Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

Research Stimulus Fund

Final Report

'Strategies to PROtect and improve the WELfare of dairy COWs in Irish systems of milk production – ProWelCow'

DAFM Project Reference No: 14/S/890

Start date: 01/06/2015

End Date: 31/05/2016

Principal Coordinator and Institution: Laura Boyle, Teagasc Animal and Grassland Research and Innovation Centre

Email: laura.boyle@teagasc.ie

Collaborating Research Institutions and Researchers: none

Please place _one_ "x" below in the appropriate area on the research continuum where you feel this project fits

Basic/Fundamental ⟶			Applied ⟶			Pre Commercial
1	2	3	4	5 x	6	7

Please specify priority area(s) of research this project relates to from the National Prioritisation Research Exercise* (NRPE) report;

Priority Area (s)	Area I: Sustainable Food Production and Processing

Key words: *(max 4)*

Cow welfare, intensification, stakeholders, lameness

1.   Rationale for Undertaking the Research

This section should outline the rationale for carrying out the research and identify the need / problem to be addressed

Scientific evidence suggests that there are advantages and disadvantages to dairy cow welfare and reproductive performance associated with pasture based systems of milk production (Mee, 2012; Boyle and Rutter, 2013).   However, consumers perceive pasture based systems as 'natural' and therefore better for cow welfare than confinement systems. This offers a marketing advantage to Irish dairy products. Irish systems of milk production have an advantage over countries in which milk is primarily produced from confined cows should legislation protecting cow welfare be passed in the EU. It is speculated that such legislation would ensure that all dairy cows have some outdoor access. Such advantages could be threatened by expansion in the Irish dairy industry arising from the abolition of quota because of associated risks to cow welfare. One of the main features of expansion is larger herd sizes often associated with longer walking distances/increasingly fragmented land bases, higher stocking densities, lower number of labour units/cow, low cost accommodation, contract rearing of replacements, maximal amounts of grazed grass in the diet which is achieved by early turnout/long grazing seasons (Boyle, 2013). All of these have potential negative implications for dairy cow welfare particularly in terms of lameness (Barker et al., 2009) but also in terms of metabolic, climatic and social stress and health and welfare in the peri-parturient period. We wanted to take a proactive approach to addressing such welfare issues not only because we considered it ethically correct to do so but also in an effort to protect the strong positive image of Irish dairying held by consumers of Irish dairy products.

2.   Research Approach

Specify the research methodologies employed, emphasising novel techniques and also outline any modifications from the original approved project proposal

Firstly a review of the literature on dairy cow welfare was conducted focusing primarily on papers of relevance to dairy cow welfare in pasture based systems of milk production of which there are a limited number.   Both the scientific and popular press was reviewed including many 'in-house' Teagasc publications. Secondly the question 'Is there potential to breed for better animal welfare?' was posed to almost 40 geneticists, animal welfare scientists, policy makers and industry representatives who attended a 'Challenge Session' organised by the project team at the European Association for Animal Production (EAAP) in Warsaw in 2015. A methodological approach was adopted in the preparation and execution of the Challenge Session such that it yielded results of use to ProWelCow. The experts who attended the session were asked to rank welfare traits in order of importance as well as to rank the likelihood/feasibility of their inclusion in breeding indices. Following on from this a smaller meeting of European experts in farm animal health and welfare was organised at the Polish Institute for genetics and animal breeding in May 2016. The focus was a critical analysis of cow welfare indicators identified in the general literature review and at the EAAP challenge session for their potential for inclusion in breeding indexes (the EBI). This was primarily based on the phenotyping strategies available for the routine collection of such data. Thereafter all the traits in the EBI were reviewed in terms of their relevance to cow health and welfare drawing on the scientific literature to support their conclusions. These three structured assignments differed slightly from what was detailed in the project proposal but yielded much more information.

The second task involved an evaluation of international on-farm dairy cow welfare assessment schemes and their relevance for pasture based milk production systems. The original project plan did not propose evaluating Bord Bia's Sustainable Dairy Assurance Scheme (SDAS) but soon after the project the decision was taken to include the SDAS in the assessment. Additionally the post-doctoral (PD) researcher visited the UK (AssureWel), Denmark (Arla) and the Netherlands (Friesland Campina). Each

evaluation involved a meeting with relevant personnel and at which the PD presented the ProWelCow project and was presented with supporting documentation and literature on the scheme under review. Additionally the PD attended up to 4 dairy farm visits with inspectors in each country including Ireland (the SDAS).

The third task involved semi-structured interviews with a cross section of personnel from the Irish dairy industry (farmers, IFA, Ornua, DAFM, Teagasc advisors and researchers, Co-ops, Bord Bia etc.). These were conducted face to face rather than over the telephone which was the only change from the original project plan.

Farmers were surveyed on current and emerging management, housing and nutritional practices on Irish farms having potential implications for dairy cow welfare and lameness. This was planned to be conducted by telephone but instead dairy farmers were surveyed at the Moorepark Open Day and the National Ploughing Championships in 2015. Additionally the scope of this task was broadened to include Teagasc dairy advisors and cattle veterinarians. Advisors (n=48) were surveyed at a Teagasc 'in-service' training day and two of the research team attended the Cattle Association of Veterinary Ireland Conference to survey vets (n=60) on their perceptions about practices of relevance to cow welfare.

Finally, a pilot welfare assessment scheme for use on Irish farms was developed which employed resource and animal based measures of relevance to dairy cow welfare in pasture based systems of milk production. A protocol developed by dairy cow welfare researchers in the Scottish Rural College (SRUC) for use in organic and confined systems was modified based on findings from the previous ProWelCow tasks. The protocol was not tested on Teagasc farms as was planned in the project proposal. Instead the project team leveraged funding (€100k) from Ornua to conduct a comprehensive epidemiological study of dairy cow welfare in Ireland which was to commence in autumn 2017.

3.   Research Achievements/Results
Outline main results achieved

Literature review
Risks
- Lack of epidemiological data on cow welfare/lameness in pasture based systems
- Suboptimal body condition score of cows in pasture based systems
- Risk of climatic stress in pasture based cows
- Mastitis and lameness are major production diseases in pasture based as well as confined systems

Protective factors
- Numerous benefits to dairy cow health, welfare and reproductive performance associated with access to pasture compared to year round confinement systems

Research priorities
1. Epidemiological study of risk and protective factors for cow welfare in Irish dairying systems
2. Prevalence of welfare conditions (e.g. poor body condition, lameness, hoof and hock lesions) and need for baseline data on welfare-related resources (roadway lengths/condition, space allowances/presence of water in collecting yards, cubicle size/bedding, use of OWP, topless cubicles etc.)
3. Research on implications of prolonged time spent off pasture (i.e. walking, waiting in collecting yards, 'on/off grazing' etc.) in large herds for cow behaviour and welfare
4. Housing requirements for spring calving cows in a pasture based system (optimal feeding space, cubicle:cow ratio, flooring)

Breeding for better welfare

ProWelCow research revealed that animal welfare issues of concern to society relate to issues associated with negative mental states (pain and suffering) and include lameness, mutilations, neonatal survival and poor body condition/hunger. However, the multifactorial nature of animal welfare means there is no single 'welfare' indicator ('trait'). The research revealed that many existing indicators of relevance to cow welfare do not fulfil the criteria for inclusion in a breeding index because they are not easily or cheaply measured. Nevertheless, several existing EBI traits have relevance to welfare. Indeed, many of the traits in the current EBI will contribute to improvements in dairy cow welfare if matched by improvements in nutrition, housing and management. Body condition score of dairy cows is likely to improve as an indirect result of selection for improved fertility and lower maintenance requirements in the EBI. Important areas where genetics play a role in improving cow welfare are in reducing the high incidence of painful diseases such as lameness and mastitis and these traits are already included in the health sub-index of the EBI. However, the analysis of the EBI in light of the changes in farming practices associated with expansion suggest that there is a case for strengthening the current weighting on lameness to protect cow welfare. Furthermore, while somatic cell count (SCC) is in the health sub-index of the EBI, the absence of data on clinical mastitis means high accuracy of selection for mastitis itself is not possible. This is also an area for re-appraisal to determine if changes can be implemented to improve cow welfare. Finally, all traits in the current index are solely derived from their economic impact and take no account of societal implications. There is a need for research to identify new welfare traits, on new ways of deriving weightings for such traits and on ways of improving routine access to data on these or correlated traits to facilitate higher accuracy of selection. Finally the project identified a need for a Delphi study to gauge stakeholder opinion of the importance of detailed cow welfare traits within an overall dairy breeding goal for profit, with the aim of assessing its suitability as a complementary, participatory approach to defining breeding goals.

Evaluation of dairy assurance assessment schemes in 4 EU countries

Four assurance schemes were evaluated: Bord Bia's SDAS; RSPCA/Freedom Food's AssureWel (UK); Friesland Campina's Cow Compass (NL) and Arla (DK). Assurance of cow welfare standards was implied to a lesser (SDAS) or greater (AssureWel) extent in all schemes but all, excluding the RSPCA's AssureWel (and possibly Cow Compass), were deficient in this regard. One of the main concerns relates to the credibility of the standards underpinning the schemes. It was not always obvious that the stated benefits to animals and consumers were justified because of the lack of objective data to support them. Most of the indicators used were poorly defined and not science-based and little information was provided to assessors on how to measure them. No scoring scales or sample size estimations were provided and there was no information on their validity for on-farm use. Very often it was difficult to measure objectively on farm that which was promised by the standard. Many of the schemes (especially the SDAS) relied more heavily on the inspection of records than of resources and the animals themselves even though the latter are of more relevance to animal welfare. Finally no animal based welfare indicators specific to pasture based systems of milk production were identified in any of the schemes indicating the need for research on the development of appropriate indicators.

Stakeholder perceptions about cow welfare

Semi-structured interviews were conducted with 30 dairy industry personnel. Welfare was seen by most as an essential component of the 'Green Ireland' brand. However, a common view was that cow welfare was not a problem within the industry and that measures were already in place to protect it; such complacency could pose risks to cow welfare. On the other hand, interviewees across several stakeholder groups recognised the potential threat to welfare posed by herd expansion and an over-riding focus on low-cost production. This is encouraging, as an awareness of the possible risks means that proactive steps to mitigate it are likely. Vulnerability of the industry to poor profitability arising from volatile milk prices and mental health challenges for farmers were seen by many as risks for cow

welfare. Increasing demands from international buyers were cited as being the most important factor driving increased focus on cow welfare in the industry. Bord Bia's SDAS was generally well regarded though some thought it should be extended to better address cow welfare issues. There was a perception that more focused training of Teagasc/Co-Op advisors in cow welfare would improve their dissemination of relevant knowledge. Research is needed on the links between the physical and mental health of farmers and the welfare of their animals. There is also a need to simplify and rationalise the information gathering and dissemination structures, bringing as much as possible under the aegis of a single, transparent, body.

Current management, housing and herding practices on Irish farms
Dairy farmers (n=115), cattle vets (n=60) and Teagasc advisors (n=48) were surveyed in 2015. Unsurprisingly, the majority (77%) of farmers increased herd size in the previous 3yrs. More farmers who expanded invested in the milking parlour (93.5%) than those who did not expand (6.5%). This is encouraging as it indicates that cow welfare is not likely to be adversely affected by inefficiencies in the milking process. However, there was no more investment in housing, roadways or handling facilities on farms that expanded than in those that did not. Vets (90.0%) and advisors (87.5%) agreed that the best way to herd cows is on foot. However, more than 30% of farmers used quads/tractors; on those farms, herds were larger than where cows were herded on foot (152.7 vs. 99.0 cows). Farms with the longest distance to the furthest pasture (884.4 m) were also the largest. The lack of investment in roadways combined with potential for faster herding and longer walking distances in large herds pose lameness risks. Furthermore, given that cows were housed for c. 3.6mths, the lack of investment in housing poses risks of overcrowding/social stress; indeed 32.9% of farmers provided less than one cubicle per cow and a similar proportion did not provide bedding in the cubicles. Almost ⅓ of respondents in the 3 groups reported that social stress was the primary welfare issue for cows in expanded herds. However, stakeholders differed in their perception of the primary cause of poor welfare. Low BCS was ranked as the main welfare issue by a higher proportion of farmers (72.2%) than vets (13.9%) or advisors (13.9%). The most vets selected lameness as the main cause of poor welfare (28.3%), followed by farmers (13%) and advisors (2.2%). All stakeholders were in agreement that there are more threats than benefits to dairy cow welfare associated with expansion in the dairy industry. This task identified a need for better knowledge dissemination on cow welfare across, and better communication between, stakeholder groups. Our research suggests that poor BCS, overcrowding and lameness are all important causes of poor cow welfare in expanding, low cost, pasture-based systems and that future research should focus on these areas.

Development of a cow welfare assessment scheme for use in Irish pasture based systems of dairying
An absence of animal based indicators specific to pasture based systems of milk production was identified in the evaluation of international dairy cow welfare assurance schemes. Hence the project team worked with dairy cow welfare researchers in the SRUC to modify and adapt an existing scientific protocol they had developed to assess the welfare of dairy cows in confined and organic systems in the UK. The Prowelcow team had significant input into the development of questions associated with grassland management and grazing and attempted to include animal based indicators related to herding. Some ideas include recording cow behaviour during herding and while holding in the collecting yards. However these need to be validated firstly in controlled experiments. Unfortunately this protocol was not tested on the Teagasc farms as planned owing to time limitations arising from time invested in leveraging funding from Ornua to conduct an epidemiological study of cow welfare in Ireland.

4.   **Impact of the Research**
A summary of the tangible impact of the research project should be provided under the outcomes' and 'outputs' heading below. In addition, please provide a short narrative synopsis of the benefits / improvements the research has made to the area under

investigation particularly as regards end users, e.g. industry, consumers, regulatory authorities, policymakers, the scientific community, etc

Our research findings provide research performing organisations with direction as to the priority areas where research on strategies to protect/improve cow welfare is required. However, even in the absence of new research, the project findings evaluated in light of the large body of existing scientific literature on dairy cow welfare indicate areas where protective changes can be implemented immediately. This is particularly the case for lameness where serious deficiencies in management practices to prevent lameness were identified by the survey of management practices. Furthermore, there is generally less awareness in the wider scientific community of the challenges to dairy cow welfare associated with intensive pasture based systems. This project helps to address this knowledge gap. The survey findings also suggest knowledge gaps about cow welfare and lameness not only amongst dairy farmers but also amongst those who advise them namely, veterinarians and advisors. Hence they help to strengthen the case for a renewed focus on up-skilling stakeholders on issues of relevance to dairy cow welfare.

The outcomes of this project also have potential for use by marketing bodies such as Ornua to illustrate a proactive approach to dairy cow welfare in Ireland. Indeed the Prowelcow project team were able to leverage financial support from Ornua to conduct an epidemiological study of cow welfare in Ireland which would have followed on from the Prowelcow project. Related to this preliminary work was done to develop a dairy cow welfare assessment scheme for use with pasture based systems of milk production. While the Ornua study did not proceed, aspects of this scheme have potential for inclusion in Bord Bia's SDAS which is currently lacking in animal or resource based indicators of relevance to dairy cow welfare. This would not only strengthen the relevance of the SDAS to dairy cow welfare but would also help to underpin sustainability claims.

Our review of the Irish Economic Breeding Index (EBI) formed a platform for potential changes to the weighting on lameness to address the lack of progress in this area.

4(a) Summary of Research Outcomes
(i) Collaborative links developed during this research

The Challenge Session held at the EAAP meeting in Warsaw (2015) was organised by the project team in collaboration with Dr. Simon Turner of SRUC. This exercise not only raised the importance of breeding for better welfare amongst the scientific community but importantly strengthened collaborations between Teagasc and SRUC in Scotland. Links with SRUC were strengthened further during the development of an epidemiological project to investigate risk factors for dairy cow welfare which Ornua were committed to funding and in the modification of the SRUC existing protocol for dairy cow welfare assessment for use with Irish production systems.

A meeting to address the question of breeding dairy cows for better welfare was held at the Institute of Genetics and Animal Breeding of The Polish Academy of Sciences in Jastrzebiec, Warsaw on the 5th of May 2016. This was attended by researchers in animal welfare and genetics/genomics from Wageningen, SRUC, WUR, Neiker, NMBU, University of Bologna and Teagasc. All of Teagasc's ProWelCow project team attended. An outline of a potential future project in the area of breeding and welfare was formulated and potential funding opportunities were identified. The meeting participants will form the core group of any future consortium to leverage funding in this area.

The social science component of the ProWelCow work involved collaboration with UK based researchers Dr. Sylvia Snijders and Prof. Alison Rieple of the University of Westminster in London. Ideas for further qualitative research in this area were identified.

(ii)   Outcomes where new products, technologies and processes were developed and/or adopted

No specific new products, technologies or processes were developed or adopted.

(iii)   Outcomes with economic potential

No specific outcomes with economic potential were identified.

(iv)   Outcomes with national/ policy/social/environmental potential

The findings of this research address dairy cow welfare which is an issue of growing societal concern. For many years consumer concerns have focused on intensively raised pigs and poultry. Dairy cows were perceived as having good welfare predominantly because they have outdoor access. In recent years with continuing intensification in the dairy industry, even in Irish pasture based systems, consumer attention has switched to dairying. This work highlights areas requiring particular attention which will help to allay consumer fears, hence it is important that the findings of this report are addressed in light of further expansion being targeted in the 10 year plan for the Agri-Food sector (FoodWise 2025). Our stakeholder interviews revealed that there are increasing demands from international buyers of Irish dairy produce for scientific evidence to underpin some of the quality claims being made. Given the value of the dairy industry to the Irish economy failings in the area of dairy cow welfare pose an enormous risk to our reputation in international markets.

4 (b) Summary of Research Outputs

(i)   Peer-reviewed publications, International Journal/Book chapters.
Acceptable Format: Walsh, D.R., Murphy, O., Cosgrave, J. (2008). Echinococcosis - an international public health issue. Research in Veterinary Science 774, 891-902.

More, S.J., Hanlon, A., Marchewka, J., Boyle, L.A. 2016. Private animal health and welfare standards in quality assurance programmes: a review and proposed framework for critical evaluation. Veterinary Record 180 (25), 612

Papers in preparation
Marchewka, J., More, S.J., Hanlon, A., Mee, J.F and Boyle, L.A. A comparison of 4 private standards schemes for dairy cow welfare (using framework published in Vet Record)

Boyle, L.A., Mee, J.F., Marchewka, J. and Berry, D.P. Potential for improving dairy cow welfare through breeding - an evaluation of the Irish Breeding Index (Veterinary Ireland Journal)

Snijders, S.S., Marchewka, J., Mee, J.F., Rieple, A. and Boyle, L.A. Stakeholder perspectives on protective and risk factors for dairy cow welfare in Ireland (Journal of Agricultural and Social Sciences)

Boyle, L.A., Snijders, S.S., Marchewka, J., and Rieple, A. Stakeholder perspectives on protective and risk factors for dairy cow welfare in Ireland (Veterinary Ireland Journal)

Marchewka, J., Mee, J. and Boyle, L.A. 2017. Risk and protective factors for dairy cow welfare: results of a survey of dairy farmers, dairy advisors and cattle veterinarians (Animals)

Marchewka, J., Mee, J.F., and Boyle, L.A. Risk and protective factors for lameness in Irish dairy cows: results of a survey of dairy farmers, dairy advisors and cattle veterinarians (Irish Veterinary Journal)

(ii)   Popular non-scientific publications and abstracts including those presented at conferences

Mee, J.F., Marchewka, J., Boyle, L.A. 2018. Infrastructure/management issues pose risks to cow welfare in expanding dairy herds. In: Proceedings of the 27th European Grassland Federation general meeting. 17-21st June, Cork, Ireland. (Poster presentation by John Mee).

Boyle, L.A., Marchewka, J., Berry, D. and Mee, J.F. 2017. ProWelCow – Dairy cow welfare. T Research, Teagasc, Autumn Vol. 12 No. 3, pgs. 12-13.

Boyle, L.A., Coneely, M., Marchewka, J., Rieple, A., Snijders, S., Berry, D.P. and Mee, J.F. 2017. ProWelCow: Understanding risks and protecting Irish Dairy Cow Welfare. In Proceedings of Moorepark Open Day July 4th 2017 - Irish Dairying: Resilient Technologies. pgs. 146-147.

Boyle, L.A., Mee, J.F., Marchewka, J. 2017. Risks to welfare associated with changes in infrastructure and management in expanding dairy herds. In Proceedings of the 7th International Conference on the Assessment of Animal Welfare at Farm and Group Level (WAFL). Wageningen, The Netherlands, 5-8th September, 2017. (Oral presentation by Laura Boyle).

Marchewka, J., Mee, J. F., Boyle, L. 2016. Potential effects of herd expansion on cow welfare in a pasture-based dairy industry. 67th Annual Meeting of the European Federation of Animal Science. 29th of August to 2nd September 2016, Belfast, Northern Ireland. (Oral presentation by J. Marchewka)

Marchewka, J., Mee, J.F., Boyle L. 2016. Perceptions of the causes of poor welfare in a pasture-based dairy industry. 50th International Society Applied Ethology (ISAE) Congress, Edinburgh, UK, 12-16th July 2016 (Poster presentation)

Marchewka, J., Mee, J. F., Boyle, L. 2016. Risks to cow welfare in an expanding dairy industry – veterinary, advisory and farmer ProWelCow - survey results. The World Association for Buiatrics (World Buiatrics Congress). Dublin, 3rd to 8th July 2016. (Poster presentation).

Marchewka, J., Mee, J. F., Boyle, L. 2016. Perceptions about the causes, treatment and prevention of lameness in a pasture-based dairy industry. In Proceedings of the 16th International Conference on Production Diseases in Farm Animals, 20th to 23rd of June 2016, Wageningen, The Netherlands (Oral Presentation by J. Marchewka). p.37.

Marchewka, J., Mee, J.F., Boyle L. 2016. ProWelCow: implications of herd expansion for dairy cow welfare. ANEMBE CONGRESS. Santiago de Compostela, Spain. 11th to 13th May 2016. (Oral presentation by John Mee).

Marchewka, J., Mee, J.F., Boyle L. 2015. ProWelCow: Implications of herd expansion for dairy cow welfare. Proceedings of the Cattle Association of Veterinary Ireland Conference 2015, Mullingar Park Hotel, Mullingar, Co. Westmeath, Ireland; 9th to 11th October 2015 (Poster presentation). p.188.

Marchewka, J., Mee, J. F. O'Driscoll, K., Boyle, L. 2015. ProWelCow: implications of herd expansion for dairy cow welfare. Veterinary Ireland Journal. Vol. 5 Nr 9 pp. 425-428, September 2015

(iii)   National Report

(iv)   Workshops/seminars at which results were presented

Boyle, L.A. Dairy cow welfare – To protect we have to measure. Animal welfare Intergroup meeting, European Parliament, Strasbourg, France, 19th April 2018.

Moorepark Open Day July 4th 2017 – Irish Dairying: Resilient technologies. ProWelCow: Understanding risks and protecting Irish Dairy Cow Welfare. (pgs. 146-147 in proceedings).

(v)   Intellectual Property applications/licences/patents

none
(vi)   Other
none

5.   Scientists trained by Project

Total Number of PhD theses: __0__

Total Number of Masters theses: __0__

6.   Permanent Researchers

Institution Name	Number of Permanent staff contributing to project	Total Time contribution (person years)
Teagasc	3	0.285
Total	**3**	**0.285**

7.   Researchers Funded by DAFM

Type of Researcher	Number	Total Time contribution (person years)
Post Doctorates/Contract Researchers	1	1.00
PhD students		
Masters students		
Temporary researchers		
Other		
Total	**1**	**1.00**

8.   Involvement in Agri Food Graduate Development Programme

Name of Postgraduate / contract researcher	Names and Dates of modules attended
N/A	

9.   Project Expenditure

Total expenditure of the project: € 76,542.18

Total Award by DAFM: € 78,260.83

Other sources of funding including benefit in kind and/or
cash contribution(specify):   € 0

Breakdown of Total Expenditure

Category	Teagasc	Name Institution 2	Name Institution 3	Name Institution 4	Total
Contract staff					
Temporary staff					
Post doctorates	44,729.89				44,729.89
Post graduates					
Consumables					
Travel and subsistence	8,756.93				8,756.93
Sub total	53,486.82				53,486.82
Durable equipment					
Other	9,683.65				9,683.65
Overheads	13,371.71				13,371.71
Total	**76,542.18**				**76,542.18**

10. Leveraging
Summarise any additional resources'/funding leveraged by this award from other sources e.g. Additional Staff, National/EU funding secured, EI Commercialisation Fund, etc.

The ProWelCow project team leveraged €100k from Ornua to fund further epidemiological work in the area of dairy cow welfare in Ireland. This work was to have followed on from completion of the Prowelcow project in autumn 2016 but unfortunately it did not proceed as Teagasc did not have a scientist dedicated to dairy cow welfare research at the time.

11.   Future Strategies
Outline development plans for the results of the research.

In 2017 a new research officer (RO) was hired by Teagasc to work in the area of dairy cow welfare. The ProWelCow PI is working closely with this RO to ensure the ProWelCow findings are taken into consideration in the design of the future cow welfare research programme at Moorepark. To date the welfare assessment protocol is being modified for use in a new dairy cow welfare research programme. The work conducted during the yearlong ProWelCow project yielded numerous results and the project team are committed to continue writing the associated papers in the coming years. Dissemination of the results has continued since the project completed most recently with a presentation on cow welfare which included ProWelCow results to the Animal Welfare Intergroup of the European Parliament in Strasbourg on April 19th 2018.