Farmers Attitudes towards Management of Workload on Their Farms: The Case of Dairy Clients in the Teagasc Moorepark Advisory Catchment

Thesis submitted to University College Dublin in fulfilment of the requirements for the degree of M.Agr.Sc. Agricultural Extension and Innovation

By:

Ellen Standish (B.Agr.Sc.)

Supervisor:

Dr Jim Kinsella, School of Agriculture & Food Science,
University College Dublin, Belfield, Dublin 4

September 2017

Table of Contents

I declare that this thesis has not previously been submitted as an exercise for a degree at the National University of Ireland, or any other university, and I further declare that the work embodied in it is my own.

_____

Ellen Standish

ANOVA: Analysis of variance

Co-Op: Co-operative

EBI: Economic Breeding Index

Ha: Hectare

HR: Human resources

ICBF: Irish Cattle Breeding Federation

Kg: Kilogramme

Kg/cow: Kilogrammes of milk solids per cow

LU: Livestock unit

LU/Ha: Livestock units per hectare

Abstract

Purpose: Research has been completed, and some is on-going, in the area of labour efficiency on Irish dairy farms. However, there may be a disconnect between the research and farmers' perceptions about labour efficiency. The aim of this research was to identify farmers' attitudes towards current management of workload on their farms, their plans to improve their workload management and what they feel are the most appropriate advisory methods to support workload management.

Research design: The study was based on a cross-sectional design through collection of data from dairy farmers in the Teagasc Moorepark Advisory Office catchment area. Data was collected through semi-structured postal questionnaires; secondary data from farmers' 2016 eProfit Monitor Reports and 2016 Co-op Performance Reports; and farmers' reactions to key findings were gauged at two dairy farmer discussion group sessions in the same catchment area.

Findings: Farmers said that they worked on average 67 hours/week with the majority having additional help on the farm (family or other labour). The most common practices/technologies utilised over the past three years to improve workload management were using a contractor for major jobs, hiring of additional labour and improved use of grass. When examined there was no correlation between higher contractor use and reduced working hours. One third of farmers said they would need additional labour in 2017 and only 20% of those actually intended on hiring additional labour in 2017.The most common practices/technologies which farmers said they would utilise over the next three years to improve workload management were adding additional winter accommodation, improved use of grass, and sale of surplus stock.Seventy five percent of farmers were happy with current workload management advice and support from Teagasc. Farmers recommended that Teagasc review their advisory services to their dairy clients through an increased focus on workload and labour management in pre-established discussion groups, the hiring of a HR specialist advisor who would be available to advisors and their clients on request, and/or by reducing the workload/client list of all advisors to ensure they have more time to spend with their clients, resulting in a more focussed approach to workload and labour management between advisors and their clients.

Practical Implications: This study indicates that by Teagasc having a clear understanding of what farmers want from their advisory services, the organisation can then enhance their services in this area in a way that better matches their clients' needs.

Chapter One: Introduction and Literature Review

Over the past ten years the structure of Irish dairy farms has changed significantly towards larger herds. The abolition of milk quotas in 2015 resulted in a significant rise in milk production which has been associated with increased herd sizes and milk yields per cow (Dillon, et al., 2016). Dairy cow numbers in Ireland have increased by 327,000 since 2010 to over 1.35 million cows while dairy farmer numbers have remained static since 2010 – meaning the number of dairy cows in herds of 100 cows or greater has increased from 13% in 2005 to 47% in 2016 (Kelly, et al., 2017). The 'rapid increase in larger herds highlights a potential mismatch between the availability of family labour and the workload on farms…. hence there is a growing requirement for both full and part time employees to work on dairy farms' (Kelly, et al., 2017) as 65% of Irish farms used family labour in addition to the main farm operator, either full or part time (Ruane & Phelan, 2001).This indicates a need for improvement in workload management on farms and for additional labour units to work on farms. The Irish Government's FoodWise 2025 strategy has set ambitious targets for the agricultural industry by 2025 including an 85% increase in the value of agri-food exports to €19 billion; a 70% increase in value added in agri-food, fisheries and wood products to €13 billion; a 65% increase on the value of primary production to €10 billion; and the creation of 23,000 direct jobs in the agri-food sector all along the supply chain from primary production to high value added product development (DAFM, 2015).

There is opportunity to improve farm labour efficiency to work smarter not harder, by either the farmer themselves improving their personal work practices or the farmer engaging with their staff more effectively (Heffernan, 2017). Therefore it is important that farmers focus on continually up-skilling themselves to improve their ability to manage their farming businesses (Dillon, et al., 2016). Continuous education is a requirement of all people in business and farmers and their employees are no different (Beecher, 2017). Research indicates that a focus must be put on improving farm facilities and practices to allow smaller operators to potentially work the farm on their own or to allow large operators to improve their labour efficiencies before incurring the cost of hiring in additional labour (O'Brien, et al., 2007). There are many questions that farmers need to consider going forward to achieve their goals of more profitable and sustainable farms - can the practices on farm evolve to meet the increased workload associated with expansion and greater productivity? Can a farm run with one labour unit with family labour or will hired labour need to be considered? Will the farm sustain two incomes – one for the owner and one for the hired labour unit? This study will address farmers' attitudes towards their current and their planned workload management practices, their requirements

for hired labour, and what they feel is required from advisory services to improve the workload management on their farms.

A body of research has been completed, and some is on-going, in the area of labour efficiency on Irish dairy farms, namely by: Deming (2017); O'Brien et al., (2015 and 2007); O'Donovan et al., (2008) and O'Shea et al., (1998). From this work labour can be seen as a limiting factor for agricultural growth, both in terms of its requirement and its availability (O'Brien, et al., 2007) and the maintenance of a sustainable dairy industry is very dependent on improving labour efficiency in the wake of large scale expansion (O'Donovan, et al., 2008). The Teagasc Dairy Manual recommends 150 livestock units/labour unit and this can be achieved by only keeping dairy cows and replacement heifers (e.g. 150 dairy cows only or 120 dairy cows with 60 replacement heifers etc.), compactly calving cows to grass in the spring, use of casual labour during busy periods, and use of contractors for major tasks (Teagasc, 2010). But is this recommendation actually being implemented on Irish dairy farms? Results from a 2016 Teagasc Moorepark study on the management of labour tasks and resources to maximise labour productivity, sustainability and profitability of farms indicated that labour use was 18.5 hours/cow/year on the top 20% (most efficient) farms, 28.3 hours/cow/year on average farms and 39.1 hours/cow/year on the bottom 20% (least efficient) farms (Deming, 2017). Similar figures were found in a study in 2011 where average labour use per cow was 40 hours/cow/year, with the most efficient farmers using 20 hours/cow/year (Teagasc, 2010). This was also in line with O'Donovan et al (2008) who found that medium sized farms of 50-80 cows averaged 42.2 hours/cow/year and as herd size increased (to over 80 cows), labour usage reduced to 29.3 hours/cow/year. When compared to findings in 1988 (O'Shea, et al., 1988), labour input per cow had decreased at a rate of roughly 1 hour/cow/year. These findings show that as herd size increases, generally labour efficiency increases, and this may be attributed to the use of hired labour and contractors (O'Brien, et al., 2015). Herd size has been shown to have a significant effect on the average input of a full time labour source, be it family or hired labour (O'Brien, et al., 2007). While efficiency is increasing, cow numbers are increasing also, therefore labour continues to be a significant area of concern, whether a farm is already labour efficient or not.

While the aforementioned research may address some of the queries surrounding labour efficiency, there may be a disconnect between the research and farmers' perceptions of labour efficiency and workload management. The labour issue is a real concern to dairy farmers across the country and is widely reported on in the media; O'Brien reported in 2015 that milk price aside, the availability of skilled labour and the cost of that labour is one of the greatest challenges facing Irish dairy farms (O'Brien, et al., 2015), with labour being one of the highest

costs on dairy farms after feed costs (average across 46 countries) (Hemme, et al., 2014). The challenges the dairy sector face means there needs to be more focus on increased environmental sustainability, higher quality milk to produce products of greater added value and increased focus on people in dairying to ensure there are more trained people entering the sector (Dillon, et al., 2016). From looking at the research to date, farmers' personal views and suggestions merit more in-depth examination. Farmers have concerns regarding the sustainability of their current farming practices, particularly the management of workload at peak times such as the calving season. Average farm labour input per cow per month has been found to be highest in Spring and early Summer (Deming, 2017) (O'Donovan, et al., 2008). The seasonality of labour demand means labour units may only be required during these 'peaks' in demand. As farms are expanding in herd size, this labour demand at these peak times is continuously on the rise and this paper aims to examine the way dairy farmers are adapting to these changes on their farms, both in terms of their own workload management and attitudes towards the necessity for additional labour units on their farms.

It is important for the industry to fully understand the manner in which farmers make decisions, why they may choose a certain innovation over another, and how farmers are influenced by policy or market protections and regulations (Öhlmér, et al., 1998). It has been shown that receptiveness to innovation in agriculture can be very slow i.e. farmers can be slow to implement some 'modernisations' on their farms (Avolio, et al., 2014). It is recognised that while innovations can develop rapidly, the agriculture industry is failing to fully grasp the potential benefits of these innovations (Mofakkarul Islam, et al., 2013), and that uptake of innovation varies between farming systems (Läpple, et al., 2015). For example, competency with the use of mobile phones and computers is a form of implicit knowledge for some farmers but it must be considered that it is not implicit knowledge for all farmers. Studies have concluded that computer and internet use was closely related to several factors such as age, gender, education, income levels, marital status, occupation and/or presence of individuals in household working in sectors other than agriculture (Gündüz, 2011). As this example shows, the use of computers/technology may have an impact on farmer decision making in terms of their uptake of certain innovations on farms and this study aims to explore what practices and technologies farmers have utilised (and have plans to utilise) to improve the management of workload on their farms.

Azjen's Theory of Planned Behaviour accepts that 'general dispositions tend to be poor predictors of behaviour in specific situations' (Azjen, 1991), and this is an appropriate theory to inform this study. There can often be a disconnect between attitudes, intentions and the subsequent follow through with actions. Ajzen states that the more robust an intention, the

higher the probability of follow through on the action.A person's enthusiasm also has a major impact on their perception of the extent to which they actually control their behaviour (Azjen, 1991). Considering the effect that labour challenges and farmer receptiveness to new innovations can have on dairy farm efficiency, the Theory of Planned Behaviour provides a useful context to help consider the complexities of social behaviour. This study applies this theory through the examination of relationships between farm characteristics and the practices/ technologies utilised to aide workload management on the farm.

While looking at how and why farmers make decisions on their farms, it is also important to consider the implications for the farm advisory services. Farmers tend to base decisions around current policy and economic factors (Willock, et al., 1999). However, by engaging with their advisory services and farming social networks, more informed decisions can be made towards strengthening the future of the farm. Current economic conditions, such as BREXIT, must also be considered when making these decisions. New policy should be drawn up by taking into account the effect social interactions with other farmers have on a farmer's decision making process (Murdoch, 2000). The growth targets which have been set for the Irish agri-food sector are ambitious and are based on the idea of increasing farm productivity through knowledge adoption by farmers and their agents (Läpple, et al., 2015). This study assesses the opinions of farmers regarding the best sources of information on management of workload as well as their satisfaction with the services provided by Teagasc Advisory Services in terms of workload management.

Chapter Two: Research Aims and Questions

Research Aims

The aim of this research was to identify farmers' attitudes towards current management of workload on their farms, their plans to improve their workload management and what farmers feel are the most appropriate advisory methods to support them in the challenge of improving workload management on their farms.

Research Questions

The four main questions of the study are:

1. How do dairy farmers view their own management of workload on their farms?
2. What are dairy farmers' plans for the future (next three years) in terms of improving workload management?
3. Are there relationships between farm characteristics and the practices/technologies utilised to aid workload management on the farm?
4. What supports do dairy farmers feel are required from advisory services to help address their workload management challenges?

Chapter Three: Methodology

The research design was based on quantitative and qualitative research within a cross-sectional design which involved the collection of data from a number of different sources in relation to dairy farmers in the Teagasc Moorepark Advisory Office catchment area. The focus was to understand farmers' attitudes towards current management of workload on their farms, their plans to improve their workload management on their farms and what supports they need to do that. Cross-sectional design allows for the researcher to examine more than one case at a single point in time. The mixed methods approach using farmer questionnaires and discussion groups allowed for quantitative and qualitative data to be gathered, meaning variation, relationships and patterns of association could be established between cases (Bryman, 2012).

Design

This study collected data through semi-structured postal questionnaires completed by dairy farmers in the Teagasc Moorepark Advisory Office catchment area and dairy farmer discussion group sessions with groups from the same catchment area. Firstly, suitable dairy farmers were selected by the researcher in conjunction with the dairy advisors in the Teagasc Moorepark Advisory Office – suitable participants were categorised as those clients who were active members of discussion groups, had a Teagasc eProfit Monitor completed for 2016 and were a member of ICBF's HerdPlus (so the researcher had access to their 2016 Co-Op Performance Report). Eighty six suitable participants were identified and were posted a semi-structured questionnaire to be completed and returned, with results remaining anonymous to all but the researcher. Secondly, Teagasc eProfit Monitors and ICBF Co-op Performance Reports for 2016 provided supplementary data on certain key farm characteristics of the responding farmers while the returned questionnaires provided farmers opinions and information on certain farm practices. The questionnaire and eProfit Monitor and Co-op Performance Report data was combined and analysed using 'IBM SPSS Statistics 24'. Thirdly, discussions were undertaken with two dairy discussion groups from the Moorepark Advisory office catchment area. The groups were identified by the researcher and local advisors as their monthly meeting dates fitted with the timeframe of this study (August 2017). The purpose of these discussion sessions was to present some of the key findings from this study and to gauge farmers' reactions as to them. These findings ranged from perceived mean hours/week worked by farmers to their level of satisfaction with support from Teagasc Advisory Services

in the area of workload management and what Teagasc might improve their labour advice services.

Sampling

The research population was Teagasc dairy farmer clients in the Teagasc Moorepark Advisory Office, Fermoy, Co Cork. There were 305 dairy clients in the Advisory Office catchment area. Farmers were identified by dairy advisors through selection criteria designed by the researcher, in conjunction with the dairy advisors in the region – suitable participants were classed as those clients who were active members of discussion groups, had a Teagasc eProfit Monitor completed for 2016 and were a member of ICBF's HerdPlus so the researcher had access to their 2016 Co-Op Performance Report. As a result, 86 suitable participants were identified. From this list of 86 dairy farmers, questionnaires were posted out to all with the aim of a 60% response rate. Mangione provided a classification of bands of response rate to postal questionnaires with an acceptable rate being 60% to 69% (Mangione, 1995). A low response rate means that there is a higher risk of bias within the findings (Bryman, 2012). A high response rate of 60% was proposed because a very clear letter explaining the research itself as well as guidelines for questionnaire completion was enclosed with the survey. The surveys were posted to respondents but they were given two return options, either by return post or return to their advisor or the researcher at their monthly discussion group meeting. The researcher attended and co-facilitated meetings with these groups so farmers were familiar with the researcher and aware of the research taking place. A follow up text message was also sent to farmers to remind them of the closing date for returned questionnaires. In terms of discussion sessions, there were over 10 dairy discussion groups in the Teagasc Moorepark Advisory Office catchment area at the time, all of which were very well established and participants were very open with one another, meaning conversations were very in-depth and engaging. Two groups were identified by the researcher as their monthly meeting dates fitted in with the timeframe for data collection in this study.

Instrument One: Semi-Structured Postal Questionnaires

A questionnaire was drawn up to give insights in to the research population in order to answer the research objectives (Appendix 2). Several drafts of this questionnaire were created before deciding to pilot the questionnaire. Piloting took place in the reception waiting room of the advisory building in Teagasc Moorepark with dairy clients who were waiting for their

appointments with advisors. The questionnaire was given to them with a draft of the letter which was sent to project participants. No assistance was given in the piloting stage, as actual participants would not have assistance due to the questionnaire being sent by post. Piloting was a success as it uncovered some important issues such as the structure of questions, which were amended in the final version. Following on from piloting, a text message was sent out to the dairy farmers in early May 2017 informing clients of the study and that they would receive a questionnaire in the post in the following weeks. Following this, a letter (Appendix 1) introducing the study, a numbered questionnaire and an envelope for easy return were posted to all selected clients in stages over a two week period between the 4th and 17th May 2017. The letter included details of the project, instructions to complete the questionnaire and instructions for return. Farmers were given the option of returning the completed questionnaire to the advisory office or returning it to the researcher or their advisor at their monthly discussion group meeting. It also stated that by completing and returning their questionnaire, they were consenting to the researcher accessing and using their 2016 eProfit Monitor and 2016 Co-op Performance Report. Responses on returned questionnaires were kept anonymous to all but the researcher. One week later a reminder text was sent to participants to remind them to return their completed questionnaires. The following week, a final reminder was sent. The final date for return of surveys was 23rd June 2017. Fifty four farmers returned questionnaires giving a response rate of 63%. However, due to three farmers having incomplete eProfit Monitors for 2016 on the final return date, their questionnaires were excluded from the data sample, giving a final response rate of 59%.

Instrument Two: 2016 eProfit Monitor and 2016 Co-Op Performance Reports

eProfit Monitors are relatively popular and common practice for dairy farmers in the Cork East Region. The Teagasc eProfit Monitor Analysis Report for dairy farmers in 2016 states that 1352 spring milk dairy farms in 2016 completed eProfit Monitors nationally, and 269 completed them in the Cork Region (Teagasc, 2017). The eProfit Monitors can show fundamental financial differences between different enterprises and common key farm characteristics by showing their cost of production, profit, concentrate feeding, grass utilisation, contractor usage and hired labour usage etc. Similarly, production figures can be ascertained from co-op performance reports for participants in the research population. Information selected from 2016 eProfit monitors is shown in Appendix 3. This data was coded and inputted into the SPSS data analytics tool for analysis. Data from these sources was compared to data from the 2016 National Farm Survey (Dillon, et al., 2017), Teagasc Profit Monitor Analysis Dairy Farms 2016 (Teagasc, 2017), and figures from 'The People in Dairy Project' report (Kelly, et al., 2017).

Instrument Three: Discussion Group Sessions

There were over 10 dairy discussion groups in the Teagasc Moorepark Advisory Office catchment area all of which have been running for several years, resulting in the farmers being very comfortable in a group setting so they were very open with one another and conversations were very in-depth and engaging. Two groups were identified as their monthly meeting dates fitted with the timeframe of this study (August 2017). Thirty to forty minutes of their monthly meeting time was allocated to discussion of results of this survey, facilitated by the researcher. Group One had ten farmers present while Group Two had 15 farmers present. The purpose was to present some of the key findings from this study to gauge the farmers' reactions. These findings ranged from perceived mean hours/week worked by farmers; mean contractor costs and machinery costs compared to the national average of spring milk dairy farms in 2016; main practices utilised over the past three years to improve workload management and main practices selected to be utilised over the next three years to improve workload management; likeliness to hire additional labour units in 2017; level of satisfaction with support from Teagasc Advisory Services in the area of workload management; and what Teagasc can improve in their labour advice services. These groups allowed the farmers to consider the findings presented, to bounce ideas off each other and provided an opportunity for the conversation to develop to help the researcher ascertain how farmers perceive the services provided by Teagasc in terms of workload management and how they can improve this service.

Chapter Four: Results

Fifty one farmers (response rate of 59% from the population of 86 dairy farmers) returned completed questionnaires within the time allowed. This first part of this Results Section presents selected characteristics of farmers and compares these figures to national and regional averages. Part Two summarises the current opinions and attitudes to workload management on their farms. Part Three summarises future plans for the farms in relation to workload management. Part Four addresses hired labour on farms. Part Five explores the supports that farmers say are needed from advisory services to aid farmers with workload and labour management.

Part One: Farm and Farmer Characteristics

Farmers have been farming for an average 28 years (ranging from three to 54 years). Ninety six percent of farmers were farming full time in 2016 and 100% had spring calving herds. Common profit/cow was on average €798 (€85,697 average common profit per farm). National Farm Survey 2016 results indicate that dairy farm income was down 17% to €51,809(Dillon, et al., 2017). Key characteristics of farmers in this study are summarised in Table 1 and are compared to their relative national average figures:

Table 1: Study Averages and National Averages

	Study Average	National Average
Dairy Farmer Age	48	51 (Dillon, et al., 2017)
Farm Size	73.5 Ha	52 Ha (Dillon, et al., 2017)
Livestock Units	172 LU	164 LU(Dillon, et al., 2017)
Cow Numbers	120 Cows	115 Cows (Teagasc, 2017)
Whole Farm Stocking Rate	2.41 LU/Ha	2.24 LU/Ha (Teagasc, 2017)
Milking Platform Stocking Rate	2.74 LU/Ha	2.45 LU/Ha (Indicative Figure) (Teagasc, 2017)
Milk Produced	5699 L/cow	5329 L/cow (Teagasc, 2017)
Milk Solids	449 Kg/cow	426 Kg/cow (Teagasc, 2017)
Six Week Calving Rate	76%	63% (Dairygold 2016 Supplier Average)
Received an Ag. Education	88%	70% (Heanue & O'Donoghue, 2014)

Average performance of farms (Table 1) in this study is excellent. Average farm size, cow numbers and farm stocking rates were greater than the national average, with significantly higher production averages. This group of farmers produced 370L/cow above the national

average for milk production and 231L/cow above the Cork regional average (Teagasc, 2017). Similarly, they were 23Kg/cow above the national averages for milk solids, and 61% above their supplier (Dairygold) average of 388Kg/cow in 2016 (Teagasc, 2017). Six week calving rates were 13% higher than the national average. A high proportion of farmers had received an agricultural education - level of education is detailed in Figure 1.

Level of Agricultural Education

■ Level 5	
■ Level 6	
■ Level 7	
■ Level 8, 9 & 10	
■ No agricultural education	

42%
16%
12%
9%
21%
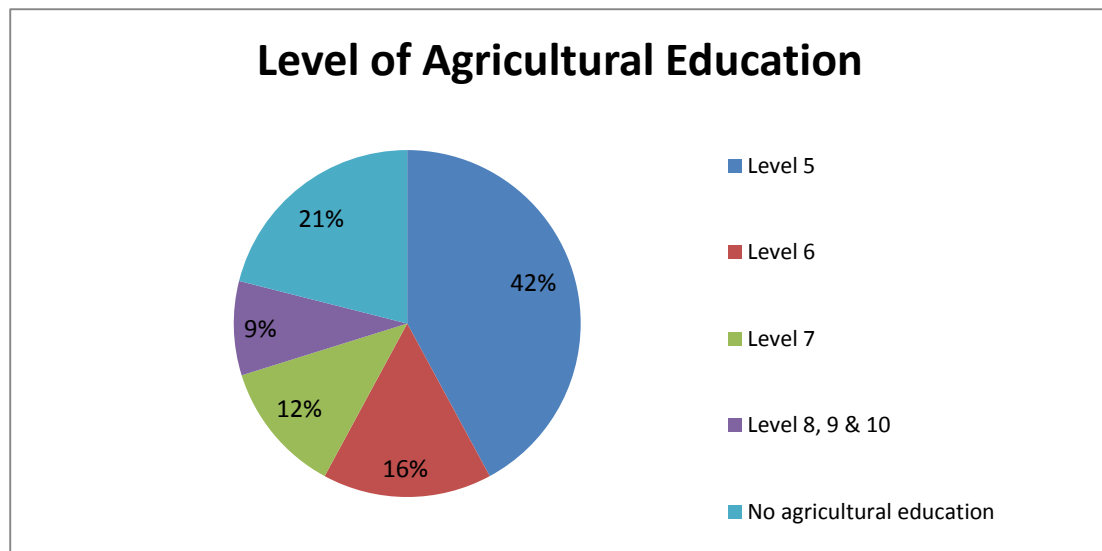
Figure 1*: *Level of education received by respondents (n=51)

Part Two: Workload Management on Farms

Farmers answered that they worked on average 66.58 hours per week. When asked to react to this figure in discussion group sessions, farmers said the figure was high and perhaps not realistic. But when considered that the whole milking process could potentially take up to five hours/day (37 hours/week) alone, the 67 hours/week worked could be accurate. They said the result could be skewed by the timing of survey completion, so perceived working hours would be higher than if asked at another time of year. Also the farmers felt that hours worked may be perceived as the 'whole working day' e.g. wake up at 7am and come home in the evenings at 7pm and may have considered this as a 12 hour working day - that is not a realistic interpretation of the hours worked/day.

Table 2 indicates the number of farmers who had other people working on their farmswith them in 2016 with the average hours/week they contributed.Two farmers also utilised students as temporary labour; one farmer's brother in law worked on the farm; and four farmers utilised the services of Farm Relief Service ranging from 2.5 hours/week to 4 weeks/year.

Table 2:** **People who worked on farms in 2016 with average hours/week contributed

Labour Source	% of respondents utilising source (n=51)	Mean hours/week contributed across the year in 2016
Spouse/partner	59% (30)	18.9
Parent(s)	33% (17)	30.6
Child/children	39% (20)	19.65
Hired labour unit(s)	51% (26)	30.55

The average 'hired labour' bill on 2016 eProfit Monitor reports of farmers (n=47) amounted to €11,701.62 (€97/cow), ranging from €0 to €90,000. The national average labour costs for the average spring milk dairy farms in 2016 was €84/cow and the top 25% spring milk dairy farms in 2016 was €68/cow (Teagasc, 2017). This indicates that the labour bill for farmers in this study was €13 - €29/cow higher than the national averages. In contrast to 'hired labour' on dairy farms there is also 'own labour' which is labour that is provided by the farm family (Teagasc, 2017). The financial value of own labour can be estimated on a farmers eProfit Monitor and this is known as the unpaid labour charge. eProfit Monitor results from 2016 indicate that the national average spring milk producers unpaid labour value was on average €9,660 (equivalent to labour/cow €84/cow) while the national top 25% of spring milk producers

was €68/cow (equivalent to €10,790) (Teagasc, 2017). Unpaid labour bill charge was not collected in the data for farmers in this study; however, their unpaid labour hours were on average 2708 hours in 2016.

Average contractor costs for farmer respondents in 2016 was €17,658.90 and average machinery running costs for farmers in 2016 was €7,834.68. While machinery running costs of farmers were only marginally higher than the national average (Table 3), contractor costs were €57/cow higher than the national average. In the discussion group sessions farmers thought these figures were accurate – higher contractor costs are to be expected in this region and this can be attributed to land fragmentation, more intensive enterprises, substantial difference in output in this region to some other areas of the country and that farmers in this region give more work to contractors – 'if the work can be done by someone else, it is contracted out to someone else'.

Table 3**: **Study averages and national averages (Teagasc, 2017) for contractor costs and machinery running costs

	Surveyed farmers	National Average
Average contractor costs/cow	€147	€90
Average machinery running costs/cow	€65	€53

Table 4 demonstrates the correlation between the perceived mean hours/week worked by the farmers across the year in 2016 with their mean contractor costs and machinery running costs for 2016. It indicates that there is no correlation between contractor costs or machinery running costs with the hours worked on the farm. Generally, when contractor costs are high the farmers machinery running costs are low but contractor or machinery costs do not seem to rise or fall in line with the number of hours worked per week by the farmer. These results were not statistically significant and the strength of association was low.

Table 4: _The relationship between the average hours per week worked by farmers in 2016 with their contractor costs (€) and machinery costs (€)_

Average Hours/ Week Worked by Farmers	Mean Contractor Costs (No. of Farmers n=50)	Mean Machinery Costs (No. of Farmers n=49)
39 – 50 hours	€17,211 (3)	€8,837 (3)
51 – 60 hours	€15,771 (18)	€7,573 (17)
61 – 70 hours	€17,687 (16)	€8,212 (16)
71+ hours	€20,385 (13)	€7,658 (13)
	Statistical Significance: 0.752 (NS) **Strength of Association: 0.200**	**Statistical Significance: 0.995 (NS)** **Strength of Association: 0.066**

Note: _(S) = statistically significant at P≤0.05, (NS) = not statistically significant at P≤0.05_

Common farm tasks such as milking cows, paperwork completion and farm maintenance were broken down to hours/week in the spring period (Figure 2) and on average the most time consuming tasks were 4.55 hours/day milking (i.e. moving cows, milking, cleaning), and 3.19 hours/day at stock management (i.e. calving cows, rearing calves and animal health).

Hours/Week Spent at Major Dairy Farm Tasks

- ■ Milking
- ■ Stock Management
- ■ Feeding Stock
- ■ Grassland Management
- ■ Paperwork/ Financial Management
- ■ Off Farm Activities (e.g. mart, discussion groups)
- ■ Cleaning/Repairs/Maintenance
- ■ Working with Other Farm Enterprises
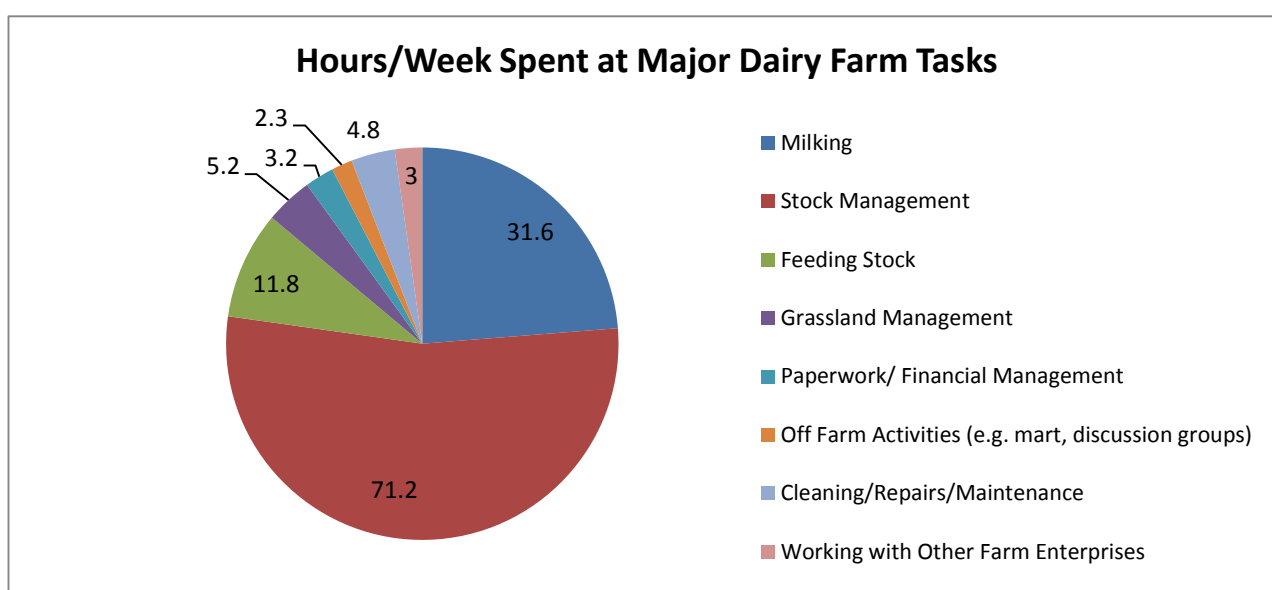
Figure 2: _Hours per week spent at major dairy farm tasks in spring 2016_

Ninety eight percent of farmers have utilised new practices and/or technologies to help better manage workload on their farms. When asked to rank the top three practices/technologies that have most helped with workload management on their farm over the past three years, a range of responses were given (Table 5) with the most common being the use of a contractor

for major jobs, hiring of additional labour units and improved use of grass. For the one farmer who said they had not used new practices/technologies to improve workload on the farm, their reason was that they had already implemented some of the innovations but it was over three years ago.

Table 5: **_Ranking of the most helpful practices/technologies utilised by farmers on farms over the past three years to aid their workload management (n=50)_**

Practices/Technologies Used to Help Manage Workload on the Farm	Ranked in the Top Three (% of farmers)
Using the contractor for major jobs	70
Hiring of additional labour units	34
Improved use of grass	30
Adding additional calving facilities/ calf accommodation	24
Use of automatic calf feeders/ milk buckets/ milk trolleys	24
Upgrading the milking parlour	18
Discussion group membership	18
Preparation & planning ahead of calving season	18
Focusing on fertility/ improving the six week calving rate	16
Use of paperwork management software	14
Use of grassland management software	14
Adding additional winter accommodation	10
Sale of surplus stock	10
Switching to a single farm enterprise	8
Upgrading handling facilities	8
Improved grazing infrastructure	8
Purchasing/ replacing quad bike	6
Contract rearing heifers	4
Replacing tractor or car/jeep	4
Utilising once a day milking	2
Adding an underpass for cows	2

In the discussion group sessions, farmers thought that the top practices/technologies chosen were as expected and that improved use of grass is a hugely important area – 'cows are longer out, so you have less work by utilising more grass'. They also said that once a day milking in the spring or stopping stripping cows should have also placed highly on the list. Another farmer said 'I would have thought chasing a higher EBI herd to improve calving ease and calving date to reduce workload in the busy spring calving period would have been in the top three'.

Rankings of the most helpful workload management practices on farms were compared to the key farm characteristics from farmers '2016 eProfit Monitor and 2016 ICBF Co-Op Performance reports. These include whole farm stocking rate (LU/Ha), milk solids produced (Kg/cow), six week calving rate (%) and labour bill (€) (Table 5) through bivariate analysis using "IBM SPSS Statistics 24". A Compare Means test was completed for each of these comparisons to give an indication of the average stocking rate, milk solids, six week calving

rate and labour bill for the number of farmers who ranked certain practices or technologies in their top three. For each of the comparisons made, statistical significance and measure of association was analysed using an ANOVA table, with the view of ascertaining whether there was a significant relationship between each of the comparisons.

Analysis indicated no statistically significant relationships between the practices/technologies utilised on farms over the past three years and whole farm stocking rate (LU/Ha) (detailed in Appendix 4), except for the case of discussion group membership (p=0.024). Those who ranked discussion group membership in their top three practices/technologies utilised on the farm over the past three years (n=9) had a lower average stocking rate of 2.1LU/Ha compared to those who did not rank it in their top three practices or technologies (n=42) with a higher average stocking rate of 2.5 LU/Ha. This could suggest that less intensive farmers benefit more from discussion group membership than more intensive farmers; however, there are associated benefits with all of the practices utilised on all farms.

There was no statistically significant relationship between the practices/technologies utilised on respondents' farms over the past three years and milk solids produced (Kg/cow) (detailed in Appendix 5), except for the cases of utilising automatic calf feeders/milk buckets/milk trolleys (p=0.024), and upgrading the milking parlour (p=0.017). Those who ranked calf feeders in their top three practices/technologies utilised (n=12) produced on average 475kg/cow compared to those who didn't (n=39) who produced on average 441kg/cow. This may be attributed to the significant reduction in workload associated with managing calves when automatic feeders are used, meaning more time can be allocated to focusing on milk quality and production. Those who ranked upgrading their milking parlour in their top three practices/technologies utilised (n=9) produced on average 482kg/cow compared to those who didn't (n=42) who produced on average 442kg/cow. Those with newer or upgraded parlours can have more automated or easy to use milking systems, meaning more of a focus can be put on milk quality and production.

There was no statistically significant relationship between the most helpful practices/technologies utilised over the past three years on farms and their labour bill (€) (Table 6), except for the case of sale of surplus stock (p=0.003) and switching to a single farm enterprise (p= 0.026). Those who ranked sale of surplus stock in their top three practices/technologies utilised (n=5) had higher average labour bill of €34,691 compared to those who didn't (n=42) who had average an average labour bill of €8,965. Those who ranked switching to a single farm enterprise in their top three practices/technologies utilised (n=4) had a higher average labour bill of €31,736 compared to those who didn't (n=43) who had an

average labour bill of €9,838. This suggests that those who sold surplus stock or switched to a single farm enterprise had higher average labour bills in 2016 which may be attributed to the fact that increased focus on the dairy enterprise brings a greater workload, particularly in the calving season, meaning an increased need for additional labour.

Table 6: _The relationship between the most common practices/technologies utilised_ _by respondents over the past three years and labour bill (€)_

Practices/technologies utilised over the past three years	Ranked in top three – Mean € (no. of respondents)	Not ranked in top three – Mean € (no. of respondents)	Significance (p)	Measure of association (eta)
Additional labour units	15156 (17)	9744 (30)	0.353 (NS)	0.138
Contract rearing heifers	4362 (2)	12028 (45)	0.582 (NS)	0.082
Sale of surplus stock	34691 (5)	8965 (42)	0.003 **(S)**	0.422
Contractor for slurry/fertiliser/silage etc.	12498 (14)	11363 (33)	0.854 (NS)	0.028
Switching to a single farm enterprise	31736 (4)	9838 (43)	0.026 **(S)**	0.325
Improved use of grass	4445 (14)	14780 (33)	0.088 (NS)	0.252
Improved grazing infrastructure	8984 (4)	11954 (43)	0.768 (NS)	0.044
Use of PastureBase Ireland/ AgriNet	8875 (6)	12115 (41)	0.701 (NS)	0.058
Paperwork management software	25350 (6)	9704 (41)	0.058 (NS)	0.278
Additional calving facilities/ calf accommodation	6517 (9)	12929 (38)	0.368 (NS)	0.134
Preparation & planning ahead of calving season	9707 (9)	12174 (38)	0.730 (NS)	0.052
Automatic calf feeders/ milk buckets/ milk trolleys	14221 (12)	10838 (35)	0.600 (NS)	0.079
Additional winter accommodation	5614 (4)	12268 (43)	0.508 (NS)	0.099
Fertility/ improving the six week calving rate	4527 (7)	12957 (40)	0.283 (NS)	0.160
Discussion group membership	4814 (8)	13115 (39)	0.264 (NS)	0.166
Upgrading milking parlour	14318 (8)	11165 (39)	0.674 (NS)	0.063
Handling facilities	11197 (3)	11736 (44)	0.963 (NS)	0.007
Once a day milking	2420 (1)	11903 (46)	0.626 (NS)	0.073
Quad bike	5000 (2)	11999 (45)	0.615 (NS)	0.750
Replacing tractor or car/jeep	10231 (2)	11767 (45)	0.912 (NS)	0.017
Underpass for cows	3890 (1)	11871 (46)	0.682 (NS)	0.061

Note: _(S) = statistically significant at P≤0.05, (NS) = not statistically significant at P≤0.05_

There was no statistically significant relationship between the most helpful practices/technologies utilised on farms over the past three years and six week calving rate (%) (detailed in Appendix 6), except for the cases of switching to a single farm enterprise (p=0.046), and adding additional winter accommodation (p=0.033). Those who ranked switching to a single farm enterprise in their top three practices/technologies (n=4) had an average 86% six week calving rate compared to those who didn't (n=47) who had an average

six week calving rate of 76%. This could be attributed to reducing the other enterprises on the farm meaning more of a focus can be placed on improving breeding and fertility on the farm. Those who ranked additional winter accommodation in their top three practices/technologies (n=5) had an average 68% six week calving rate compared to those who didn't (n=46) who had an average six week calving rate of 77%.

Part Three: Hired Labour on the Farm

Fifty seven percent of farmers (n=29) did not think they would need any additional labour units in 2017; 29% stated they would need a part time labour unit; 4% a full time labour unit and 10% were unsure. Of the 33.3% of farmers who said they would need additional labour, 26% of those believed that the labour unit would still be required even if they had implemented new practices and/or technologies to help manage their workload and only 20% of those actually intended on hiring an additional labour unit in 2017. Responses may have been different if the survey had been administered at a quieter time of the year. Farmers in the discussion group sessions said that these results were unexpected – 'labour is supposed to be the biggest issue yet 57% said they don't need it'? However, they rationalised it by saying almost half need labour and half don't – 'you can't expect everyone to need additional labour, every farm is different'. Also, the high level of subcontracting in the area may mean that a lot of the work is outsourced and that otherwise an additional labour unit would be needed. They also noted that timing of survey distribution may have affected the response.

The figure of 20% who said they needed labour actually intended on hiring labour was a shock to the group as it only meant three - four farmers intended on hiring labour, which is extremely low - 'If the question were to be asked now (August), the figure would most likely be higher due to better cash flow towards the end of summer'. They thought it was very contradictory to the 33% who said they need labour; however, one farmer said 'there is a real contradiction between reckoning you need an additional labour unit and actually needing an additional labour unit'. They also argued contrary to that fact was that workload is significantly reduced in May when the surveys were completed meaning famers generally wouldn't be hiring for the rest of the year. A huge problem is that farmers can hire an employee in the spring, but don't have work for them for the rest of the year as they can't keep sustainable levels of work throughout the year for a labour unit.

Twenty seven percent of farmers indicated the payment rates they were willing to pay labour units/day (Figure 3) which indicates that half the farmers were unwilling to pay more than €90/day and 29% were unwilling to pay over €70/day. Only 24% of farmers said it was easy to hire a labour unit when required. This is a noteworthy finding as the issue of the necessity and availability of labour for Irish dairy farms is one that is prevalent in 2017.

Payment Rates Farmers were Willing to Pay Labour Units Per Day
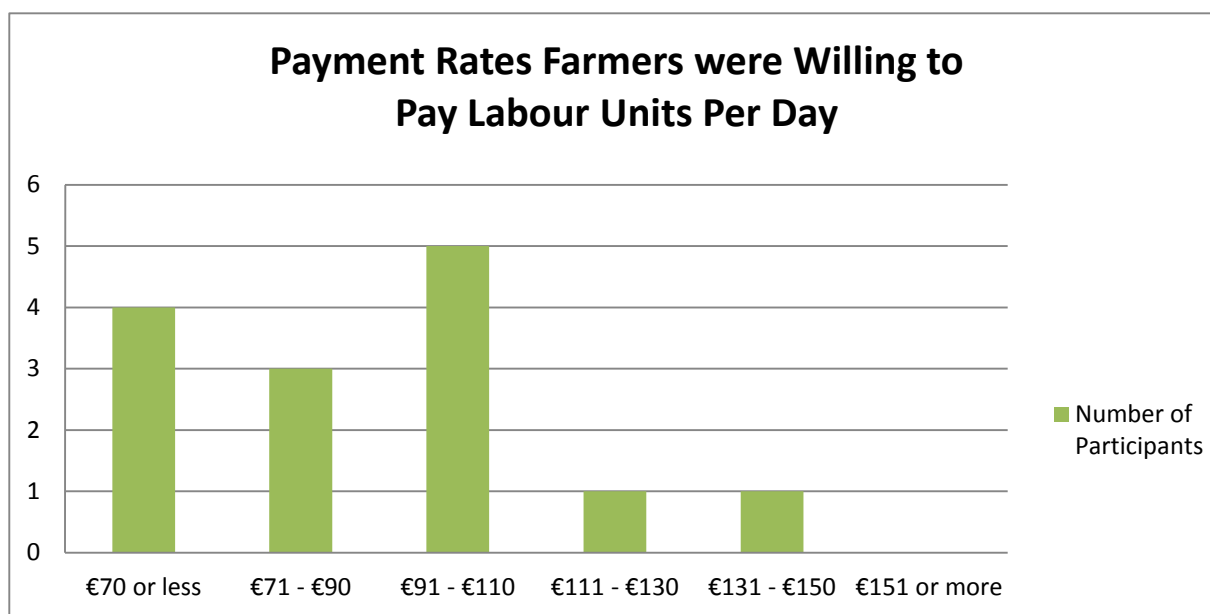
Figure 3*: Distribution of Farmers by Payment ratesthey were willing to pay labour (n=14)*

The top three qualities farmers look for in a person when hiring someone to work on the farm (Table 7) were having a good work ethic, experience of farm work and knowledge of farm work. Potential farm employees were selected from a large range of sources with the most popular outlet for sourcing new employees being word of mouth (43%), followed by Farm Relief Services (37%) and sourcing students to work on farm (28%). The top outlets for sourcing employees are outlets that have been used for many years to source employees, with newer methods of sourcing employees faring poorly in these findings, such as social media (4%) and the internet (2%), and no farmers at all selected the use of radio adverts. Clearly above all else farmers value good work ethic and prior experience when hiring labour and this is evident in the way they source their employees.

Table 7*: Ranking of the most popular qualities farmers look for in a person when hiring someone to work on the farm (n=48)*

Qualities Farmers Look for in A Person When Hiring Someone to Work on the Farm	Ranked in Top Three (% of farmers)
Good work ethic	96
Experience of farm work	71
Knowledge of farm work	33
Good references	31
Full driving license	17
From a farming background	13
Agricultural qualification	6
Punctuality	2
Safety conscious	2
Ability to work unsupervised, use their head & learn from their mistakes	2

Eighty eight percent of farmers said that they plan to utilise new practices/technologies over the next three years to help better manage workload on their farms. When asked to rank the top three practices/technologies that they plan to implement, a wide range of options emerged (Table 8) with the most common options being adding additional winter accommodation, improved use of grass, and sale of surplus stock. This would indicate that a large proportion of farmers see improving their winter accommodation for cows as the main practice that is going to help them improve their workload on their farms over the next three years. The four farmers who said they would not utilise new practices/technologies to improve workload on the farm gave the reason that there was no need/interest or that they had no need as they had already implemented some of the practices/technologies already and as a result had a comfortable farming system.

In the discussion group sessions, farmers said that the options which were most popular were as expected and noted that utilisation of grass also appeared in the top options in the practices/technologies utilised over the past three years on farms; they attributed this to the fact that there's lots of work done in improving grass utilisation but a lot left to do – 'soil fertility is still a huge issue and is a key driver to make more use of grass which can help reduce workload'. Some said that they thought that technology would have appeared high up in the rankings, such as automatic calf feeders, upgrading the milking parlour, robots etc. or options such as contract rearing heifers.

__Table 8__: Ranking of the most likely practices or technologies selected by participants to utilise on their farms over the next three years (n=51)

Practices/Technologies Likely to be Implemented to Help Manage Workload on the Farm	Ranked in the Top Three (% Farmers)
Adding additional winter accommodation	28
Improved use of grass	24
Sale of surplus stock	22
Using a contractor for major jobs	20
Use of automatic calf feeders/milk buckets/milk trolleys	20
Upgrading the milking parlour	18
Upgrading handling facilities	18
Hiring of additional labour units	16
Improved grazing infrastructure	16
Focusing on fertility/ improving the six week calving rate	14
Preparation & planning ahead of calving season	12
Use of grassland management software	10
Switching to a single farm enterprise	6
Contract rearing heifers	6
Use of paperwork management software	6
Discussion group membership	2
Utilising once a day milking	2
Purchasing/ replacing quad bike	2
Replacing tractor or car/jeep	2
Installing/ upgrading automatic scrapers	2
Adding an underpass for cows	2
Installing a robot	2
Adding additional calving facilities/calf accommodation	2

Farmers' rankings of the workload management practices they plan to utilise over the next three years were compared to the key farm characteristics from their 2016 eProfit Monitor and 2016 ICBF Co-Op Performance reports such as whole farm stocking rate (LU/Ha), milk solids produced (Kg/cow), six week calving rate (%) and labour bill (€) (Table 9) through bivariate analysis using "IBM SPSS Statistics 24". A Compare Means test was completed for each of these comparisons to give an indication of average stocking rates, milk solids, six week calving rate and labour bill for the number of farmers who ranked certain practices/technologies in their top three. For each of the comparisons made, statistical significance and measure of association was analysed using an ANOVA table, with the view of ascertaining whether there was a significant relationship between each of the comparisons.

There is no statistically significant relationship between the practices/technologies farmers plan to utilise over the next three years and whole farm stocking rate (LU/Ha) (detailed in Appendix 7). Those who planned to improve their herd fertility, upgrade their milking parlour or upgrade their handling facilities all had lower stocking rates than those who didn't, however none were statistically significant. Those who plan to hire additional labour units, contract rear their heifers or to utilise a contractor for all major jobs all had higher stocking rates than those

who didn't, however none were statistically significant.Having a higher stocking rate can bring with it associated issues in terms of workload management (such as fragmentation, grassland management, need for additional winter forage etc.), so the need for using additional labour units or contractors for jobs or having heifers contract reared is an understandable necessity for those with higher farm stocking rates.

There is no statistically significant relationship between the practices/technologies farmers plan to be utilise over the next three years and milk solids produced (kg/cow) (detailed in Appendix 8), except for the case of automatic calf feeders/milk buckets/milk trolleys (p=0.037). Similarly, this was a significant relationship between automatic calf feeders/milk buckets/milk trolleys and the most helpful practices/technologies utilised on farms over the past three years. Those that ranked calf feeders in their top three practices/technologies to be utilised over the next three years (n=10) produced on average 422kg/cow compared to those who didn't (n=41) who produced on average 455kg/cow.Those who have already utilised milk feeders over the past three years had higher solids than those who didn't in 2016, which could indicate that the utilisation of calf feeders reduces a farmer's workload, meaning they have more time to focus on milk quality and production.

There is no statistically significant relationship between the practices/technologies farmers plan to utilise over the next three years and six week calving rate (%) (detailed in Appendix 9). Those who plan to switch to a single farm enterprise, to utilise a contractor for all major jobs, to improve their use of grass and grazing infrastructure, to better prepare and plan ahead of calving season and plan to improve their handling facilities all had higher six week calving rates than those who didn't, however none were statistically significant. Those who plan to improve their herd fertility over the next three years had on average lower six week calving rates than those who didn't, however this was not statistically significant. In order to increase their six week calving rate, farmers need to improve their herd fertility.

There is no statistically significant relationship between the most helpful practices/technologies farmers plan to utilise over the next three years and their labour bills (€) (Table 9), except for the case of hiring additional labour units (p=0.005) and the sale of surplus stock (p=0.031). Those who ranked additional labour units in their top three practices/technologies to be utilised years (n=8) had a higher labour bill of €28,306 compared to those who didn't (n=39) who had an average labour bill of €8,296. Those that ranked sale of surplus stock in their top three practices/technologies to be utilised (n=10) had a higher

labour bill of €28,082 compared to those who didn't (n=37) who had an average labour bill of €8,626.

Table 9: The relationship between the most common practices/technologies planned to be utilised by respondents over the next three years and labour bill (€)

Practices/technologies to be utilised over next three years	Ranked in top three – Mean € (no. of respondents)	Not ranked in top three – Mean € (no. of respondents)	Significance (p)	Measure of association (eta)
Additional labour units	28306 (8)	8296 (39)	0.005 **(S)**	0.400
Contract rearing heifers	9113 (3)	11878 (44)	0.810 (NS)	0.036
Sale of surplus stock	23082 (10)	8626 (37)	0.031 **(S)**	0.315
Contractor for slurry/fertiliser/silage etc.	22454 (9)	9156 (38)	0.058 (NS)	0.279
Switching to a single farm enterprise	9522 (3)	11850 (44)	0.840 (NS)	0.030
Improved use of grass	18298 (11)	9494 (36)	0.151 (NS)	0.213
Improved grazing infrastructure	12608 (12)	11391 (35)	0.850 (NS)	0.028
Use of PastureBase Ireland/ AgriNet	7218 (5)	12235 (42)	0.582 (NS)	0.082
Paperwork management software	13806 (3)	11558 (44)	0.845 (NS)	0.029
Preparation & planning ahead of calving season	7369 (5)	12217 (42)	0.595 (NS)	0.080
Automatic calf feeders/ milk buckets/ milk trolleys	14929 (9)	10937 (38)	0.576 (NS)	0.084
Additional winter accommodation	8075 (14)	13240 (33)	0.400 (NS)	0.126
Fertility/ improving the six week calving rate	4000 (5)	12618 (42)	0.343 (NS)	0.142
Discussion group membership	5500 (1)	11836 (46)	0.745 (NS)	0.049
Upgrading milking parlour	7721 (9)	12644 (38)	0.490 (NS)	0.103
Handling facilities	5951 (8)	12881 (39)	0.352 (NS)	0.139
Once a day milking	5500 (1)	11836 (46)	0.745 (NS)	0.049
Quad bike	3600 (1)	11878 (46)	0.671 (NS)	0.064
Automatic scrapers	2420 (1)	11903 (46)	0.626 (NS)	0.073
Replacing tractor or car/jeep	10000 (1)	11739 (46)	0.929 (NS)	0.013
Underpass for cows	5235 (1)	11842 (46)	0.735 (NS)	0.051
Robots	10000 (1)	11739 (46)	0.929 (NS)	0.013
Additional calving facilities/ calf accommodation	470 (1)	11946 (46)	0.556 (NS)	0.088

Note: (S) = statistically significant at P≤0.05, (NS) = not statistically significant at P≤0.05

Farmers (n=49) were asked whether they wanted certain farm characteristics to remain the same, increase or decrease by 2020 on their farms. Forty nine percent of farmers wanted cow numbers to increase and 51% wanted cow numbers to remain the same by 2020. Thirty five percent wanted farm size to increase and 65% wanted farm size to remain the same. One hundred percent of farmers wanted herd EBI to increase by 2020 and 86% wanted milk yield

to increase by 2020. Fifty eight percent wanted the length of their working day to decrease by 2020. This suggests that farmers will need to implement more work efficient practices and/or hire additional labour on their farms to achieve this. However, only 33% of farmers indicated that they were open to hiring additional labour in 2017.

Part Five: Industry and Advisory Supports

Farmers indicated that their most popular source of information on workload management was discussion groups, which was ranked most popular by 51% of farmers, followed by agricultural advisors (ranked most popular by 22% of farmers and second most popular by 29% of farmers). Twenty nine percent of farmers selected 'other farmers' as their third most popular source of information on workload management practices. When asked to react to these findings in the discussion group sessions, farmers agreed that these findings were what they would have expected and added that discussion groups are a huge source of information/advice because their advisor(s) are present and they get opinions/criticisms on their own practices from the other group members, which is hugely beneficial.

Farmers were asked their opinions on the supports currently available from advisory services and industry in terms of workload management. Seventy five percent of farmers were happy that they had adequate support from Teagasc Advisory Services in the area of workload management. In the discussion group sessions, farmers thought that this figure was higher than expected. They are very happy with Teagasc Advisory Services, particularly in terms of discussion groups and technical knowledge but one comment indicated why the figure of 75% was so low – 'we don't do anything on workload management'. They feel there is scope to improve services on the workload/labour management by advisory services –'The technical advice we get is great and advisors have a major influence in these aspects such as grassland management and this is indirectly giving us workload management advice as these technical practices reduce our workload'. Discussion groups were pitched as the most realistic and achievable method of improving workload management knowledge transfer from Teagasc Advisory Services as they believe groups are where you get a strong debate going about the issues with advisors and other farmers. They suggested quantifying the time spent at certain jobs on the farm for a day or week. This could be a hugely beneficial activity to do with discussion groups (the host farmer would complete this activity beforehandmeaning that the results could be discussed at the meeting).

Finally, farmers discussed the advisory supports which should be in place for labour management –'we really do need a push with that' as it is an area they are neglecting. The researcher pitched the idea of a specialist advisor to spend a few hours with farmers individually to discuss workload/ people management; and farmers stated – 'it wouldn't really work as what we need to do is assess the baseline issues ourselves and identify where we are at with our workload before bringing additional labour into the equation. He went on to say

'discussing that with our own advisor and own group is the best way to do that'. The consensus was that HR advice could ideally be given through a farmer's own advisor, as they know their clients' farms well; however, they stated that advisors have too many clients at the moment for such a service which means more frontline advisors would be required to reduce current advisors client base/workload. They suggested a specialist HR service is also an option and that this type of service has the benefit of the HR specialist having in-depth knowledge of agricultural employment law etc., but the downside is that they wouldn't know the farmer or their farm as well as the farmer's own advisor would.

Chapter Five: Discussion, Conclusions and Recommendations

Discussion

The aim of this research was to identify farmers' attitudes towards current management of workload on their farm, their plans to improve their workload management and what farmers think are the most appropriate advisory methods to support them in the challenge of improving workload management on their farms. Four main research questions were used to do this and some of the important findings are discussed in this section.

In addressing the first research question which was how dairy farmers view the management of workload on their farms, farmers said that they worked on average 67 hours per week with the majority having additional help on the farm, be that from family or other paid labour sources. Findings from a labour efficiency study in Teagasc Moorepark (Deming, 2017) indicate that on an average 200 cow farm, the total farm hours amounted to 5,145 hours with the farmers themselves contributing 3,087 of those hours, hired labour contributing 1,492 hours and contractors and family labour making up the remainder. Thirty four percent of the work was concentrated in the spring season. Deming (2017) measured the proportion of time spent on farming tasks of the highest, average, and lowest efficiency farms. Findings indicated that milking took up the most time on these farms followed by cow care and calf care respectively. Comparing Deming's research to the findings of this study would indicate that workload peaks in the spring time with stock management taking a huge amount of time, largely due to calving and calf rearing, with milking being one of the most time consuming jobs on the farm on average across the year. Ninety eight percent of farmers have utilised new practices/technologies to help better manage workload on their farms and the most common practices/technologies reported by farmers that they used over the past three years were using a contractor for major jobs, hiring of additional labour and improved use of grass.These are noteworthy practices/technologies considering the recommendations of the Teagasc Dairy Manual - 150 livestock units/labour unit and this can be achieved by only keeping dairy cows and replacement heifers (e.g. 150 dairy cows only or 120 dairy cows with 60 replacement heifers etc.), compactly calving cows to grass in the spring, use of casual labour during busy periods, and use of contractors for major tasks (Teagasc, 2010).

In addressing the second research question which was what dairy farmers' plans are for the future (next three years) in terms of improving workload management, 57% of farmers did not think they would need any additional labour in 2017. Of the 33% of farmers who said they would need additional labour, 26% of those believed that the labour would still be required

even if they had implemented new practices/technologies to help manage their workload and only 20% of those actually intended on hiring an additional labour in 2017. These are unexpected results as the structure of Irish dairy farms has changed significantly over the last ten years with the number of dairy cows in herds of 100 cows or greater has increased from 13% in 2005 to 47% in 2016 (Kelly, et al., 2017). This report also states that 'the rapid increase of herds greater than 100 cows highlights a potential mismatch between the availability of family labour and the workload on farms…. hence there is a growing requirement for both full and part time employees to work on dairy farms' (Kelly, et al., 2017). As a result there is a clear need for additional labour on farms, so it is surprising that such a low number of farmers in this study stated that they would hire additional labour in 2017. This may be attributed to the high level of contractor use in the area meaning work that would otherwise be done by additional labour is done by a contractor.

Only 24% of farmers said it was easy to hire labour when required. This is a noteworthy figure as the issue of the necessity, availability and above all retention of labour on Irish dairy farms are issues that are prevalent in media and as a topic of farming discussion in 2017. A study in Australia in 2011 indicated that there were four key issues that hindered the retention of employees on farms, namely: inadequate working conditions; lack of career development/promotion opportunities; health and safety issues and the availability of alternative employment (Nettle, et al., 2011).

Eighty eight percent of farmers said that they plan to utilise new practices/technologies over the next three years to help better manage workload on their farms, with the most common options being adding additional winter accommodation, improved use of grass and sale of surplus stock. The fact that improved use of grass has appeared as a top result also in practices utilised over the past three years indicates farmers are aware of the benefits of utilising more grass on their farms and feel that this is directly related to reducing their workload on the farm. Teagasc launched a multi-year campaign (2017-2020) called Grass10 to increase grass utilisation on Irish livestock farms (Teagasc, 2017), and this initiative may be a way to help farmers achieve their goals of utilising more grass, which they also feel will reduce their workload.

In addressing the third research question which looked at whether there are relationships between farm characteristics and the practices/technologies utilised to aid workload management on farms, the use of contractors for major jobs on the farm was very high in the region, but the study found no correlation between higher contractor use and reduced working

hours by farmers. Generally if machinery running costs are high, contractor costs should be low. There could be a consideration for analysing the related costs of machinery and the scale of business, however, this study looked solely at the machinery running costs in comparison to contractor costs as these directly related to the level of machinery work completed on the farm. This indicates whether work was being completed by the farmer/farm workers or by a contractor. This is an important finding as it could indicate that these farmers were very aware of the benefits of utilising contractors for certain farm tasks (spreading fertiliser and slurry etc.) as a method of reducing the workload on the farm. Findings from a labour efficiency study in Teagasc Moorepark (Deming, 2017) indicates that on an average 200 dairy cow farm some 55% of total machinery work on the most labour efficient dairy farms was completed by the farmer and 45% completed by a contractor. In contrast, on the least labour efficient farms, 85% of all machinery work was completed by the farmer and 15% completed by a contractor (Deming, 2017).

It is also noteworthy that there were very few statistically significant relationships between the practices utilised (and planned to be utilised) on farms to help reduce workload management and the key farm characteristics tested (whole farm stocking rate, milk solids produced, six week calving rate and labour bill). It was particularly notable that there was a statistically significant relationship between the sale of surplus stock or having switched to a single farm enterprise in the past three years and having a higher labour bill. This could indicate that these farmers have become more focused on their dairy enterprise through increased cow numbers in light of the sale of surplus stock and switching to the single dairy enterprise. With this increase in cow numbers, the need for additional labour is greater. Another important finding was that those who plan to improve their herd fertility over the next three years had on average a lower six week calving rate than those who did not plan to improve their herd fertility. However, this was not statistically significant. This finding is noteworthy because in order to increase their six week calving rate, farmers need to improve their herd fertility. One hundred percent of farmers also stated that they wanted their herd EBI to increase by 2020. These findings could indicate that the farmers are very aware of the benefits of improving their herd fertility, which will in turn improve their six week calving rate and they think this will make their workload more manageable.

In addressing the fourth research question which was what supports dairy farmers think are required from advisory services to help address their workload management challenges, 75% of farmers were happy that they had adequate advisory support from Teagasc in the area of workload management. Overall farmers were very happy with services they received from Teagasc but improvements can be made in workload management assistance with several

ideas suggested by the farmers including- a specialist HR advisor in Teagasc, discussion group activities in relation to workload management and HR as well as the possibility of reducing their own advisors' client lists so they have more time for each client to deal with these issues. Studies from Australia have shown favourable results in terms of discussing employment relationships as part of discussion groups to aid the development of a framework that supports improvement in employment relationships on farms (Nettle, et al., 2006).

Project Limitations

This study was completed as a dissertation as part of a postgraduate study programme, meaning time and scale limited its scope. With less time constraints, a follow up project on a provincial or national scale could potentially produce extremely beneficial guidance for the improvement of Teagasc Advisory Services in terms of workload and labour management for dairy farmers. The timeframe of the project meant surveys were posted to farmers in late Spring, just after the busy calving period and the beginning of the breeding season which may have skewed some findings of the study.

Conclusion

The starting point for this paper was that despite the body of research that has been completed, and some that is on-going, in the area of labour efficiency on Irish dairy farms, there may be a disconnect between the research and farmers' perceptions of labour efficiency and workload management on their farms. This study aimed to address that disconnect and it identified that dairy farmers continue to implement a wide range of practices/technologies to address workload management on their farms.It also noted that farmers themselves are aware of the need to address their own workload management practices before hiring in additional labour. Despite the rapid increase in dairy expansion and prevalent 'labour issue' commonly spoken about in the media, it is noteworthy that the majority of farmers who took part in this study did not actually intend to hire labour in 2017. This study has shown that many farmers perceive that they are currently managing their workload well and when looking towards farm expansion, consider management of workload a hugely important factor. That said, the research indicated that Teagasc should review its workload management advisory service to ensure that its advisors have the time and resources available to them to provide the level of service expected by clients in the areas of workload and human resource management.

In order to build on the lessons learned in this study, there is scope for Teagasc to complete similar studies in other advisory regions or at a national level. The attitudes of dairy farmers in this study do not necessarily represent all dairy farmers' attitudes towards workload and human resource management on their farms, or the type of services they feel would help them with their labour challenges. In building on the findings from this study, there is potential to research the connection between farmers who think they need to hire additional labour and subsequent follow through in actually hiring labour. From the analysis of dairy farmers' attitudes in this study, it is recommended that Teagasc review their services to their dairy clients through:

- An increased focus on workload and labour management in pre-established discussion groups.
- The hiring of a HR specialist advisor who would be available to advisors and their clients on request.
- By reducing the workload/client list of advisors to ensure all advisors have more time to spend with each of their clients, resulting in a more focused approach to workload and labour management between advisors and their clients.

The key message is that there is a lot being done on dairy farms to improve workload management, but there is a lot still to be done and Teagasc need to assess and tailor their services to help facilitate this widespread improvement in workload management on dairy farms.

Bibliography

Avolio, G., Blasi, E., Cicatiello, C. & Franco, S., 2014. The drivers of innovation diffusion in agriculture: evidence from Italian census data. *Journal on Chain and Network Science ,* 14(3), pp. 231-245.

Azjen, I., 1991. The Theory of Planned Bahavior. *Organisational Behavior and Human Decision Making Processes,* Volume 50, pp. 179-211.

Beecher, M., 2017. *Training the next generation of dairy farmers.* Moorepark, Fermoy, Co Cork, Teagasc, Animal & Grassland Research & Innovation Cetre, Moorepark.

Bryman, A., 2012. *Social Research Methods.* Fourth ed. New York: Oxford University Press.

DAFM, 2015. *FoodWise 2025: A 10-year vision for the Irish agri-food industry.,* Dublin, Ireland: Department of Agriculture, Food & the Marine.

Deming, J., 2017. *Labour Efficiency Workshop: Teagasc Labour Conference.* Moorepark: Teagasc.

Dillon, E., Moran, B. & and Donnelan, T., 2017. *Teagasc National Farm Survey Results 2016 - Demographic Data by System of Farming (All farms),* Athenry, Co Galway: Teagasc.

Dillon, P. et al., 2016. *Irish Dairying: Well Positioned for the Upturn.* Cork, National Dairy Conference Teagasc.

Gündüz, E. O. B. a. O., 2011. An investigation on computer and internet use for agricultural development in rural areas: A case study for Tokat Province in Turkey. *African Journal of Biotechnology,* 10(56), pp. 11879-11886.

Heanue, K. & O'Donoghue, C., 2014. *The Economic Returns to,* Athenry: Teagasc.

Heffernan, D. N., 2017. *Efficient work practices; A people perspective.* Moorepark, Co Cork, Teagasc Animal & Grassland Research & Innovation Centre, Moorepark.

Hemme, T., Uddin, M. M. && Ndambi, O. A., 2014. Benchmarking Cost of Milk Production in 46 Countries. *Journal of Reviews on Global Economics,* Volume 3, pp. 254 - 270.

Kelly, P. et al., 2017. *The People in Dairy Project,* Moorepark: Teagasc.

Läpple, D., Renwick, A. & Thorne, F., 2015. Measuring and understanding the drivers of agricultural innovation: Evidence from Ireland. *Food Policy: economics planning and politics of food and agriculture,* Volume 51, pp. 1-8.

Mangione, T., 1995. *Mail Surveys: Improving the Quality.* Valume 40 ed. Thousand Oaks: Sage.

Mofakkarul Islam, M., Renwick, A., Lamprinopoulou, C. & Klerkx, L., 2013. Innovation in Livestock Genetic Improvement. *EuroChoices,* 12(1), pp. 42-47.

Murdoch, J., 2000. Networks—a new paradigm of rural development?. *Journal of Rural Studies,* 16(4), pp. 407-419.

Nettle, R., Paine, M. & Petheram, J., 2006. Improving Employment Relationships: findings from learning interventions in farm employment. *New Zealand Journal of Employment Relations,* 31(1), pp. 17-36.

Nettle, R. et al., 2011. *Renention of people in dairy farming - what is working and why?,* Melbourne: University of Melbourne.

O'Brien, B. et al., 2015. *Labour Requirements on Dairy Farms - Moorepark Open Day.* Moorepark, Teagasc.

O'Brien, B. et al., 2007. Labour Demand and Supply on Irish Dairy Farms, with Reference to Specific Scale Dependant Work Routines. *Journal of Rural Enterprise and Management,* 3(2), pp. 33-44.

O'Donovan, K. et al., 2008. Labour Input on Irish Dairy Farms and the Effect of Scale and Seasonality`. *Jouranl of Farm Management,* 13(4), p. X.

Öhlmér, B., Olson, K. & Brehmer, B., 1998. Understanding farmers' decision making processes and improving managerial assistance. *Agricultural Economics,* 18(3), pp. 273-290.

O'Shea, J., Kavanagh, A. & Reid, P., 1988. Labour Use on Irish Dairy Farms. *Irish Grassland and Animal Production Association Journal,* Volume 22, pp. 112-120.

Ruane, D. J. & Phelan, J. F., 2001. *Making labour more attractive for Irish farms: a case study of South Tipperary in the Republic of Ireland.* Wageningen, Netherlands, Proceedings of the 15th ESSE Congress.

Teagasc, 2010. *Teagasc Dairy Manual - A Best Practice Manual for Ireland's Dairy Farmers.* 1 ed. Oakpark: Teagasc.

Teagasc, 2017. *Grass 10: Grassland Excellence for Irish Livestock.* [Online] Available at: https://www.teagasc.ie/crops/grassland/grass10/ [Accessed 29 August 2017].

Teagasc, 2017. *Teagasc Profit Monitor Analysis Dairy Farms 2016.* Moorepark, Co Cork: Teagasc Dairy Specialist Service.

Willock, J. et al., 1999. Farmers' attitudes, objectives, behaviors and personality traits: The Edinburgh study of decision making on farms. *Journal of Vocational Behavior,* 54(1), pp. 5-36.

Appendix 1: Farmer Survey Information Letter

May 2017

Dear

My name is Ellen Standish. I am a student on the UCD/Teagasc Walsh Fellowship Masters in Agricultural Extension & Innovation Programme, based in the Teagasc Advisory Office in Moorepark. As part of my Master's programme I am both working with the Teagasc Advisory team at the Moorepark Office and also undertaking a research study entitled: **"Dairy farmers' attitudes towards management of workload on their farms: The case of dairy discussion group clients in the Teagasc Moorepark Advisory Office catchment "**.

I am writing to ask you to participate in this study which aims to give an insight into local dairy farmers' view of their own workload management on their farms, their plans for the future in terms of improving workload management, and what supports they feel are required from advisory services to help address the workload management challenge. Participating involves completing the attached questionnaire and returning it to the Teagasc office in Moorepark using the enclosed **FREEPOST** envelope before **Friday May 2017**.

Note, your participation is voluntary and you do not need to specify your name at any point on this questionnaire. Information provided in your completed questionnaire will be added to your 2016 eProfit Monitor report & ICBF data. **All of your data will remain anonymous**. By returning this completed questionnaire to me, you are consenting to your participation in this project and to use of data from your 2016 eProfit Monitor & ICBF data.

I believe the findings of this research will be of great value to Teagasc and their clients as it will give a direct insight into farmers' views and intentions on their labour needs and thresholds, and will help to enhance services provided by Teagasc in the area of workload management. Findings of this research will be provided to all participants and to other Teagasc dairy clients in the form of a summary report.**If you have any questions or comments please contact me at the office in Moorepark at 076 111 2818**. Thank you for your assistance with this project.

Kind regards,

Ellen Standish

QUESTIONNAIRE NO.: _____

The title of the research is:

"Dairy farmers' attitudes towards management of workload on their farms: The case of dairy discussion group clients in the Teagasc Moorepark Advisory Office catchment"

Research Questionnaire is part of a thesis for M.Agr.Sc Agricultural Extension & Innovation in association with UCD/Teagasc Walsh Fellowships Programme

Student/Researcher: Ellen Standish

This questionnaire is for completion by farmers by postal survey

All information given will be treated confidentially -

Your responses to this questionnaire are anonymous to all but the researcher and any findings will not be linked to any individual

PART ONE – BACKGROUND

1. **How many years have you been farming?**

   _____years

2. **Are you farming full-time or part-time? Please tick √ your answer:**

Full Time	
Part Time	

3. **What age are you?**

   _____

4. **Have you received any formal agricultural education? Please tick √ your answer:**

YES		*If YES please answer part (A) below*
NO		*If NO, please go to QUESTION 5*

   a) **If YES, which of the below best describes your highest level of agricultural education? Please tick √ your answer:**

Level 5 – Certificate in Agriculture	
Level 6 – Advanced Certificate in Agriculture	
Level 6 – Teagasc Distance Education Green Cert	
Level 7 – Higher Certificate in Agriculture	
Level 7 – Teagasc Professional Diploma in Dairy Farm Management	
Level 8 – BSc in Agricultural Science	
Level 9 – Masters in Agricultural Science	

PART TWO - WORKLOAD MANAGEMENT ON YOUR FARM

5. **On average across the year in 2016, how many HOURS PER WEEK did you work on the farm?**

    _____hours per week

6. **How many, if any of the following people (excluding contractors) worked on the farm in 2016? On average across the year in 2016, how many HOURS PER WEEK did they contribute to the farm?**

	How many	Approx. hours/week contributed
Spouse/Partner		
Parents		
Children		
Hired labour unit		
Other (please specify below)		

    _____

7. **It is now Spring 2017. On average, roughly how many HOURS PER DAY or HOURS PER WEEK are spent on each of the following activities:**

Activity	Hours
Milking Cows (moving, milking, cleaning etc.)	/day
Stock management (calving, rearing calves, animal health)	/day
Feeding cows/heifers	/day
Grassland management (measurement/ slurry/ fertiliser)	/week
Paperwork & financial management	/week
Off farm activities (Mart, discussion group etc.)	/week
Cleaning/repairs/maintenance	/week
Working with other enterprises on the farm	/week

8. Have you utilised new practices and/or technologies to help you manage the workload on your farm? Please tick √ your answer:

YES		*If YES please answer part (A) below*
NO		*If NO, please go to part (B) below*

A. If YES, from the list below select the top three practices or technologies that have most helped with workload management on your farm over the past three years. Please identify your top three, with 1 = most helpful, 2 = second most helpful & 3 = third most helpful:

Additional labour units (full or part time)	
Contract rearing heifers	
Sale of surplus stock	
Contractor for slurry/fertiliser/silage etc.	
Switching to a single farm enterprise	
Improved use of grass	
Improving grazing infrastructure (gates/ fencing/ extra handles/ roads)	
Use of PastureBase Ireland/ AgriNet	
Paperwork management software e.g. Herdwatch	
Additional calving facilities/ calf accommodation	
Preparation & planning ahead of calving season	
Automatic calf feeders/ milk buckets/ milk trolleys etc.	
Additional winter accommodation	
Fertility/ improving the six week calving rate	
Discussion group membership (knowledge)	
Upgrading milking parlour (new or extra units, ACRs)	
Handling facilities – drafting, collecting yard	
Once a day milking	
Quad bike	
Replacing tractor or car/jeep	
Other (please specify below)	

B. If NO, why have you not used new practices or technologies to improve workload on the farm? Please tick √ your answer:

Too expensive to implement on the farm	
Too difficult to implement on the farm	
Requires the use of a computer or smartphone	
Just haven't considered it	
No need	
Other (please specify below)	

_____

9. **Compared to 2016, do you think you will need extra hired labour on your farm in 2017? Please tick √ your answer:**

Yes –Require a Full Time person	Yes –Require a Part Time person	No – do not need extra labour	Unsure

A. If YES, do you think if you had implemented new practices and/or technologies to help you manage your workload, would this labour unit be required? Please tick √ your answer:

YES		*If YES please answer part (B)&(C) below*
NO		*If NO, please go to QUESTION 10*

B. If YES, do you intend to hire any extra labour unit on your farm? Please tick √ your answer:

Yes	
No	

C. If YES, how much would you be willing to pay this labour unit per day?

€70 or less	€71-90	€91-110	€111 - 130	€131-150	€151 or more

Other _____

10. In your experience, is it possible to easily hire a labour unit when required? Please tick √ your answer:

Yes	
No	

11. What qualities do you look for in a person when looking to hire someone to work on the farm? Please identify only your top three qualities: with 1 = most important quality, 2 = second most important quality and 3 = third most important quality:

Good work ethic	
From a farming background	
Knowledge of farm work	
Experience of farm work	
Agricultural qualification	
Good references	
Full driving license	
Other (please specify below)	

_____

12. Where do you look to source potential employees when looking to hire someone to work on the farm? Please tick √ your answer:

Farm Relief Service	
Students	
Neighbours	
Relations	
Word of mouth	
Newspaper adverts	
Radio adverts	
Social media	
Other (please specify below)	

_____

PART THREE – FUTURE PLANS FOR YOUR FARM

13. **Do you have plans to implement new practices or technologies within the next three years to improve the management of workload on your farm? Please tick √ your answer:**

YES		*If YES please answer (A) below.*
NO		*If NO, please go to (B)*

A. **If YES, from the list below select the top three practices or technologies that you plan to implement over the next three years on your farm? Please identify your top three, with 1 = main practice/technology to implement, 2 = second practice/technology to implement & 3 = third practice/technology to implement,:**

Additional labour units (full or part time)	
Contract rearing heifers	
Sale of surplus stock – bull calves etc.	
Contractor for slurry/fertiliser/silage etc.	
Switching to a single farm enterprise	
Improved use of grass	
Improving grazing infrastructure (gates/ fencing/ extra handles/ roads)	
Use of PastureBase Ireland/ AgriNet	
Paperwork management software e.g. Herdwatch	
Preparation & planning ahead of calving season	
Automatic calf feeders	
Additional winter accommodation	
Fertility/ improving the six week calving rate	
Discussion group membership (knowledge)	
Upgrading milking parlour (new or extra units, ACRs)	
Handling facilities – drafting, collecting yard	
Once a day milking	
Quad bike	
Replacing tractor or car/jeep	
Other (please specify below)	

_____

B. If NO, why do you not want to use any new practices or technologies to improve workload on the farm? Please tick √ your answer:

Too expensive to implement on the farm	
Too difficult to implement on the farm	
Requires the use of a computer or smartphone	
Just haven't considered it	
No need	
Other (please specify below)	

_____

14. Indicate on the tables below whether by 2020 (compared to now) you want the following characteristics of your farm to remain the same, increase or decrease. Please tick √ your answer:

	Increase by 2020	Decrease by 2020	Remain the same
Cow numbers			

	Increase by 2020	Decrease by 2020	Remain the same
Farm Size (Ha)			

	Increase by 2020	Decrease by 2020	Remain the same
EBI of the dairy herd			

	Increase by 2020	Decrease by 2020	Remain the same
Milk Yield			

	Increase by 2020	Decrease by 2020	Remain the same
Length of your working day			

PART FOUR – INDUSTRY & ADVISORY SUPPORTS

15. Do you think you have adequate support on management of workload from your advisory services? Please tick √ your answer:

Yes	
No	

16. From the below list please select the most important sources of information and advice on better workload management on your farm? Please identify your top three, with 1 = main source, 2 = second source & 3 = third source:

Department of Agriculture, Food & the Marine	
Teagasc documents/website	
Agricultural advisor	
Discussion groups	
Irish Farmers Journal/ Farming Independent	
TV and radio programmes	
Social media e.g. Twitter, Facebook	
Other farmers	
I can't find other information	
Other (please specify below)	

_____

This questionnaire is now complete. Thank you for taking the time to participate in this study. Please return questionnaire to me at your upcoming discussion group meeting or to the Teagasc Moorepark Advisory Office.

QUESTIONNAIRE NO: **.**

SECONDARY DATA FOR 2016	UNIT	SOURCE	FIGURE
System of production	*Spring/ Winter Milk*	*eProfit Monitor*	
Farm size	*Ha*	*eProfit Monitor*	
Total livestock units	*LU*	*eProfit Monitor*	
Dairy cow numbers	*Numbers*	*eProfit Monitor*	
Whole farm stocking rate	*LU/Ha*	*eProfit Monitor*	
Milking platform stocking rate	*LU/Ha*	*eProfit Monitor*	
Milk produced	*Litres/cow*	*eProfit Monitor*	
Milk solids	*Kg/cow*	*ICBF*	
Six week calving rate	*%*	*ICBF*	
Total labour bill	*Whole Farm Total €*	*eProfit Monitor*	
Unpaid labour hours	*Hours*	*eProfit Monitor*	
Contractor costs	*Whole farm Total €*	*eProfit Monitor*	
Machinery costs	*Whole farm Total €*	*eProfit Monitor*	
Common Profit	*Dairy detailed €/cow*	*eProfit Monitor*	
Total Common Profit	*Dairy detailed €*	*eProfit Monitor*	

Appendix 4: The relationship between the most helpful practices/technologies utilised by respondents over the past three years and whole farm stocking rate (LU/Ha)

Practices/technologies utilised over past three years	Ranked in top three – Mean LU/ha (no. of respondents)	Not ranked in top three – Mean LU/ha (no. of respondents)	Significance - p value	Measure of association – eta value
Additional labour units	2.5 (17)	2.5 (34)	0.147 (NS)	0.206
Contract rearing heifers	3.0 (2)	2.4 (49)	0.440 (NS)	0.283
Sale of surplus stock	2.5 (5)	2.4 (46)	0.818 (NS)	0.033
Contractor for slurry/fertiliser/silage etc.	2.5 (14)	2.4 (37)	0.247 (NS)	0.165
Switching to a single farm enterprise	2.6 (4)	2.4 (47)	0.303 (NS)	0.147
Improved use of grass	2.3 (15)	2.5 (36)	0.314 (NS)	0.144
Improved grazing infrastructure	2.5 (4)	2.4 (47)	0.507 (NS)	0.095
Use of PastureBase Ireland/ AgriNet	2.3 (7)	2.4 (44)	0.364 (NS)	0.130
Paperwork management software	2.4 (7)	2.4 (44)	0.654 (NS)	0.064
Additional calving facilities/ calf accommodation	2.4 (12)	2.4 (39)	0.930 (NS)	0.013
Preparation & planning ahead of calving season	2.7 (9)	2.4 (42)	0.057 (NS)	0.269
Automatic calf feeders/ milk buckets/ milk trolleys	2.5 (4)	2.4 (47)	0.507 (NS)	0.950
Additional winter accommodation	2.2 (5)	2.4 (46)	0.266 (NS)	0.155
Fertility/ improving the six week calving rate	2.5 (8)	2.4 (43)	0.370 (NS)	0.128
Discussion group membership	2.1 (9)	2.5 (42)	0.024 **(S)**	0.316
Upgrading milking parlour	2.5 (9)	2.4 (43)	0.676 (NS)	0.060
Handling facilities	2.7 (4)	2.4 (47)	0.161 (NS)	0.199
Once a day milking	2.2 (1)	2.4 (50)	0.642 (NS)	0.067
Quad bike	2.2 (3)	2.4 (48)	0.323 (NS)	0.141
Replacing tractor or car/jeep	2.7 (2)	2.4 (49)	0.263 (NS)	0.160
Underpass for cows	2.3 (1)	2.4 (50)	0.754 (NS)	0.045

Note: (S) = statistically significant at P≤0.05, (NS) = not statistically significant at P≤0.05

Appendix 5: The relationship between the most common practices/technologies utilised by respondents over the past three years and milk solids produced (Kg/cow)

Practices/technologies utilised over the past three years	Ranked in top three – Mean Kg/cow (no. of respondents)	Not ranked in top three – Mean Kg/cow (no. of respondents)	Significance (p)	Measure of association (eta)
Additional labour units	450 (17	448 (34)	0.871 (NS)	0.023
Contract rearing heifers	451 (2)	449 (49)	0.947 (NS)	0.010
Sale of surplus stock	419 (5)	452 (46)	0.125 (NS)	0.218
Contractor for slurry/fertiliser/silage etc.	435 (14)	454 (37)	0.206 (NS)	0.180
Switching to a single farm enterprise	459 (4)	448 (47)	0.660 (NS)	0.063
Improved use of grass	448 (15)	449 (36)	0.965 (NS)	0.006
Improved grazing infrastructure	469 (4)	447 (47)	0.376 (NS)	0.127
Use of PastureBase Ireland/ AgriNet	434 (7)	451 (44)	0.353 (NS)	0.133
Paperwork management software	438 (7)	451 (44)	0.521 (NS)	0.092
Additional calving facilities/ calf accommodation	443 (12)	451 (39)	0.617 (NS)	0.072
Preparation & planning ahead of calving season	437 (9)	451 (42)	0.403 (NS)	0.120
Automatic calf feeders/ milk buckets/ milk trolleys	475 (12)	441 (39)	0.024 **(S)**	0.317
Additional winter accommodation	433 (5)	451 (46)	0.432 (NS)	0.133
Fertility/ improving the six week calving rate	444 (8)	450 (43)	0.770 (NS)	0.042
Discussion group membership	467 (9)	445 (42)	0.209 (NS)	0.179
Upgrading milking parlour	482 (9)	442 (42)	0.017 **(S)**	0.333
Handling facilities	439 (4)	450 (47)	0.654 (NS)	0.064
Once a day milking	426 (1)	449 (50)	0.623 (NS)	0.070
Quad bike	441 (3)	449 (48)	0.766 (NS)	0.043
Replacing tractor or car/jeep	447 (2)	449 (49)	0.955 (NS)	0.008
Underpass for cows	441 (1)	449 (50)	0.866 (NS)	0.024

<u>*Note*</u>*: (S) = statistically significant at P≤0.05, (NS) = not statistically significant at P≤0.05*

Practices/technologies utilised over the past three years	Ranked in top three – Mean % rate (no. of respondents)	Not ranked in top three – Mean % rate (no. of respondents)	Significance (p)	Measure of association (eta)
Additional labour units	75 (17)	77 (34)	0.529 (NS)	0.090
Contract rearing heifers	79 (2)	76 (49)	0.763 (NS)	0.043
Sale of surplus stock	75 (5)	77 (46)	0.715 (NS)	0.052
Contractor for slurry/fertiliser/silage etc.	74 (14)	77 (37)	0.295 (NS)	0.149
Switching to a single farm enterprise	86 (4)	76 (47)	0.046 **(S)**	0.280
Improved use of grass	76 (15)	77 (36)	0.669 (NS)	0.061
Improved grazing infrastructure	75 (4)	77 (47)	0.747 (NS)	0.046
Use of PastureBase Ireland/ AgriNet	80 (7)	76 (44)	0.276 (NS)	0.155
Paperwork management software	76 (7)	77 (44)	0.884 (NS)	0.021
Additional calving facilities/ calf accommodation	76 (12)	77 (39)	0.976 (NS)	0.004
Preparation & planning ahead of calving season	76 (9)	76 (42)	0.896 (NS)	0.019
Automatic calf feeders/ milk buckets/ milk trolleys	78 (12)	76 (39)	0.446 (NS)	0.109
Additional winter accommodation	68 (5)	77 (46)	0.033 **(S)**	0.299
Fertility/ improving the six week calving rate	80 (8)	76 (43)	0.293 (NS)	0.150
Discussion group membership	80 (9)	76 (42)	0.224 (NS)	0.173
Upgrading milking parlour	74 (9)	77 (42)	0.349 (NS)	0.134
Handling facilities	74 (4)	77 (47)	0.589 (NS)	0.078
Once a day milking	78 (1)	76 (50)	0.874 (NS)	0.023
Quad bike	71 (3)	77 (48)	0.276 (NS)	0.155
Replacing tractor or car/jeep	87 (2)	76 (49)	0.110 (NS)	0.227
Underpass for cows	82 (1)	76 (50)	0.562 (NS)	0.083

Note: (S) = statistically significant at P≤0.05, (NS) = not statistically significant at P≤0.05

Practices/technologies to be utilised over next three years	Ranked in top three – Mean LU/Ha (no. of respondents)	Not ranked in top three – Mean LU/Ha (no. of respondents)	Significance - p value	Measure of association - eta value
Additional labour units	2.6 (8)	2.4 (43)	0.182 (NS)	0.190
Contract rearing heifers	2.6 (3)	2.4 (48)	0.322 (NS)	0.141
Sale of surplus stock	2.5 (11)	2.4 (40)	0.240 (NS)	0.168
Contractor for slurry/fertiliser/silage etc.	2.6 (10)	2.4 (41)	0.094 (NS)	0.237
Switching to a single farm enterprise	2.3 (3)	2.4 (48)	0.600 (NS)	0.075
Improved use of grass	2.5 (12)	2.4 (39)	0.341 (NS)	0.136
Improved grazing infrastructure	2.4 (13)	2.4 (38)	0.689 (NS)	0.057
Use of PastureBase Ireland/ AgriNet	2.5 (5)	2.4 (46)	0.448 (NS)	0.109
Paperwork management software	2.3 (3)	2.4 (48)	0.463 (NS)	0.105
Preparation & planning ahead of calving season	2.5 (6)	2.4 (45)	0.415 (NS)	0.117
Automatic calf feeders/ milk buckets/ milk trolleys	2.5 (10)	2.4 (41)	0.344 (NS)	0.135
Additional winter accommodation	2.4 (14)	2.4 (37)	0.941 (NS)	0.011
Fertility/ improving the six week calving rate	2.2 (7)	2.4 (44)	0.216 (NS)	0.176
Discussion group membership	2.2 (1)	2.4 (50)	0.555 (NS)	0.085
Upgrading milking parlour	2.3 (9)	2.4 (42)	0.227 (NS)	0.172
Handling facilities	2.2 (9)	2.5 (42)	0.117 (NS)	0.222
Once a day milking	3.0 (1)	2.4 (50)	0.151 (NS)	0.204
Quad bike	2.5 (1)	2.4 (50)	0.830 (NS)	0.031
Automatic scrapers	2.2 (1)	2.4 (50)	0.642 (NS)	0.067
Replacing tractor or car/jeep	2.0 (1)	2.4 (50)	0.344 (NS)	0.135
Underpass for cows	2.5 (1)	2.4 (50)	0.909 (NS)	0.016
Robots	2.0 (1)	2.4 (50)	0.334 (NS)	0.135
Additional calving facilities/ calf accommodation	2.1 (1)	2.4 (50)	0.399 (NS)	0.121

Note: (S) = statistically significant at P≤0.05, (NS) = not statistically significant at P≤0.05

Appendix 8: The relationship between the most common practices/technologies planned to be utilised by respondents over the next three years and milk solids produced (Kg/cow)

Practices/technologies to be utilised over next three years	Ranked in top three – Mean Kg/cow (no. of respondents)	Not ranked in top three – Mean Kg/cow (no. of respondents)	Significance (p)	Measure of association (eta)
Additional labour units	437 (8)	451 (43)	0.451 (NS)	0.108
Contract rearing heifers	400 (3)	452 (48)	0.061 (NS)	0.265
Sale of surplus stock	469 (11)	443 (40)	0.097 (NS)	0.235
Contractor for slurry/fertiliser/silage etc.	470 (10)	444 (41)	0.109 (NS)	0.227
Switching to a single farm enterprise	433 (3)	450 (48)	0.555 (NS)	0.085
Improved use of grass	461 (12)	445 (39)	0.296 (NS)	0.149
Improved grazing infrastructure	456 (13)	446 (38)	0.515 (NS)	0.093
Use of PastureBase Ireland/ AgriNet	453 (5)	448 (46)	0.843 (NS)	0.028
Paperwork management software	464 (3)	448 (48)	0.573 (NS)	0.081
Preparation & planning ahead of calving season	441 (6)	450 (45)	0.663 (NS)	0.062
Automatic calf feeders/ milk buckets/ milk trolleys	422 (10)	455 (41)	0.037 **(S)**	0.294
Additional winter accommodation	445 (14)	450 (37)	0.699 (NS)	0.055
Fertility/ improving the six week calving rate	466 (7)	446 (44)	0.292 (NS)	0.151
Discussion group membership	439 (1)	449 (50)	0.832 (NS)	0.030
Upgrading milking parlour	441 (9)	450 (42)	0.602 (NS)	0.075
Handling facilities	462 (90	446 (42)	0.365 (NS)	0.129
Once a day milking	414 (1)	450 (50)	0.453 (NS)	0.107
Quad bike	435 (1)	449 (50)	0.766 (NS)	0.043
Automatic scrapers	426 (1)	449 (50)	0.623 (NS)	0.070
Replacing tractor or car/jeep	441 (1)	449 (50)	0.866 (NS)	0.024
Underpass for cows	457 (1)	449 (50)	0.861 (NS)	0.025
Robots	441 (1)	449 (50)	0.866 (NS)	0.024
Additional calving facilities/ calf accommodation	440 (1)	449 (50)	0.849 (NS)	0.027

__Note__: (S) = statistically significant at P≤0.05, (NS) = not statistically significant at P≤0.05

Appendix 9: The relationship between the most common practices/technologies planned to be utilised by respondents over the next three years and six week calving rate (%)

Practices/technologies to be utilised over next three years	Ranked in top three – Mean % rate (no. of respondents)	Not ranked in top three – % rate (no. of respondents)	Significance (p)	Measure of association (eta)
Additional labour units	74 (8)	77 (43)	0.447 (NS)	0.109
Contract rearing heifers	67 (3)	77 (48)	0.063 (NS)	0.262
Sale of surplus stock	77 (11)	76 (40)	0.733 (NS)	0.049
Contractor for slurry/fertiliser/silage etc.	79 (10)	76 (41)	0.416 (NS)	0.116
Switching to a single farm enterprise	80 (3)	76 (48)	0.554 (NS)	0.085
Improved use of grass	79 (12)	76 (39)	0.224 (NS)	0.173
Improved grazing infrastructure	78 (13)	76 (38)	0.428 (NS)	0.113
Use of PastureBase Ireland/ AgriNet	71 (5)	77 (46)	0.174 (NS)	0.193
Paperwork management software	79 (3)	76 (48)	0.686 (NS)	0.058
Preparation & planning ahead of calving season	80 (6)	76 (45)	0.316 (NS)	0.143
Automatic calf feeders/ milk buckets/ milk trolleys	75 (10)	77 (41)	0.534 (NS)	0.089
Additional winter accommodation	79 (14)	76 (37)	0.248 (NS)	0.165
Fertility/ improving the six week calving rate	71 (7)	77 (44)	0.082 (NS)	0.246
Discussion group membership	65 (1)	77 (50)	0.224 (NS)	0.173
Upgrading milking parlour	77 (9)	77 (42)	0.982 (NS)	0.003
Handling facilities	79 (9)	76 (42)	0.453 (NS)	0.108
Once a day milking	77 (1)	76 (50)	0.957 (NS)	0.008
Quad bike	68 (1)	77 (50)	0.370 (NS)	0.128
Automatic scrapers	78 (1)	77 (50)	0.874 (NS)	0.023
Replacing tractor or car/jeep	73 (1)	77 (50)	0.714 (NS)	0.053
Underpass for cows	83 (1)	76 (50)	0.493 (NS)	0.098
Robots	73 (1)	77 (50)	0.714 (NS)	0.053
Additional calving facilities/ calf accommodation	80 (1)	76 (50)	0.712 (NS)	0.053

Note: (S) = statistically significant at P≤0.05, (NS) = not statistically significant at P≤0.05