problems. The PDC thus creates a continuous chain between strategic research, applied research, development, knowledge transfer and industry uptake.

The PDC combines the academic strengths and pig research facilities of the Universities of Leeds (UL) and Newcastle (UN), the veterinary expertise of the Thirsk Veterinary Laboratories Agency (VLA) and the industry awareness of BPEX.

This centre has the following mandate:

- To conduct and coordinate **research and development** work of direct relevance to the British pig industry
- To implement **knowledge transfer** that will disseminate best practice to industry and act as a two-way conduit between R&D and industry
- To facilitate **communication** between all members of the pig chain, be they producers, suppliers, processors, or retailers

- To encourage and coordinate the development of specific **training** programmes which will equip the British Pig Industry with competent personnel at all levels

Areas already identified by the centre for research include analysing the benefits of new sire lines, assessing how to manage variations in meat quality without affecting customer demand, ways to reduce the seasonal effects on production for the 25% of pigs produced outdoors in the UK and looking at the best ways to refurbish buildings to improve pig health and performance.

Personnel: The PDC essentially comprises a management team, an R&D team and a knowledge transfer (KT) team, which will work together to provide the above objectives to the pig industry.

PDC Specialist Knowledge Transfer Team

The BPEX PDC's specialist knowledge transfer team provide practical advice to individual pig businesses in England and Wales.

The **KT Team** are equipped with the latest knowledge, techniques and ideas from BPEX research and also research findings from other leading pig industries.

Key areas of current practical advice available include:

- NADIS Pig Disease Surveillance
- Breeding Programme
- Nutrition
- British Pig Projects
- Finishing Systems
- Meat Quality
- Classification
- Assurance
- Feed Report

BPEX also have a range of technical guides covering all aspects of pig meat production. An example if such a document can be seen in appendix 3.

This specialised team of five Knowledge Transfer members and 'Technology Translators' have been created to transfer best practice ideas to the whole industry assisting individual businesses and the whole sector to enhance profitability and competitiveness. The team work through pig discussion groups, BPEX seminars, the web and on a one-to-one basis with individual levy payers and organisations.

All members of the team have extensive practical knowledge of the industry whose objective is to work with your business to take it forward.

Comments and observations on the PDC:

The PDC follows a very similar structure to that described previously in New Zealand through Dexcel. They not only coordinate and in some cases perform the research within their remit, but they also **translate** the findings and then transfer this knowledge via a clear and structured pathway into the industry. The main difference between this system and that of the extension service in the US would be that they don't seem to communicate directly with the farmers. The PDC focus on facilitating meetings and working groups and encourage organisations and companies involved in the industry to take on their translated messages and pass these on to the producers.

Conclusion

Using already established channels of communication such as industry publications, organisations and companies to communicate the messages for you can be an extremely effective way of increasing the update of knowledge. This can also be seen in New Zealand and the US where they utilise the established and trusted networks to pass the messages on. In order to maximise this effect it is also important not to force corporate branding onto the information provided – the key is for the producer to take on board independent information from his most trusted source, whether that be his vet, local rep, breed society, conference, farm meeting or neighbour. Key messages and knowledge should be freely displayed and promoted in whichever way is most effective without the need for heavy branding from a single source which the farmer may or may not trust.

Example 2: The Genesis Faraday Partnership

The Genesis Faraday Partnership is one of 24 Government sponsored Faraday Partnerships that seek to improve the co-ordination between the research community and industry in specific market sectors. The Faraday Partnerships initiative is named after Michael Faraday (1791 – 1867), the physicist and chemist known for his experimental work in electricity. Throughout his scientific career, Faraday maintained strong links with industry helping to solve practical problems whilst also pursuing his fundamental research.

The Genesis Faraday Partnership was developed as a result of a proposal to the 2002 competition for new Faraday Partnerships led by the Roslin Institute.

The Faraday Partnership initiative is aimed at promoting improved interactions between the UK research community and industry. Faraday Partnerships are business friendly partnerships between the research base (Universities and Institutes) and industry (commercial companies and intermediate organisations) working to 'Faraday Principles'.

Its main aim is to promote and co-ordinate basic research, assist with technology transfer and organise and promote relevant training activities. The results of this activity will be a more sustainable livestock industry with better animal production, health and welfare, together with thriving livestock breeding and animal health companies.

The Genesis FP works to improve the co-ordination of the use of genetic and genomic technologies by the livestock breeding and animal health industries.

Ownership and Governance

The Genesis Faraday Partnership was established as a Company Limited by Guarantee in November 2002, and commenced operations from 1 January 2003. The Company is 'not for profit'. The owners of the Company are:

- The Roslin Institute (Edinburgh)
- The Royal Veterinary College (London)
- The Meat and Livestock Commission (Milton Keynes)
- The University of Edinburgh
- Sygen International plc.(Oxfordshire)

The Board of the company comprises Directors appointed by these owners plus additional Directors who balance the expertise of the Board.

Technology Translators

Genesis Faraday has now employed the first Technology Translators who will facilitate communication and broker negotiations between partnership members.

Their major objectives include:

- Liaison with Partnership Members to understand the technology needs of commercial members and the technological capabilities of academic members
- Facilitate new research projects, the transfer of knowledge and the establishment of collaborations between members
- Understanding and facilitating access to technology transfer support mechanisms
- Mentoring members through the establishment of collaborations, identifying and facilitating appropriate funding processes and mechanisms
- Organise technical meetings, workshops and exchange programmes for groups of partnership members

Comments and observations on the Genesis Faraday Partnership:

I am fortunate enough to work for an organisation that is a member of Genesis Faraday. Since Genesis Faraday commenced operations in 1 January 2003, over 90 organisations with an affiliation to farm animal genetics and genomics have become members of the Partnership. The main remit of Genesis Faraday is to promote and co-ordinate basic research, assist with technology transfer and organise and promote relevant training activities. This, the Genesis Faraday Partnership do very well in the UK, however the main activities and communication pathways tend to be focused on the membership. They have in place a membership fee, which is based on the size of the business, payable annually. With this in place, it seems that a lot of the information and knowledge stays within the membership and is not actively promoted within the wider industry. Very effective workshops are organised for members which help to set research priorities and communicate results.

Conclusion

Genesis Faraday are excellent facilitators of research, however a lot of the actual ‘translation’ stays within the membership rather than ensuring that it is being directed back down to the grass roots, which is left to the responsibility of the members.

Example 3: Milk Development Council (MDC)

The Milk Development Council was established by the Agriculture Ministers when the milk industry was deregulated and the Milk Marketing Boards disbanded at the end of 1994. At this point it was awarded the powers to collect a levy from dairy farmers to fund promotional and research activities. The levy is currently 0.06p per litre of milk sold off farms, raising approximately 7 million per annum. The MDC is officially a non-departmental public body (NDPB) which means that it is independent from Government and it's activities are not under direct political control.

The MDC works towards creating an increased demand for milk supplied by profitable British dairy farmers. Using the 7million pounds raised each year by Britain's dairy farmers, whilst attracting a further 5m from Government and industry, it provides essential services that help dairy farmers run profitable businesses. The key elements in achieving this and therefore the main services provided by MDC are:

- The opportunities that can add value to, increase demand for or arrest the decline of raw milk sales - the focus of the Market Development team
- The insight and knowledge aimed at increasing power and aid better decision-making - the focus of the Economics team
- The efficiency, expertise and business-focus with which milk can be produced - the remit of the Farm Management team and genetics evaluation service ***breeding+***

Any dairy farmer in Britain can use or benefit from MDC services, and much effort is spent communicating new developments and making sure farmers understand and make use of the range of services available.

The MDC is governed by 11 Council members who are appointed by the relevant Minister to oversee MDC's strategies and ensure dairy farmers' money is spent appropriately.

Regional committees of farmers were set up in 2001. The regional committees primarily help to communicate levy-payer views and ideas to the Council and management of the MDC. While Council members remain responsible for the way in which levy is spent, the regional committees give valuable input and have a major influence on Council and management decisions.

The MDC Extension Service

The MDC now have 10 Extension Officers (one of which is a 'trainee' and supports an experienced Extension Officer at present)

Each have responsibility for a large region and cover the whole of England, Scotland and Wales.

The Extension Team all have a practical background in the dairy industry with the majority of them having previously worked as dairy farmers and herdspersons.

Their primary roles are:

- to be the first point of contact for the MDC in their regions
- to communicate MDC funded work to dairy farmers through a range of activities
- Feedback issues and ideas from dairy farmers to the MDC council

Their main area of concentration now is in the setting up and running of Dairy Business Clubs. These are groups of between 10 and 20 farmers and are usually brought together as a group who supply the same milk buyer. These groups are now the main way that MDC will communicate research and tools such as the Farm Improvement Programmes.

Comments and observations on the MDC:

The UK is in an advantageous position in some respects, by having a compulsory levy already in place to collect the funds required to run an organisation with such scope. The Extension team at the MDC was set up partly to follow the recommendations of a previous Nuffield Scholar Emily Eubank-Ball, who studied Investigation of technology transfer to and implementation by dairy farmers.

Over the years the Extension team have been effective in facilitating very effective meetings, workshops, on-farm demonstrations and communicating new developments to the industry. Their background in practical farm life means that they do have a broad understanding of the issues farmers face with reduced time available to develop skills, read about new developments or put into practice a new technology or technique which may aid bottom line profitability This is where the farmers levy money can be put to good use, especially now into the future where the remit of the Extension staff for the MDC will focus on the establishment and running of the 'Business Clubs'.

Conclusion

Clearly this is a valuable resource, however it would appear that the weakness of this structure is the bridge between mainstream scientific developments and this grass roots based approach. It is important to recognise that the skills and remit of the previously discussed US Extension and UK Extension services are distinctly different, as the UK does not cover the element of translation or specialisation.

The MDC are also heavily involved in different aspects of small scale research and always strive to ensure that the output of their scientific research is taken up on farm. This can be seen through the recent development of the Farm Management Programmes which include fertility, grass, genetics and will soon include feeding/nutrition. It would also seem that wherever there is research the MDC fund, they will always try to ensure that built into the research milestones is an element of knowledge transfer so that the results can be communicated easily via their Extension staff to the levy payers.

Overall Discussion of the Challenges Facing the UK

There appears to be a fundamental issue that I have seen echoed throughout the world. The problem does not specifically relate to smaller research projects carried out by, for example, the Levy Boards, but more importantly a structured and coordinated approach to ALL of the large-scale dairy research being done in the UK is needed, containing an element of Knowledge Transfer attached to their project remits. In many countries the advisory services are separate from mainstream research, whereas in the US they are fully integrated. In the UK the Scottish Agricultural Colleges have traditionally been far better at achieving this approach than in England, however the ever decreasing pot of research money may begin to have an effect on the SAC structure and force them to look for income from other research activities which may not be related to high agricultural priorities.

Funding structures a major challenge:

The major issue developing in the UK which extends throughout the world, surrounds the competitive structure of our research funding. The UK used to have a fantastic structure through the Milk Marketing Board and the Government supported ADAS (Agricultural Development & Advisory Service) where teams of ‘knowledge transfer translators’, who were often linked to academic institutions, would take the science and directly apply this on-farm with key demonstration farms used to trial new techniques and prove the theory could work in practice.

Unfortunately, the UK cannot financially support such a structure in today's economic climate. The money is drying up for practical research, especially in the agricultural sector, whilst there appears to be a shift toward more human and genome based research. The industry is also facing a severe shortage of young students interested in genetics, especially quantitative. Students are opting for a degree based around genomics or human health. This situation is understandable, as the likelihood of acquiring a more lucrative position with prospects is more attractive than careers currently available in the agricultural sector.

Public and private research funding is becoming sparse as the whole industry tightens its belt. This results in higher levels of competition for an ever decreasing pot of money. With a high level of competition comes the increased likelihood of the commercial funding bodies and companies, tying up any results or outcomes with complicated Intellectual Property Right (IPR) contracts. This quite often results in the output of the important research being buried away for commercial use.

Vicious circle:

This is an ever increasing vicious circle, as the researchers become heavily focused on achieving the publication of scientific papers from the output of the research and have little or no desire to incorporate knowledge transfer as a prerequisite into research project. This is because they are given little appreciation, financial acknowledgement or gratitude for doing so – why should they bother?! They are quite rightly aiming to get as many papers published as possible to ensure that their academic establishment or research institute retain high regard within the scientific community. This provides a greater chance of fighting for the next piece of funding that comes along. Simply put, within the UK the funding will dictate what the researcher does not the highest priorities of an industry unable to fund their own large scale research independently.

This is not the fault of the researchers, they have simply responded to the change in the market – and after all it is a market, because they cannot perform research for the industry out of charity. The simple fact is that academic world does not reward scientists, geneticists and researchers for being non-scientific, it rewards the publication of scientific papers.

UK = Professors don't get any credit for talking to farmers – they don't get paid for this either

US = Researchers have an extension component which they are rewarded for pursuing

We cannot expect our scientists and geneticists to give up their valuable work or research funding-hunting time to pop out onto a farm to explain the principles of genetic selection over a cup of tea and a scone. They are probably not the right people to perform this task in the first place because the often don't speak the farmers language. Neither can or should we expect the hard working people in the industry, who spend hours organising workshops and similar events to communicate with their producers to make sense of the complex, correlated response mechanisms and wonder how best to explain this all in simple English to farmers! If this were the case, then all of our MDC

Extension Officers would probably need to be sent on a crash course in quantitative genetics – have they not got enough on their plates?

In the US they are actively seeking new ideas, securing funding to train and encourage students into agricultural science, publishing papers, writing articles and carrying out extension work. If they lose balance in either direction then the system doesn't work – the UK seems to have lost this balance.

Losing young people from research and the industry:

The situation is therefore challenging. Research is becoming super competitive – not just here but in every country that I visited, including the US, where the future funding for their excellent Extension programme is looking more and more uncertain. This is because in the US, as in the UK, the Department of Agriculture and central Federal funds are being moved away from agriculture and towards the problems in human health. Consequently, their young scientists are attracted more towards human research and genomics to follow the shifting research funding and as a consequence, their supply of young agricultural scientists and geneticists is becoming harder to find. It will be interesting to see how they handle this process; one which the UK has been through and is now facing the consequences of.

Not only are we seeing less and less young people entering agricultural research, but this trend is amplified out on farm too, where youngsters are opting for an easier life where they don't have to work every other weekend and try to manage 250 cows with one man and a dog, and little financial reward. Even if we could do something about improving the communication of new innovations, there is a real risk that the vital generation to generation 'chain of knowledge' is under threat of being lost, making the whole issue worse.

Both the solution and the barriers all come back to funding:

Possible challenges

The big challenge is the same old issue that hinders most progress in the UK dairy industry and is bringing the research community to its knees – the lack of funding and money available to achieve this coupled with a lack of ability to cooperate with one another. A great deal of work is already completed however, take for example the MDC Extension staff and the allied industries. They are all very keen to help disseminate information, but there is a real lack of cooperation and coordination between these two groups. There is a huge amount of research that has already been completed, especially within dairy genetics, but a lack of a properly structured, funded, coordinated, independent dairy **Translation Group**.

Possible Solutions

One hope on the near horizon is the recent review of the levy body structures, funding and priorities. Many decisions will be taken over the next 12-18 months that could make a real difference to the effectiveness of the current systems for communication that we have in place throughout the whole UK industry.

BPEX, through support from the MLC, have created their own structure for the pig industry, which although relatively new is growing in reputation for its integrated approach. Perhaps there is an opportunity, when reviewing some of the activities of the Milk Development Council, to look closely at the knowledge and translation gap. Currently the dairy industry are missing out on potential new knowledge which could help farm profitability because there is no mechanism in place to simply take the outcome, make sense of it and 'Kiss' - Keep It Simple Son! The MDC do the very best job they can, however with more industry cooperation and pulling together of organisations that communicate with farmers regularly; so much more could be achieved. I don't believe it has to be the job of the Extension team or those communicating the message directly to farmers to do the translation work, but this is a vital missing piece of the jigsaw.

As far as the research funding struggle is concerned – little can be done without some kind of regulation and coordination between funding bodies – both public and commercial, to ensure that knowledge transfer is a prerequisite of all submitted papers to answer the long standing scientific question: how will this actually help the farmer? This will take a great deal of cooperation and understanding to change the standard practice with such little funding available and the rush to get the work published. The researchers will need funding built into the project specification if we expect them to spend time talking to translators – this drive must come from the funding itself. Yet this raises the question of why the commercial funder should be responsible for funding this extra knowledge transfer element if all they are interested in is the IPR tied-up results?

Coupled with this, is the need to establish a more 'open access' policy to research libraries and scientific papers. Unfortunately, the restriction of access to published papers, either through scientific journals or electronic library memberships, is a barrier which currently prevents the already established translators within the industry, such as agricultural journalists, from helping to bridge this technology gap.

I cannot answer all of these question, but will endeavour to suggest some recommendations and conclusions to help overcome the challenges our industry faces with the knowledge transfer of science and genetics to farmers.

Conclusions

Cooperation

From those countries studied, there are quite distinct benefits from working together within the industry, cooperating and sharing resource. This is particularly evident in those countries that have established a Central National Database which links both research and farmers.

Translation

Many countries have identified key translators who have the ability to take the language of science and translate it into the language of farmers effectively whilst understanding what shapes and influences each. They also tend to come from a farming background and developed their scientific skills latterly. Having skilled translators in place to provide information to either an extension service or into already established industry communication channels is highly effective. This system is also highly effective in translating the needs of farmers back to researchers, who may have little knowledge of the farm level issues which are most relevant for research.

Research Funding

Part of the problem is the way research is funded in the UK. Researchers are rarely financed with part of the project being to communicate their results, often restricted through IPR because of the need for private funding for research. As funding channels become more scarce, researchers are all fighting for funding from a smaller and smaller pot. The relevance of this research to the farmer therefore becomes dependant solely upon the financial contributor's priorities which may or may not consider the farmers needs (including Defra).

Coupled with this, fewer and fewer agricultural students in the UK are moving into applied scientific research, especially in the dairy sector. Human health, genomics and pharmaceutical research attracts the students away from applied research due to the increased funding and security available.

Open Access to Research

Most scientific journals, such as the Journal of Dairy Science and Animal Science, will make papers over 12 months old available to those not subscribed to the publications. In some countries, there is a central resource available, where all new scientific developments are accessible. As the UK's scientific output is heavily tied up in both IPR and subscription access, there is a need to create a central resource, where translators can easily access the full range of reports and papers on all scientific developments, ensuring that the maximum benefit be obtained at farm level.

Recommended way forward for the UK

Cooperation

The UK dairy industry needs a wake up call and key industry leaders and heads of influential organisations should be encouraging organisations to work more closely together, communicate more regularly, stop competing against one another to be seen to be the most influential and important and begin to share resource and ideas where possible. Fragmentation and duplication is expensive and this cost will inevitably land back at the dairy farmer's gate, one way or another.

Stop re-inventing the wheel and try a new approach

We need to establish a structure to fill the gap between farmers, Extension and research to provide a framework of translators – we don't necessarily just need more Extension!

This would be best achieved following the future re-structuring of the levy bodies and the development of 'New-Co' with individual sector companies. This 'translation service' should be built into the strategic plan either used across all sectors or developed specifically for the dairy industry, where it is desperately needed. It needs to utilise and build upon already existing and 'trusted' communication channels, pulling everyone together, establishment of a central research output and reports hub, providing consistent messages/advice from all in the industry to help build up trust. We must NOT re-invent the wheel or cause duplication, wasting more industry money and frustrating farmers even further.

Find, develop and most of all keep hold of the skills we need

We must do more to help identify, develop and support those students from an agricultural background who show the potential to become effective translators of science. A coordinated industry approach to sponsorship and making sure that a structure, funding and positions are in place for these future translators is vital. Alternatively in the short term, get out there and source the experts already present in the industry.

Theoretically, an ideal UK situation would incorporate:

- UK agricultural research priorities being set by a combination of farmers, scientists and a group of people who can translate the needs of one group to the other
- Industry money set aside specifically for research projects and knowledge transfer mechanisms from levies, allied industries and DEFRA – Department for the Environment Food and Rural Affairs. This would reduce competition
- Each research project to have an element of knowledge transfer – i.e. the researcher communicating a more concise paper for the translation group

- ‘Open access’ given to all scientific papers and research, allowing translators to establish wide, broad and accurate recommendations and messages
- A group of translators, also funded independently, to translate information into language which farmers can understand. Possibly utilising the huge number of agricultural journalists in the UK, who are excellent at this already
- MDC Extension staff taking these messages out to farmers and communicating with the allied industries, organisations and bodies, who assist in this Extension, spreading the message and measuring the uptake

This structure would help to build trust; everyone would feel as if they are being listened to and that problems and challenges are being understood. This would also build strong communication channels which react quickly as with the BPEX work – getting the information down to the farmer quickly and the reaction and effectiveness of knowledge transfer returned for consideration.

What Has the Trehane & Dartington Scholarship Taught Me?

Before I conclude this report, I feel that it is vitally important to recognise that as a Nuffield Scholar, whatever the field of study, the results of your report are not the only aspect to focus your efforts upon.

Being a Nuffield Scholar, wherever you are in the world for me has been all about a few key things:

- Friendship
- Independence
- Determination
- Maturity
- Development
- Adventure
- Disappointment!

All of these aspects shape you as a Scholar and as an individual. They will provide the basis that you will surly need to drive forward in your goals and perform that all important task as a Scholar: 'Thinking outside the box'

Along the way I met some amazing people, heard some unbelievable and captivating stories and drank some unidentifiable beverages!

To the Nuffield Farming Scholarships Trust, The Trehane Trust, The Dartington Cattle Breeding Trust, Holstein UK, all of my friends, colleagues and most importantly my family; I owe so very much. The word thank you will never be enough, I just hope that with the skills I have learned and the determination this opportunity has given me, I make a positive impact in some way to this wonderful industry and the people who work hard to sustain it.

Many, many thanks.

How Have my Findings Benefited the Industry Since the Completion of my Tour?

Since my Nuffield began I have been given executive responsibility for the development of the single national database – the Centre for Dairy Information www.thecdi.co.uk with over 75% of all UK dairy data already being pooled from all the dairy breed societies, a number of beef and two of the three UK milk recording organisations. Three internationally renowned and 4 other websites run from this database directly providing a major communication channel for the UK industry and a huge research resource. Although affecting only one sector of the dairy industry, this has been a massive step forward in cooperation and communication which must continue to develop throughout the industry. Appendix 4 also demonstrates that through the CDI, we have developed a similar approach to BPEX with simple solution sheets to help simplify research.

Coupled with this, I had been asked to talk about the findings of my topic at the 2007 industry's Semex Conference and have been asked to contribute regularly to national publications, such as the Farmers Guardian and Farmers Weekly. This has been in a 'translation' capacity for specific topics, in relation to the findings and recommendations of my tour and also aimed at promoting the whole ethos of the Nuffield Farming Scholarship Experience.

Looking towards the future, I am currently involved with a group of industry organisations, trying to set up a structured funding mechanism for practical, relevant and high priority breeding science. If we can pool resources, set the priorities, based on sector knowledge and control the output of the results, we should be able to ensure that the key information is translated and disseminated out to the industry as quickly as possible.

In another capacity, I will be working closely with Rebecca Kent, who is completing a 2 year 'Knowledge Transfer Partnership' project, funded by the Department of Trade and Industry, with some funds also from DEFRA and MDC. Rebecca is employed by the University of Bath, however, works at the MDC and uses their resources for the project. Rebecca has supervisors at University of Bath who are Professors of Knowledge Management. The actual project is entitled 'To encourage the use of research information regarding cattle breeding strategies to breed cows which produce milk with properties and quantities tailored to specific market needs.'

The output so far has been a literature review into knowledge transfer, followed by a survey of UK dairy farmers that was returned by 3056 (20%) which looked at demographics, decision making, attitude to breeding, attitude to receiving new information. The project is due for completion in November 2007, after which time, we aim to work together to try and develop proposals for both the future genetics communication strategy for MDC, and also from my report's perspective, the whole structure from high level research to farm gate.

Overall this amazing opportunity has benefited me as a person. I have always been determined to do the very best job I can of whatever task I am given and will never ask another person to do something I am not prepared to do myself - my family taught me this. The Trehane & Dartington Scholarship has taken this grounding to another level and filled me with more determination and drive than ever to help our UK dairy industry drive forward in whatever little way I can. For me, it has been life changing, for the industry and fellow scholars, I hope the same.

Main Acknowledgements

Firstly

my sponsors and supporters:

NUFFIELD FARMING SCHOLARSHIPS TRUST
PATRON HRH The Duke of Gloucester KG GCVO

THE TREHANE TRUST

DCBT Dartington Cattle Breeding Trust

holstein UK

Secondly and very importantly, all of the friends, colleagues and acquaintances along the way who offered me help, support, a bed and on occasions a stiff drink – you know who you are.

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Disclaimer

The conclusions and recommendations I have discussed in this report are my own and do

not necessarily reflect the opinion of the Trehane Trust, the Dartington Cattle Breeding Trust the Nuffield Farming Scholarships Trust, or my employer.

Appendix 1:

Executive Summary

Throughout the tour, I identified a few common key issues which affected the changing dairy industries world-wide. In some countries, including the UK, these factors are having a profound effect on the ability to communicate science to farmers.

- Herd size ↑ Labour on farms ↓
- Paid, skilled labour ↓
- Lifestyle requirements and culture changing
- ↓pride in working long hours
- ↓ young people coming into industry – generations of knowledge being lost
- ↑ use of management software packages and Internet
- Average age of farmers still ↑
- **Farmers have ↓ time**
    - Affects attendance at meetings/discussion groups
    - Most influential person is the consultant i.e. vet / extension
- Producers are **working to live *not* living to work**
- Business approach rather than traditional emotional approach

As well as these issues, within the UK there are other key factors influencing the ability of industry to deliver the messages and science effectively:

- Good extension evident in the UK but **no** 'translation' service
- Farmers don't trust the science because scientists and farmers don't speak the same language and very few have the time or funding to take on this role
- Translation people are available in the UK but many tied up in journalism and not funded to be objective and totally independent
- Research funding highly competitive – affecting the KT output from projects dramatically
- Lack of cooperation within the dairy sector, especially levy bodies and allied industry organisations – they could become symbiotic in nature and much more effective

Following the study of these issues and examining possible solutions, the main conclusions/recommendations would be for the UK:

- Cooperate - work together and share resource
- Translate - language of science into 'Farmer English'
- Funding - focus on KT and wider communication
- Allow the output of scientific research to become far more accessible
- Young, enthusiastic people - Identify early and develop this resource
- Work together rather than competing
- Stop re-inventing the wheel and try something new
- Find, develop, fund and most importantly keep hold of the skills we so desperately need

Appendix 2:

List of acknowledgements to those who gave me help and support whilst on the tour (In no particular order)

America
Ben George (friend of Nuffield – Chicago Board of Trade)
Bev Spirel
Rob Wills
Marj Faust
Denny Funk
Lovely Vern
The Whole Genus ABS Team
The Roy Boys
Kent Weigel
Dave Thomas
Paul Fricke
Jack Rutledge
Rick Klemme
Ted Halbach
Nigel Cook
Paul Miller
George Shook
Ted Halbach

Canada
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Brian Van Doormal
Neil Petrany
All at Gencor & Semex Alliance
Bethany Muir
Larry Schaeffer

Australia
Steve Fried & wife Chris
Lovely Patrice
The whole Genus ABS Team
Graeme Gillan & wonderful family
Peter Williams
Geoff Wood
'Cock'
Shane McCarrey
Lovely Noel (ABS Bull Stud)
Hayley Boyd
Daniel Abernathy
John McQueen
Chris Branniff
Mathew Schafer
David Nation
Stweart McRae
Mernie Hartford
Brian Beard
Professor 'Jock' MacMillan
Sam Nicol

New Zealand
Clare Bayly
Garth Aislabie
Bill Montgomerie
John Alan
David Hale
Chris Glassey
Chris Burke
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Ireland
Andrew Cromie
Francis Kearney
Brian Wickham

UK
Becky Kent MDC
BPEX
Genesis Faraday
Holstein UK
Fellow Scholars
& Everyone else who are too many to name

Special Thanks to:
Charles, my mum Jane and sister Charlotte for their constant support

'Lady Templeton', husband William and 'Mr Frank' for their generous hospitality when I needed a place to get away to and concentrate on my report (they also make the world's best ice cream!)
www.ayrshireicecream.co.uk

Alison Maddrell for her tireless help with my grammar!

And John Stones, for his endless patience, support & guidance

My apologies if I have left anyone out and thank you.

Appendix 3: BPEX Information Sheet

Pigs | Action for Productivity

2

Strawing Up

Outdoor pig production does not allow for close supervision of farrowing or observation of young piglets; it is therefore more difficult to manage pre-weaning mortality than in indoor systems.

At birth piglets are exposed to a colder environment and as they are unable to generate heat themselves they can rapidly become chilled, as further heat is lost to the environment, especially in cold months. Chilled piglets die from hypothermia, are slower to reach the teat and are more likely to be laid on.

Strawing up farrowing arcs correctly can help combat piglet mortality in outdoor systems by reducing heat loss. On an 800 sow outdoor unit, reducing mortality by 1% is worth around £8,800 (or 50p per pig).

Targets

The top third of UK outdoor herds achieve the following results (Agrosoft Ltd. 05-06)

Mortality rate of pigs born alive = 8.4%

Mortality rate of total pigs born = 13.5%

Average number of pigs weaned per litter = 9.98

Draughts

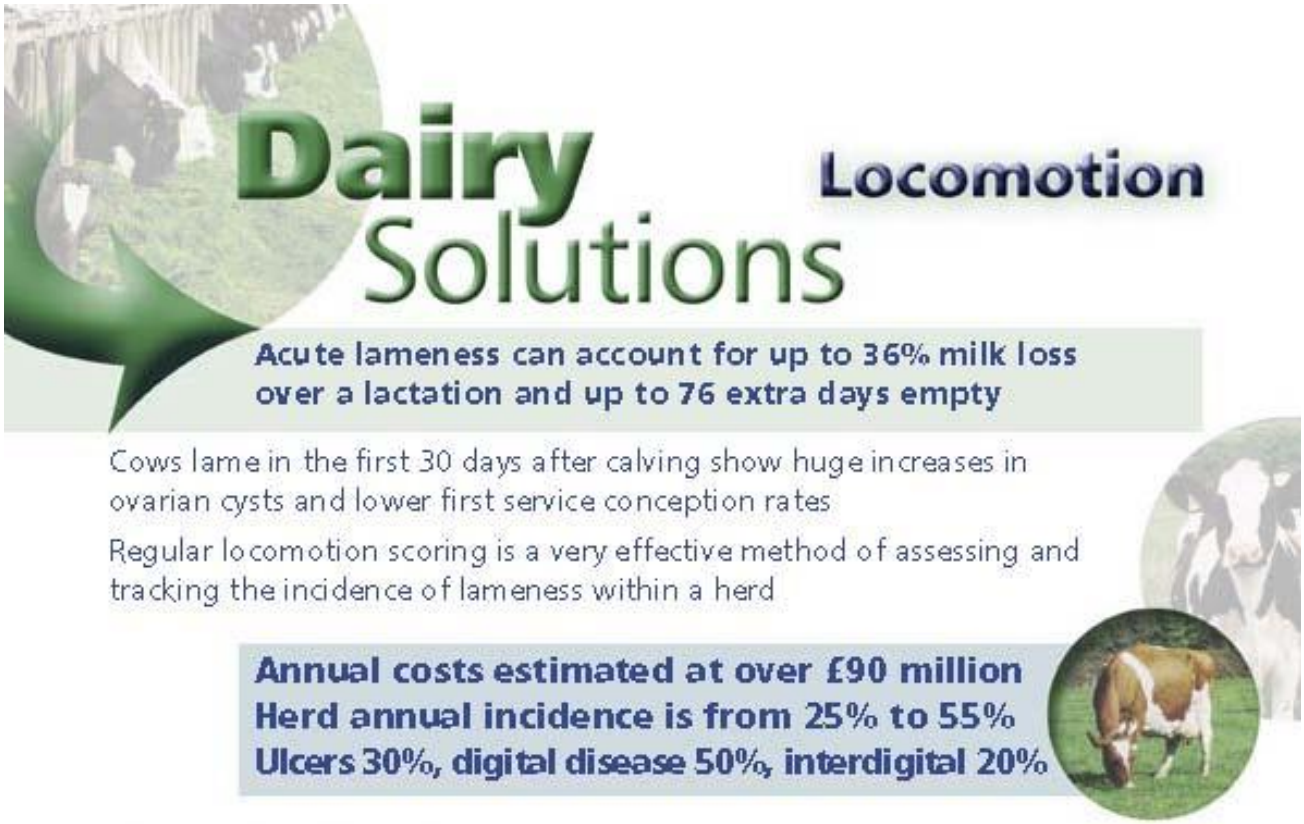
- Make sure any holes in arcs are blocked up with straw to reduce draughts. Draughts cause piglets to lie in unfavourable areas where they are at greater risk of being laid on.
- Use a spray marker to colour the tops of arcs that have holes in; this will make it easier for you and your staff to identify which arcs need attention.

Pre-farrowing

- Check prior to farrowing whether more straw is needed. This is especially important if strawing up is unlikely to occur at weekends; make sure enough straw is provided on Friday.
- Provide wheat straw for nest building; if this is not available use chopped barley straw. Barley straw should be avoided at farrowing as the stems are long and stalky and can get wrapped around the piglets.
- Excessive amounts of straw can cause problems. Newborn piglets will not have the strength to push through large amounts of straw to get to the teats. They may get stuck underneath it and be at a greater risk of being laid on.
- Place the wads of straw on the ground before the arc is tipped back over as this will save time and effort.

A bad example

Appendix 4: CDI Solution Sheet



Management Action

- Familiarise yourself with the locomotion scoring system. Assessed visually, the scale runs from 1 to 9 with 1 as using three legs only, and 9 excellent.
- Stand behind the cow to inspect weight distribution. Ideal locomotion is where the back foot is placed directly in the print left by the front.
- Assess your cows' locomotion every six months. Use the same person each time. For an independent CDI Classifier, call 01923 695208.
- Trim the feet of any cow showing a reluctance to use each leg equally to prevent problems worsening. A shoe on a good claw helps mobility quickly.
- Pay equal attention to the front and rear feet. The front feet are the load bearing surfaces and the cow will benefit from prompt action.
- Record any management, nutritional or environmental changes to allow tracking of any impact of change on the incidence of lameness.
- Establish a foot maintenance program with regular, preventative foot trimming, footbathing and by providing supplemental vitamins and minerals.
- Ensure surfaces and tracks remain as clean and dry as possible. Slurry can help spread digital dermatitis, cause slurry heel and weaken horn.
- Consider grooving concrete to improve traction especially around corners. Slippery surfaces can result in pressure on the sole and falls.
- Pay attention to the locomotion scores in a proof when selecting sires for breeding replacements. Available for both UK and International sires.