“Measuring the benefits of discussion groups for tillage farmers - has the adoption of recording components of yield impacted on crop husbandry practices?”

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

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DECLARATION

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.

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Common Agricultural Policy (CAP)

Department of Agriculture, Food and Marine (DAFM)

Knowledge Transfer discussion group scheme (KT)

Farm Improvement Plan (FIP)

Dairy Efficiency Programme (DEP)

Beef Technology Adoption Programme (BTAP)

Sheep Technology Adoption Programme (STAP)

Central Statistics Office (CSO)

National Farm Survey (NFS)

Discussion Group (DG)

Hectares (Ha)

eProfit Monitor (ePM)

THESIS ABSTRACT

Purpose: This study provides insight into the drivers of performance of Teagasc tillage discussion groups, comparing the farmers' expectations of discussion group membership to their actual experiences and unveiling how the information provided at discussion groups is being used on farm. The study looks at how a scheme can impact the adoption of good farming practices, in particular recording components of yield by investigating farmers' perception of the task and the benefits of carrying it out. The findings provide recommendations to help utilise such an extension method to its full potential by using farmers' experiences and opinions to help further improve the productivity, profitability and sustainability of the tillage sector in Ireland.

Research design: The study was carried out with tillage farmers in County Cork who participate in Teagasc Tillage discussion groups. Data was collected by surveying the farmers at one of their monthly discussion group meetings and using quantitative data from farmers' 2016 and 2017 eProfit Monitors and plant count figures provided for the KT programme in 2017 and 2018.

Findings: The research population is heavily represented by an older age demographic with 40% found to be over the age of 57. These farmers have been involved in farming for a long time (20 years +) with an average farm size of 88.2ha and 56% of whom have been in a discussion group for more than 15 years. While 11 respondents joined a discussion group at the introduction of the KT scheme it appeared that payment was the motive for only 2 members. The main motivating factor encouraging farmers to join a discussion group was the desire to gain up to date knowledge and information from other farmers in a discussion group situation (58.2%). The study unveiled that peer-to-peer learning was a key element to the success of these discussion groups and the social aspect of partaking in a discussion group was very important to all of them. The introduction of the KT scheme was found to have some level of a positive impact of adoption of crop management and financial management practices as 66% of those completing plant counts were using the information that the practice provided them.

Practical implications: This study provides a clear understanding of what these farmers want from extension programmes such as discussion groups and enables organisations such as Teagasc advisory services to further enhance their delivery of this extension method to better satisfy the needs of their clients.

1. INTRODUCTION

1.1. Background to the study

Teagasc is a national body, the Agriculture and Food Development Authority responsible for providing advisory services and research to the agriculture and food industry in Ireland through three directorates which include research, operations and knowledge transfer[1]. Discussion groups fall under the knowledge transfer directorate and are now used as a key method for Teagasc to disseminate knowledge to farmers. Explicit and indigenous knowledge is shared using this method as advisors are informing the members of the most recent scientific findings from the research side of the organisation and members are also exposed to unique socio-cultural environments in each specific group, providing them with an opportunity to learn from each other. Food Harvest 2020 outlines that discussion groups play a crucial role in achieving improved technical and financial knowledge leading to optimised efficiency and improved performance (DAFM, 2010). Under the Rural Development funding from the Common Agricultural Policy (CAP) the Department of Agriculture, Food and Marine (DAFM) launched a Knowledge Transfer discussion group scheme which began in 2016 (DAFM, 2016). As part of this scheme Teagasc assigns a trained advisor to facilitate each discussion group of their clients involved in the scheme. The farmers that signed up to these discussion groups are required to attended a minimum of 5 meetings during the year and complete a number of tasks outlined by DAFM and they receive a maximum payment of €750 each, annually for the three years of the scheme (DAFM, 2016). Teagasc advisors must assist farmers with the completion of these tasks and then submit a Farm Improvement Plan (FIP) with recommendations for each group member annually (DAFM, 2016). Teagasc also receive a payment from DAFM for the number of clients that successfully participate in the discussion groups and that have a completed FIP submitted annually.

According to the National Farm Survey (NFS) there were 7,387 tillage farmers recorded in Ireland in 2016 with an average farm size of 61 hectares and 33 hectares dedicated to cereals (Dillon, et al., 2016). While it may be a small sector in size it makes a very important contribution to Irish agriculture and the economy. Two-thirds of the grain that is produced in Ireland is used for animal feed and the remainder is used as a valuable raw material for

[1] Teagasc Agriculture and Food Development Authority https://www.teagasc.ie/

Ireland's brewing, distilling and flour milling industries (Food Harvest 2020). The three main cereals produced in Ireland are barley, wheat and oats and while overall production of these cereals increased by 82,000 tonnes to 2,393,000 tonnes in 2017 due to an increase in overall yield of 6.8% (to 8.8 tonnes per hectare) we are only 80% self-sufficient in grain in Ireland. This suggests that there are opportunities for Irish cereal growers to increase production however the total area under cereal production decreased by 3% from 2016 to 2017 (CSO) (-8,700 hectares to 271,700 hectares) (Dillon, et al., 2016). This is mainly as a result of the expansion of the dairy industry leading to a high demand for land, tilled land going back into grass or tillage farmers converting to dairy.

Tillage farmers today face many challenges such as price volatility and particularly climatic and disease issues. They are also placed at a disadvantaged compared to our competitors due to the competitive pressures they are subject to such as cost of rented land, small scale holdings, land fragmentation and high input costs (Food Harvest 2020). Even though it is a very challenging industry for growers they still remain viable, on average tillage farms were the enterprise to earn the second highest income per hectare in 2017 of €607/ha following dairy with €1530/ha (Dillon, et al., 2016). While there may be a significant difference between the incomes of the dairy and tillage enterprises, tillage farming still remains more profitable than cattle or sheep enterprises at €322 and €451/ha respectively (Dillon, et al., 2016). The average tillage farm income increased by 20% in 2017 to €37,158 compared to 2016 figures (Dillon, et al., 2016). There was a 30% increase in the number of tillage farms reported to have earned over €50,000 in 2017, with over 50% of tillage farms earning more than €20,000, this shows a significant decrease in the number of tillage farms in the lower income categories in 2017 (Dillon, et al., 2016).

FoodWise 2025 sets out targets for the tillage industry to continue developing over the next number of years. Such targets include improving sustainability and reducing costs of production through the use of good farming techniques, while also increasing output of wheat and feed barley and the production of forage crops to meet the demands of the livestock sector and increasing cropped area of malting barley and wheat to meet the demands of distillers, maltsters and brewers (DAFM, 2015). Food Harvest 2020 also recommends to develop markets and improve sustainability to overcome EU pesticide regulations, but to also consider growing a greater acreage of winter crops as they are higher yielding and crops such as beans, peas, oilseed etc. to increase overall farm return per hectare (DAFM, 2010).

While there are many challenges for this agricultural enterprise there is still a positive outlook, the number of farmers and land growing cereals is reducing however 55% of tillage farmers in the south of Ireland were said to be viable according to the 2017 National Farm Survey. It is important that tillage farmers continue to receive support in overcoming all of these challenges they face in order to ensure the success and viability of the enterprise long into the future as any further reduction in cereal production would not only impact the economy and our food and drink industry directly but would have a negative impact on other agricultural enterprises also. This is important to remember after this year where tillage farmers have done their part to help drystock and dairy farmers build fodder stocks for the winter of 2018 by whole cropping wheat and barley and setting forage crops instead of winter crops in some cases.

1.2. Research Problem

The adoption of innovation plays a critical role in achieving sustainability and efficiency in the agricultural industry today. Adoption of new technologies and farm management systems by Irish farmers was described in Food Harvest 2020 as being relatively low to date in Ireland and innovation "will only contribute adequately to a globally sustainable Irish agri-food and bio economy sector" (DAFM, 2010) if the rate of adoption improves. More emphasis must be placed on agricultural education and extension services in order to improve farmers' skills and knowledge as food producers. Discussion groups are one of the main extension vehicles which Teagasc now use to disseminate information to farmers in order to foster adoption of innovations and enable farmers to improve their systems of production. In order to maximise the value of discussion groups and to continue to influence the farming industry Teagasc must gain an insight into how discussion groups work on the ground, the variety of groups out there and what farmers' views are on the topic.

There have been studies carried out in recent years on the benefits of discussion groups for dairy (Teagasc, 2013; Prager & Creaney, 2017) and beef farmers (Teagasc, 2014; Daniel et al, 2016), research has not been completed to analyse the benefits of discussion groups for tillage farmers in an Irish context however it has been completed in other countries such as France (Compagnone & Hellec, 2015). With the introduction of the Knowledge Transfer (KT) scheme in 2016 there is now an opportunity and data available to analyse how involvement in discussion groups has impacted tillage farmers' uptake of information and adoption of innovations but also their attitude and behaviour. This study is not an evaluation

on the Knowledge Transfer scheme per se; it is an evaluation of the Teagasc Tillage Discussion Group programme involving the delivery of the Knowledge Transfer programme.

Recording components of yield and plant count data for crops is extremely beneficial for crop husbandry but is thought to not be widely practiced yet. It was made a mandatory task within the KT scheme to complete. As it is a requirement rather that a voluntary practice, it would be beneficial for Teagasc advisors to understand whether the adoption of this mandatory practice has brought about other desired changes in crop husbandry practices.

1.3. Research Questions

The four main research questions of the study are as follows:

> How has involvement in a Teagasc tillage discussion group impacted the farmers' knowledge, attitude and behaviour in relation to tillage farming?
>
> What do group members feel are the benefits of taking part in a discussion group and how has discussion group membership met with their expectations?
>
> What would improve the delivery of a discussion group, from the farmers' perspective - is it stimulating enough for them?
>
> Has membership in a tillage discussion group motivated these farmers to review and change their crop husbandry practices in order to improve crop yield and profit? In particular has making recording components of yield a requirement of the KT scheme impacted adoption of the practice?

1.4. Research Objectives

The objective of this study is to provide insight into the drivers of performance of Teagasc tillage discussion groups in Co. Cork, comparing the farmers' expectations of discussion group membership to their actual experiences and unveiling how the information provided at discussion groups is being used on farm. The study aims to look at how a scheme can impact the adoption of good farming practices, in particular recording components of yields through counting plants and tillers after crop establishment by investigating farmers' perception of the task and the benefits of carrying it out. The findings should provide Teagasc tillage advisors with recommendations on how tillage discussion groups can develop with the help of the KT scheme.

1.5. Limitations

The study is carried out on discussion group members who are all involved in the KT scheme and are 2 years into a 3 year programme. Analysis of the groups before joining KT would have been beneficial rather than asking members to recall actions prior to joining KT. The research population is a group of tillage farmers partaking in KT groups in Cork only and who are only Teagasc clients which is not a fair representation of all tillage farmers in discussion groups. The research population also only consists of the discussion group members who attended that particular discussion group meeting and who would be considered to be regular attendees and did not include the members who attend less frequently.

1.6. Utility of Study

The findings of the study can be used by Teagasc advisors on the ground to help them utilise such an extension method to its full potential by drawing on farmers' experiences and opinions to help further improve the productivity, profitability and sustainability of the tillage sector in Ireland. Teagasc can use the outcomes and recommendations of this study when developing future knowledge transfer programmes.

2. LITERATURE REVIEW

In order to understand the research questions the researcher examined studies previously completed relating to discussion groups, focusing on themes such as the benefits of discussion groups, farmers' learning and practice change and the impact of government funded extension programmes and how these themes are linked to Teagasc tillage discussion groups which are under evaluation.

2.1. The Benefits of Discussion Groups as an Agricultural Extension Method.

Agricultural extension programmes aim to improve productivity on farm and promote new technologies through a variety of methods such as training courses, demonstrations, one-to-one consultations and discussion groups (Evenson, 2001; Romani, 2003). Such programmes create a link between researchers, agricultural advisors and farmers (Birkaeuser, et al., 1991). Agricultural extension methods such as discussion groups can have a varying impact on farm performance due to regional effects and farmer characteristics (Läpple, et al., 2012). As a participatory extension method, discussion groups have become one of the most popular approaches to transferring knowledge in Ireland since they were first introduced in the 1980s (Byrne, 1997). The discussion group methodology is defined by Davis et al (2011) as a participatory extension method as it is facilitated by an extension advisor rather than being treated as a training course by an instructor. Farmers are required to interact with each other and improve their problem solving abilities by developing their management and decision-making skills.

It is expected that economic return is the most significant benefit of participating in a discussion group. Lapple et al (2012) stated that "Membership in a discussion group has the potential to significantly improve farm income", they found that there is a return to discussion group membership for farmers in their gross margin, however it is expected that the return can vary among farmers due to the quality of discussion groups and personal characteristics. In an endogenous switching regression analysis to quantify the economic return to participatory extension programmes in Ireland, Lapple et al (2012) found that farmers who choose to participate in a discussion group have above average gross margins and farmers who choose not to participate are not better or worse off than an average farmer. Information and technology transferred at discussion groups has the ability to enable members to be more productive on poorer quality soils especially. Findings from the

literature suggests that farmers who have participated in a discussion group for a long period of time regardless of incentives such as annual payment achieve higher gross margins (Läpple, et al., 2012), so increasing the number of farmers in discussion groups and ensuring they remain members of the groups for many years may help the Irish tillage sector become more profitable. Hennessy and Heanue (2012) discovered in their study of the effect of discussion group membership on technology adoption and farm profit on dairy farms that farmers participating in discussion groups are more likely to adopt new technologies and best practice and this can also be the contributing factor to higher farm profits.

Farmers who join discussion groups for financial reward may not benefit as much from discussion group membership as someone who joined voluntarily for knowledge, as their motives are very different (Läpple, et al., 2012) and this may be the case with some of the new members who joined discussion groups as part of the KT scheme in Ireland in 2016. In the past enterprises such as dairy, beef and sheep were given the opportunity to avail of schemes aimed at increasing the involvement in discussion groups. Much like the current Knowledge Transfer Scheme these farmers were given the opportunity to join a discussion group with the incentive of having the service funded by the government and to receive a payment for attending meetings and completing relevant tasks. In 2009 DAFM launched the 'Dairy Efficiency Programme' providing €18 million of a financial support to dairy farmers for membership in a participatory based extension programme from 2010 to 2012 (DAFM, 2009). Similarly in 2012 DAFM launched the 'Beef Technology Adoption Programme' providing funding of €15 million over a three year programme with the aim of encouraging adoption of best management on beef farms in Ireland (Teagasc, 2012), followed by the 'Sheep Technology Adoption Programme' version for sheep farmers in 2013. Participatory extension programme schemes such as these were never applicable to specialised tillage farmers in Ireland until the introduction of the KT scheme in 2016. So the motives of farmers who joined discussion groups for this scheme could be questionable compared to the tillage farmers who have been in discussion groups over the last number of years in the absence of financial incentives funded by the government.

In the study completed by Lapple et al, (2012) it was found that age was not of significance to discussion group membership in contrast to other literature findings suggesting that younger farmers are more likely to take part in extension as education has a smaller return for older farmers (Goodwin & Schroeder, 1994) and farmers with larger more intensively farmed holdings are more likely to participate in discussion groups (Läpple, et al., 2012). El-Osta and

Morehart (2002) found that age, size of farm and specialization in dairy influenced the adoption rate of capital-intensive technologies and education and size of the operation had a positive influence on the adoption rate of management-intensive technologies.

Discussion groups provide the benefit of delivering an effective means of promoting the adoption of new technologies; the facilitator has the ability to use this extension method to create an environment where farmers can learn from each other, not only about new technologies but also technical information (Garforth et al., 2003; Hennessy & Heanue, 2012). There is a clear link found between farm profitability and adoption of technology or practices as adoption in this way leads to a change in productivity and efficiency on farm ultimately leading to changes in farm profitability (Gabre-Madhin, et al., 2003). Adoption of agricultural practices and technology are effected by a range of personal, economic, social and cultural factors but also the characteristics of the technology itself has an effect on adoption by farmers (Pannell, et al., 2006), given the link between adoption and profitability it could be said that this range of factors also effects profitability to a certain degree.

2.2. Farmers' learning and practice change

As agriculture is becoming more and more intensive and specialised there is a growing importance for farmers to co-develop knowledge, become innovators and problem-solvers (Sewell, et al., 2017) in order to improve the productivity, profitability and sustainability of their farms (Wheeler, et al., 2016) to ensure these farms remain viable long into the future. Farmers today need an extension service that is an "engine for innovation" (Sewell, et al., 2017) providing them a service which fosters innovation and co-learning instead of training them and telling them what they should and should not do (Benson & Jafry 2013; Ben Salem & Smith 2008).

Klerkx et al (2017) discusses how stakeholders' involvement in participatory research can help to make research findings more applicable to what's happening on the ground in farming and therefore helping to develop effective agricultural extension and education programmes, leading to practice change. It is important to provide a place that fosters learning, allowing farmers to interpret research findings and relate it to their own situations (Klerkx, et al., 2017). It is vital that farmers don't completely rely on extension agents; they must get their information from various sources for example the industry and other farmers (Wheeler, et al., 2016). Extension programmes such as discussion groups have the potential to provide an opportunity for farmers to share information among themselves and share their experiences

which extension advisors can also learn from. This shift from one-way communication styles, the top-down approach in transferring knowledge to a two-way collective learning approach is described by international research as very important for farmers' learning success (Lacy, 2011).

Sewell et al (2017) carried out a study which looked at the practice change of New Zealand farmers engaging in an agricultural extension programme for 18 months to 3 years, aimed at supporting farmers' learning to enable them to make their own decisions about the degree and nature of herb pasture uptake. In order to successfully support farmer learning and practice change extension programmes need to focus on developing a sense of belonging to a community where there is relaxed social interactions among people who can share openly their farming practices and participate in dialogue and questioning and this can be facilitated by an extension agent who is trusted by the group (Sewell, et al., 2017). Such a program also needs to create an environment where farmers can develop their self-efficacy, a belief in their capabilities not only from reflecting on their own experience but by observing others succeed and realising it is achievable for them too (Sewell, et al., 2017). Farmers need to see themselves as co-producers of knowledge instead of consumers of knowledge and participatory extension programmes are key to achieving this (Sewell, et al., 2017).

Trialability, compatibility, complexity and risk are outlined as being the main barriers to practice change (Ahnstrom et al. 2009; Greiner 2015; Sewell et al. 2017) but learning sessions can be used to eliminate the effects of these barriers. Factors such as education, finances, farm size and type, time, labour and dependency on farm income can either facilitate or interfere with farmers' behavioural change and their ability to adopt technology or practices (Mills, et al., 2017). A farmer may be able to adopt technology or change practice but they also have to be willing to and their willingness is determined by their personal attitudes, social influences and their perception of how difficult or easy it would be to carry out a suggested action (Mills, et al., 2017) but also their response-efficacy as the more they believe that their actions will make a difference the more likely they are to continue with the new behaviour (Homburg & Stolberg, 2006). A socio-cultural group participatory situation can help farmers to understand innovations and how to incorporate them into their farming system, consider other changes to their system that may be required for it to work and provide an opportunity for them to discuss alternative solutions. One of the biggest barriers to the adoption of innovation for farmers is the financial risk however vicarious experience goes

a long way to overcoming this (Sewell, et al., 2017). Being able to see something working on someone else's farm gives farmers the confidence to try it themselves.

It is important that advisory approaches understand and are able to deal with the diversity of farmers' beliefs and values and adapt and target messages accordingly (Mills, et al., 2017). Extension agents must understand the context when helping farmers to learn and bring about practice change, the context with regards to the technology or practice and the farmers' personal circumstances and farming systems (Sewell, et al., 2017).

2.3. Evaluating the impact of government funded extension programmes

Farmers engage with, for example, environmental learning and behaviour through networking with other farmers and sharing knowledge informally. The same can be achieved for adoption of innovation and practice change through government funded extension programmes like the KT scheme by aiming to change social norms by sharing information in group situations and requesting tasks be completed that if used correctly could help improve farm productivity and profitability (Mills, et al., 2017). Throughout Europe the delivery of agricultural advice is quite fragmented and this means that farmers have to interact with a wide range of agents such as local authorities, extension advisors, government agencies, agri-businesses and rural development agents (Feola, et al., 2015). Farmers' level of engagement is determined by their relationship and trust with these agents (Sutherland, et al., 2013). The UK have been known to take the approach that farmers need a "nudge" to influence behaviour (Barnes, et al., 2013) and by using the combination of gaining good information and insight into how farmers make decisions they can steer them towards making sustainable choices (Olander & Thogersen, 2014).

The KT scheme is aimed at steering farmers in the Tillage sector in particular towards more sustainable production of crops and encouraging use of the tools which the government believe from talks with other relevant bodies, are necessary in order to achieve this. The literature suggests that farmers might successfully engage with advice and behavioural change by networking with other farmers (Sligo & Massey 2007; Oreszczyn et al. 2010) in an informal setting where they can share knowledge and experiences. In Ireland farmers engage with local governance structures such as the Catchment Programme (Teagasc, 2018) and such programmes are heavily aimed at changing social norms amongst a group of farmers, as they share information and expose their practices among their peers there will in time

automatically be a new set of norms/standards of acceptable behaviour set among the group (Barnes, et al., 2013). This approach can lead to improvement in many different areas not just adoption and practice change. Mills et al (2017) completed a study looking at how the level of willingness, ability and engagement of farmers in the UK effected their adoption of environmental management and is a very good example of how farmers need a balance of all three factors for successful adoption. This study found that farmers who were able to adopt as they were undertaking environmental management and engaging with the extension programme as they looked for advice but who lacked willingness because they only joined the agri-environmental scheme for the financial reward would not change their attitude and would revert back to their old ways once payment ceased at the end of the scheme (Mills, et al., 2017). Similarly some large farmers could see such schemes as subsidiary income where they only have to slightly alter their practices to meet the minimum specifications of the scheme, treating it as a tick the box exercise and not undertaking any more than necessary, they will not change their practices as a result of the scheme (Mills, et al., 2017) as they will return to doing things the way they always have once the scheme is over. Having said that there are always people who are willing and able to adopt and change their practice however like to do it in their own way and due to the rigid nature of schemes in some instances these people don't engage (Mills, et al., 2017). The hardest things to influence are a farmer's attitude, beliefs and behaviour and their general willingness to participate. This requires a lot of trust and in many cases this is not the type of relationship farmers have with government agencies, in particular government departments for agriculture. This can pose a major barrier in government funded extension programmes (Mills, et al., 2017).

In an evaluation of the impact of Dairy Efficiency Programme (DEP) on farmers' knowledge, attitudes and behaviours, it was found that the scheme had a notable impact on dairy discussion groups as there was an increase in membership and a more structured programme of activities (Teagasc, 2013). Such schemes are beneficial to create entirely new groups and to bring new farmers into groups and this can cause a change in group dynamics for better or for worse (Teagasc, 2013). In the case of long established groups the introduction of new members caused issues if they had very different motives to the existing members as it was considered these new members were only interested in the DEP payment and this hindered the performance of some groups (Teagasc, 2013). In this evaluation Teagasc advisors expressed their concerns that the scheme was very weighted towards paperwork which was challenging to get farmers to complete and less emphasis on this in the future would be

beneficial to the success of the discussion groups as giving farmers 'homework' at meetings to complete as part of their payment was negatively impacting their participation and attendance at group meetings so more flexibility was needed (Teagasc, 2013). Similarly the introduction of the Beef Technology Adoption Programme (BTAP) brought about a huge increase in beef discussion group membership. Teagasc (2014) completed a study evaluating the impact on farmers' participation in Teagasc beef discussion groups in which it was found that 21.8% said they joined the discussion group for the BTAP payment. It is evident from research completed by Moran (2013) in the Northwest that just under half of the farmers said the BTAP payment had no influence on their membership of a discussion group while a further 36% said they would remain members without the BTAP payment and it appeared that the scheme helped to publicise the availability of discussion groups to beef farmers. Again like with the DEP Teagasc advisors felt that there was a lot of administration work involved in taking part in the BTAP scheme which became a barrier to improvement in group performance as farmers somewhat resented it (Teagasc, 2014) and the lack of flexibility particularly with the scheduling of meetings frustrated farmers sometimes as a lot of their work is weather dependant and unpredictable. Moran (2013) found that the biggest benefit to discussion group membership was the peer-to-peer support and learning and farmers who intended to continue partaking in a discussion group even after payment ceased had a higher level of practice adoption than the members who intended to leave the group if there was no payment. Having examined 20 practices which are promoted in Teagasc beef discussion groups Moran (2013) discovered that there was an increase in adoption of mandatory BTAP tasks which was expected but there was also an increase in the adoption of other practices. While it could not be said for definite that this increase was as a result of discussion group membership it certainly has a positive effect on practice adoption and the longer farmers are involved in discussion groups the higher the level of adoption is. In this study discussion group members were found to have higher levels of adoption for the 20 selected practices than non-discussion group members, which demonstrates the extent of learning and application by members of discussion groups (Moran, 2013).

Conclusion to the Literature Review

The literature suggests that there are many benefits to being a member of a discussion group for a farmer which can all contribute to a financial benefit. The factors which affect the outcome of increased production and profitability as a result of membership should be looked at in the analysis of this study to see how age, size of operation and motivations for

discussion group membership can aid or hinder achieving such an outcome. An effective extension programme must develop learning groups of farmers and other experts e.g. extension agents, aiming to enhance farmer self-belief and contextualise farmers' learning. A participatory two-way collective learning approach is very important for farmers' learning to progress and needs to be the basis for development of an extension programme. Farmers need to be given the opportunity to learn from each other's experiences and take control of their own learning rather than being presented with the knowledge. Factors effecting behavioural change are important to explore when evaluating uptake of innovations and farming practices and schemes such as BTAP, DEP and STAP provide a stepping stone to increasing the level of adoption of good farming practices.

3. METHODOLOGY

A mixed method approach was used in this study using a cross-sectional design for the collection of data as this allows for the examination of many cases at a single point in time, collecting a large amount of quantitative data producing many variables from which patterns of association can be detected (Bryman, 2012). The advantage of collecting quantifiable data is that it provides the researcher with a consistent benchmark to refer back to (Bryman, 2012).

The study was carried out on tillage farmers in County Cork who participate in Teagasc tillage discussion groups. The data was collected from 5 tillage discussion groups in April and May of 2018. This purposive sampling strategy (Devers & Frankel, 2000) was used because the researcher worked closely with these groups of farmers during their first year of the Walsh Fellowship programme in the Midleton Teagasc Advisory office and wanted to further develop the understanding of this selected groups experiences of discussion groups in order to developing theories and concepts on the topic (Bryman, 2012) and given the limited timeframe it was decided to select this group of farmers for the collection of data.

There are a total of 85 farmers in the 5 discussion groups. Firstly the researcher compiled a questionnaire which the group members completed during a two hour discussion group meeting. A survey questionnaire will provide quantitative data that can be compiled to show trends of attitudes and behaviour of the targeted population (Bryman, 2012). A survey is a structured method of answering research questions that can be easily generated and distributed in a group situation. It produces an instant response at the end of the meeting and the results can be analysed quicker than in the case of other methods (Bryman, 2012). The researcher then used the quantitative production data available to them from the information gathered for the KT Farm Improvement Plans for the farmers who responded to the survey. This approach was used because this data had already been collected as part of the KT programme and analysing it is of great benefit to advisors but also to this study as it provides insight into the crop management and financial performance of the research population (Bryman, 2012).

In order to satisfy ethical issues before completing the survey the farmers were asked if they had any objections to their information being used anonymously and in the case of profit monitor data, being used in a group average. Then the farmers were notified that by completing the surveys and returning them to the researcher they were giving consent to use

their information which they all understood and anyone that didn't feel comfortable with this were not made feel obliged to take part.

Method 1: Questionnaire

The farmers who attended the monthly discussion group meeting for their group in April/May were asked to complete a structured questionnaire and these farmers compiled the research population. In the questionnaire the group members were asked questions in relation to their own farming background, their discussion group membership and their adoption of good farming practices such as recording components of yield (Appendix 2). The researcher attended each of these discussion group meetings and provided an explanation for each question which helped avoid confusion and ensured a high rate of good quality responses. The data collected was then inputted into the SPSS programme and analysed.

Method 2: Quantitative Data

Quantitative production data from the farmers who completed the questionnaire was collected through the information they provided in 2017 for their Knowledge Transfer Farm Improvement Plans. This data included components of yield information in relation to plant counts for spring barley in 2017/2018 and profit monitor data for 2016 and 2017 obtained using the Teagasc online €Profit Monitor financial analysis system that is available to Teagasc advisors and clients (Teagasc, 2018). Figures such as average farm size, output €/ha, gross margin €/ha, variable costs €/ha, cost of leasing land €/ha and net margin €/ha were compared with the average for all tillage farmers who completed €Profit Monitors in 2016 (Teagasc, 2017).

4. STUDY FINDINGS AND ANALYSIS OF DATA

In presenting the study findings the researcher will first analyse the findings of the questionnaire completed by the research population, examining the responses to each question asked. Following on from this the quantitative data collected from the participating farmers Farm Improvement Plans will be analysed in particular the eProfit Monitor results for 2016 and 2017 and the plant count results for spring barley crops for 2017 and 2018.

4.1. Profile of Respondents

A total of 57 responses to the questionnaire were returned out of 85 members of the 5 tillage discussion groups, giving a response rate of 67% of the target population. The majority of the farmers in the discussion groups that were studied were over the age of 40 with just 27% (n=57) of respondents under the age of 40, most of whom were between 31 and 40 years old. Furthermore 33% of the respondents were aged between 41 and 56 and the remaining 40% were over 57 years of age showing that there was an older age demographic in these discussion groups. This corresponds to NFS figures for 2016 stating the average age of farmers in Ireland is 56 (Dillon, et al., 2016). As shown in Table 1 below out of the 57 tillage farmer respondents only 14 of them had a farm size of less than 150acres (60ha), while 39% of respondents were farming more than 250acres in total (including owned and rented land). The average farm size of the research population was 88.2ha which is larger than the NFS average specialised tillage farm size of 61ha (Dillon, et al., 2016). Table 1 represents all the land that the respondents are farming and given that 44% of these tillage farmers operate a mixed farming enterprise (beef, dairy or sheep) this is not an analysis of just tillage land farmed by the research population.

Table 1. *Distribution of farm size of study respondents (N=57)*

Farm Size	No. of respondents	Percentage %
>30 acres	0	0
31-60 acres	1	1.8
61-90acres	2	3.5
91-150 acres	11	19.3
151-250 acres	21	36.8
<250 acres	22	38.6
Total	**57**	**100**

Respondents were asked if they had a formal agricultural education of any description to which 77% (n=57) replied yes. Given the age demographic it is to be assumed that the majority of these farmers completed practical agricultural training courses in agricultural collages in the south of the country rather than degrees from institutes and universities. These farmers were also asked about how many years they have been involved in the decision making process on the farm to which many responded more than 25 years, as can be seen in Figure 1 below. This result is not unforeseen again given the age demographic of the research population.

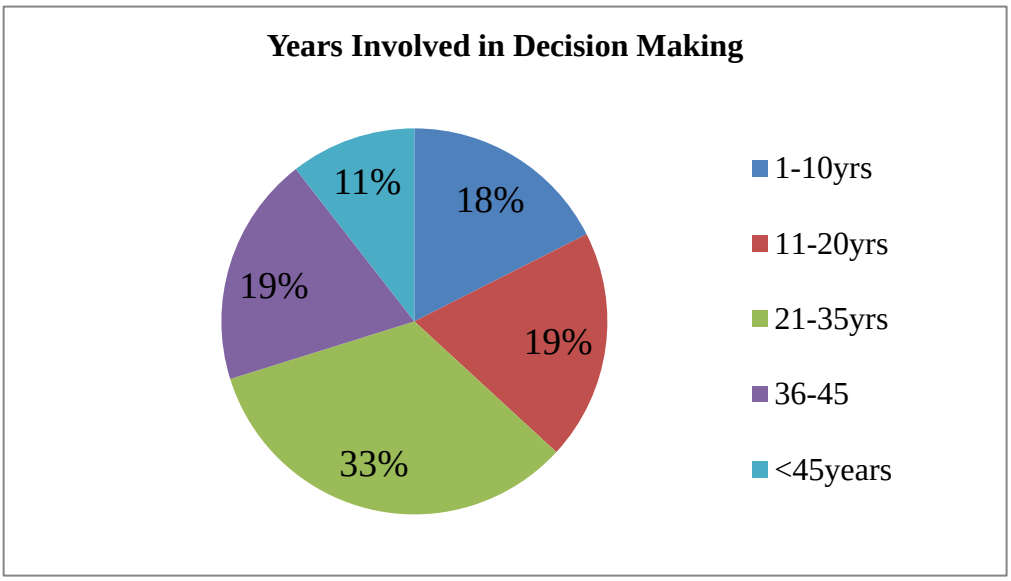

Figure 1. *Distribution of how long respondents have been involved in decision making on the farm. (N=57)*

Figure 2 shows the different periods that respondents have participated in a discussion group. Eleven respondents (19%) joined a discussion group as a result of the introduction of the KT scheme and so have only been members of a discussion group for 2 years. Interestingly only two respondents said they joined the discussion group for payment, one of whom stated they would not continue to partake without payment from the scheme. Surprisingly a further 28% have been members of their discussion groups for 20 – 25 years, so there is huge variation in discussion group membership among the research population. The average length of discussion group membership of the research population is 14 years.

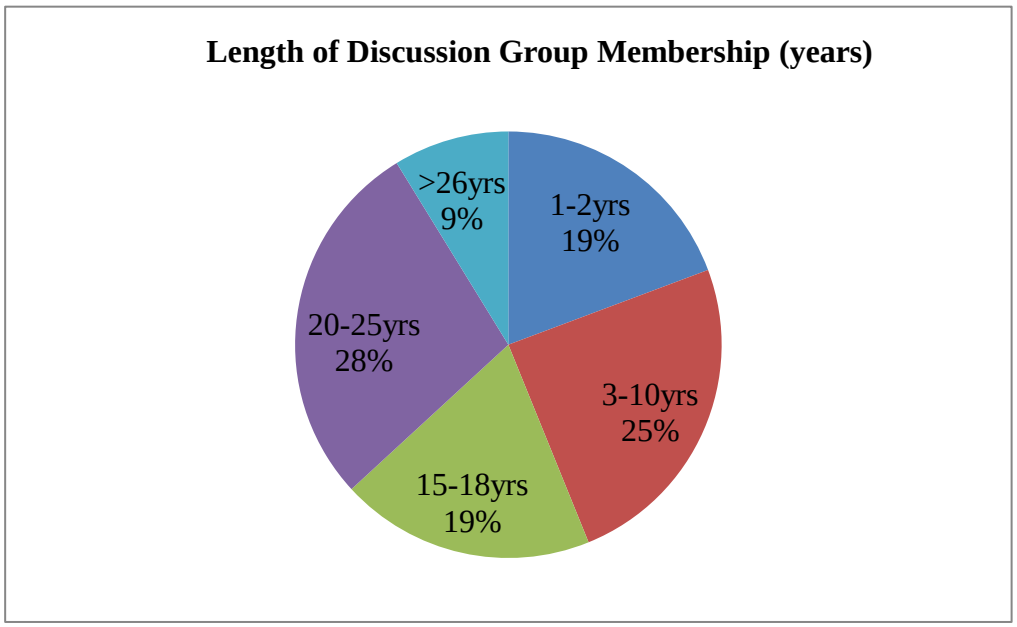

Figure 2. *Distribution of discussion group membership in years. (N=57, mean=14.14)*

4.2. Respondents views on their discussion group

When asked why they joined a discussion group, 58.2% said it was to gain up-to-date information and knowledge (as seen in Table 2), followed by 11% who wanted to share their experiences and learn from other's experiences. Farmers also wanted to join to discuss and solve issues (9.1%) and to meet people (11%). The respondents' reasons for joining a discussion group show their expectations of what a discussion group involves and they want to gain knowledge from the experience not only knowledge from research completed by Teagasc but from other farmers' experiences as well. They expect it to be a social gathering of like-minded people in similar situations to themselves.

Table 2. *Distribution of respondents reasons for joining a discussion group. (N=55)*

Reasons for joining a discussion group	**Frequency No. of respondents**	**Percentage %**
Gain up-to-date information/knowledge	32	58.2
To share experiences	6	10.9
To learn more about tillage farming	3	5.5
Discuss/solve issues	5	9.1
Payment	2	3.6
Told by a neighbour	1	1.8
To meet people	6	10.9
Total	55	100

The social aspect of discussion group membership was very important to 82.5% of respondents. Two respondents thought that the discussion group was not stimulating enough because they felt they needed exposure to new ideas and there is not enough discussion among the group.

All of the discussion group members surveyed said they would recommend joining a discussion group to others. All respondents said they were applying the information and practices discussed at their group meetings to their own farming enterprise to some degree and 72% of the respondents gave details as to exactly what knowledge they were applying to their own farming systems. Of these respondents (n=41) 41.5% said they were using the knowledge they gained from group discussions to make decisions on crop management in general. Some farmers adopt methods used by other group members (14.6%), others use the information discussed to make decisions on spray and fertiliser programmes for timing and product choice (14.6%) and 12.2% said they used the information gained to keep up to date with research and best practice.

4.3. Comparing new discussion groups to long established discussion groups

Eleven (19%) of the study respondents had joined discussion groups as part of the KT scheme (newer members) in 2016/2017. Of the 81% (n=46) of respondents who were already in discussion groups prior to the introduction of the KT scheme 39 had been involved with a discussion group for more than 10 years. Table 3 outlines the distribution of age, comparing the age demographic of those who recently joined a discussion group to those who are more established discussion group members. We can see from Table 3 that the majority of farmers that have been members of discussion groups before the introduction of the KT scheme are over the age of 57 (23) and this corresponds to earlier findings that 40% (n=57) of respondents are more than 57 years of age.

Table 3. *Distribution of age of new discussion group members and long established members. (N=57)*

Age (years)	New DG members N (%)	Long established DG members N (%)	Total N (%)
<20	0	0	0
21 – 25	1 (9%)	0	1 (1.75%)
26 – 30	1 (9%)	1 (2%)	2 (3.5%)
31 – 40	5 (45%)	7 (15%)	12 (21.05%)
41 – 56	4 (36%)	15 (33%)	19 (33.3%)
>57	0	23 (50%)	23 (40.4%)
Total	**11**	**46**	**57**

Table 4 displays the distribution of land farmed comparing the two types of discussion group members. It can clearly be seen that those who have been members of a discussion group for longer are farming larger areas of land, with only one (n=11) respondent farming more than 250 acres in the group of new discussion group members compared 21 (n=46) of the long established members.

Table 4. *Distribution of land farmed by new discussion group members and long established members. (N=57)*

Ha	New DG members N (%)	Long established DG members N (%)	Total N (%)
<30	0	0	0
31 – 60	1 (9%)	0	1 (1.75%)
61 – 90	2 (18%)	0	2 (3.51%)
91 – 150	2 (18%)	9 (20%)	11 (19.3%)
151 - 250	5 (46%)	16 (35%)	21 (36.84%)
>250	1 (9%)	21 (45%)	22 (38.6%)
Total	**11**	**46**	**57**

When looking at the respondents reasons for joining a discussion group in the first place it was found that the majority of both new and long established members joined to gain up-to-date information and knowledge which is a very positive result (see Table 5 below). Surprisingly only two (n=11) of the newer group members said they joined in order to receive payment as part of the KT scheme considering they all joined due to the introduction of the scheme.

Table 5. *Distribution of new discussion group members' and more established members' reasons for joining a discussion group. (N=55)*

Reasons for joining a discussion group	New DG members N (%)	Long established DG members N (%)
Gain up-to-date information/knowledge	5 (46%)	27 (62%)
To share experiences	2 (18%)	4 (9%)
To learn more about tillage farming	0	3 (7%)
Discuss/solve issues	1 (9%)	4 (9%)
Payment	2 (18%)	0
Told by a neighbour	0	1 (2%)
To meet people	1 (9%)	5 (11%)
Total	**11**	**44**

While we know that all respondents of the study believe they are applying the information they gain at their discussion group meetings on their own farm it is important to analyse what exactly or how the new and more established group members are using the knowledge they gain by participating in their discussion group. In Table 6 we can clearly see the most popular answer given by the more established group members is that they make decisions for crop management based on group discussion at meetings. While this is also found to be applicable for newer members many also adopt methods used by other group members. This finding emphasises the importance of peer-to-peer learning in discussion groups.

Table 6. *Distribution of new discussion group members' and more established members' use of information gained from meetings. (N=41)*

What DG information is applied on farm	New DG members N (%)	More established DG members N (%)
Influences spray application, timing and products	1 (10%)	4 (13%)
Make decisions for crop management based on group discussion	3 (30%)	14 (45%)
Apply all knowledge from DG on farm	1 (10%)	1 (4%)
Influences spray & fertiliser programs for timing & products	1 (10%)	5 (16%)
Adopt methods used by other group members	4 (40%)	2 (6%)
Keeping up to date with research and best practice	0	5 (16%)
Total	**10**	**31**

Looking at the adoption of plant count monitoring it was found that all newer group members were completing plant counts on their crops, with six respondents actually having started prior to joining the KT scheme in order to improve yield and use of inputs and the remaining five completed the task as part of the scheme. Of the more established group members 78% (n=46) say that they practice this management strategy. Similar to the new discussion group members half of them (55%) started as part of the KT scheme and the remainder adopted the practice before the introduction of the scheme.

Only one farmer in the group of new discussion group members had no agricultural qualification of any kind (n=11) and twelve of the long established group members had no agricultural qualification.

4.4. Recording components of yield - Plant count monitoring

Even though all discussion group members were required to complete plant count monitoring of a crop for the KT scheme, 17.5% of respondents stated that they do not carry out this crop management practice (as seen in Figure 3), which was found by the researcher through experience of working with these farmers to be mostly due to their reluctance to being told what to do and in some cases not seeing the benefit in spending time carrying out the task.

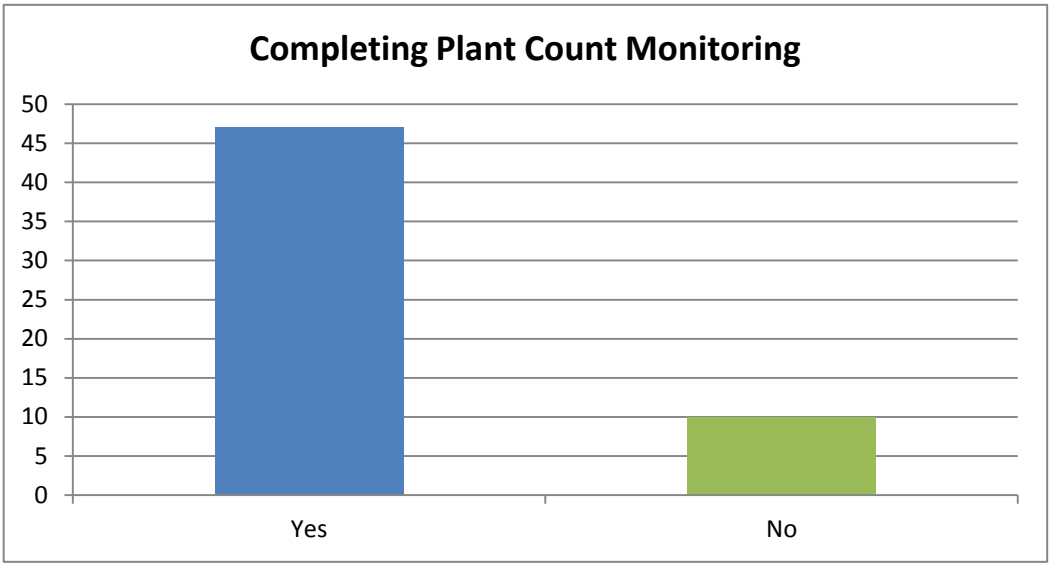

Figure 3. *Distribution of number of respondents who complete plant count management practice. (N=57, mean= 1.18, Std. Dev. = .384)*

Of the 82.5% (N=47) of respondents who claimed to complete plant count monitoring 49% started carrying out this practice in the spring of 2017 when the KT scheme was in its first year of the programme, 15% of respondents started carrying out plant counts in 2015 following the advice of advisors and agronomists. A further 15% began this practice during the period 2011-2014 and 10.6% between 1978 and 1998. This is shown in Figure 4.

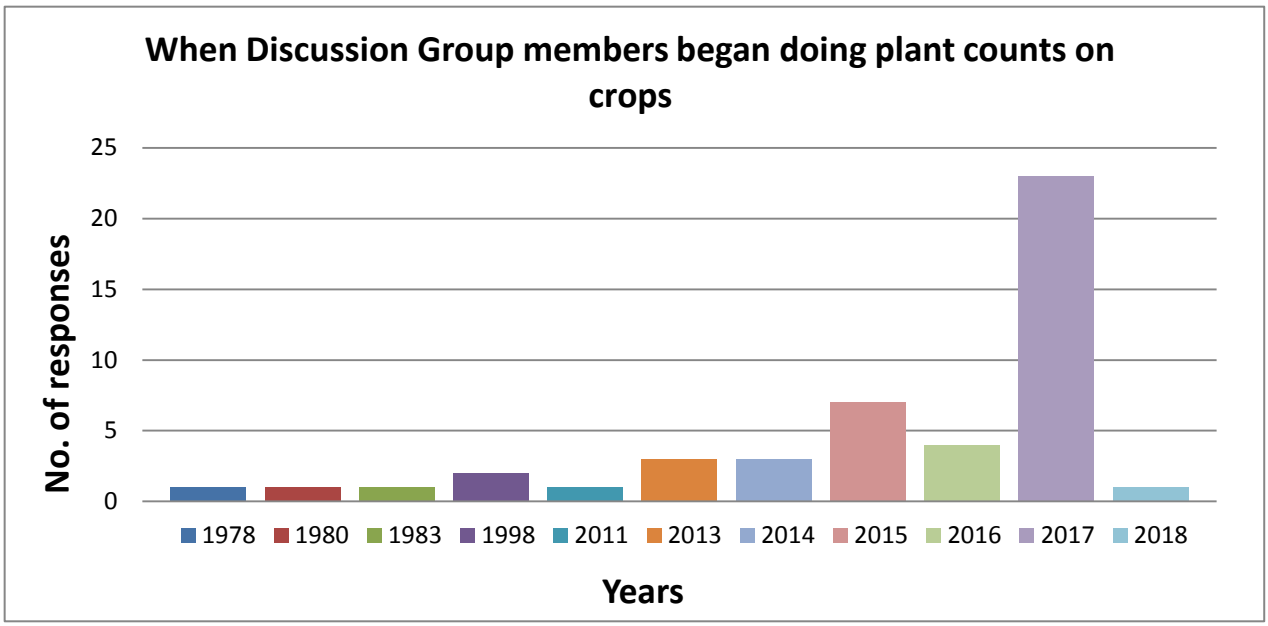

Figure 4. *Distribution of when respondents began carrying out plant count monitoring. (N=47)*

Respondents were asked their reasons for completing plant count monitoring and 44.4% said they only carry out the practice to satisfy the requirements of the KT scheme, while 22% adopted this practice to utilise the tool to help them with crop management decision making and a further 18% and 9% of respondents began carrying out this task as a means of improving yields and assessing crop performance respectively.

Of the farmers who said they carry out plant count monitoring 66% said they change their crop management based on plant count results, while the remaining 34% said they have not changed crop management after having completed the task, suggesting that they merely completed the task as a tick the box exercise. The results displayed in Table 7 would suggest that those who have been in a discussion group longer are slower to adopt new practices such as plant count monitoring especially when it is made mandatory by a scheme. It may also suggest that they don't believe they need to complete the task in order to know how to manage their crop. No significant difference was found between those who use the information from plant count monitoring and those who don't in terms of age, reasons for joining a discussion group or size of farm. However twelve of the respondents who don't use the plant count monitoring information only began carrying out this task in 2017 for the purpose of completing the task for the KT scheme. In comparison almost half of the respondents who do use the information they get from carrying out the task began plant count monitoring before 2015.

Table 7. *Relationship between use of plant count information and length of discussion group membership. (N=47)*

Change crop management based on plant count results	No. of Respondents N (%)	Mean length of DG membership (years)
Yes	31 (66%)	7.5
No	16 (34%)	11
Total	**47**	**9.25**

Table 8 looks at the relationship between the length of discussion group membership and adoption of plant count monitoring. Of the farmers who do not carry out plant counts 60% (n=10) have been in a discussion group for more than 15 years and are older than 41 years of age, while 55.3% (n=47) of the farmers who do monitor plant counts have been discussion group members for more than 15 years as well. Table 8 demonstrates that there is no significant relationship between length of discussion group membership and adoption of plant count monitoring.

Table 8. *Relationship between the length of discussion group membership and adoption of plant count monitoring. (N=57)*

Complete Plant Count Monitoring	No. of Respondents (Frequency)	DG Membership %		% of Population
		>15yrs	<15yrs	
Yes	47	44.7%	55.3%	82.5%
No	10	40%	60%	17.5%
Total	**57**			**100%**

When analysing the relationship between age and those who carry out plant count monitoring it was found that 38.3% of the respondents who do plant counts were over the age of 57 (40% of population are <57) however there was no statistically significant relationship between the two. On examination of the relationship between having an agricultural education and

monitoring plant counts it was found that while 80.9% of those who said they carry out plant count monitoring have an agricultural education and 40% of those who do not monitor plant counts do not have any agricultural education, there was no significant relationship between the two variables (Ch2= 2.036, df=1, p=0.154).

The researcher looked at the average plant count numbers achieved on crops of spring barley by the discussion group members in spring 2017 and 2018. Table 9 shows the comparison between the respondents who use the information from recording this component of yield to the respondents who carry out the practice but don't use the results for crop management. While those who do not use the information provided by carrying out plant counts seem to have a lower average plants/m2 figure in both years there was very little difference between the two groups of respondents and the researcher could not base analysis off one year of results considering the 2018 results were abnormal given the very poor spring and late sowing of crops.

Table 9. *Distribution of average plant counts achieved in 2017 & 2018 on spring barley crops for respondents using results of plant counts and respondents who are not. (N=47)*

Year (Spring)	Respondents using results for crop management	Respondents completing task just for KT scheme
2017	271 plant/m2	263 plants/2
2018	257 plants/m2	245 plants/m2

4.5. eProfit Monitor

The profit monitor figures for all respondents in the research population for 2016 and 2017 (n=57) were analysed. 2016 profit monitors were completed in the first year of the KT scheme during the spring of 2017. Prior to having to complete a profit monitor as a mandatory task for the KT scheme less than 5% (n=57) of respondents were completing profit monitors. Table 10 looks at the average figures for the whole research population and the minimum and maximum figures also to give an idea of the range for each variable. The biggest fixed cost facing tillage farmers currently is the cost of leased land and so this is dealt with in its own right, separate from fixed costs.

Table 10. *Distribution of respondents' eProfit Monitor figures for 2016 and 2017. (N=57)*

Year		Ha **	Leased Ha	Land Lease Cost/ha ***	Output €/ha	Gross Margin €/ha	Variable Costs €/ha	Variable Cost as % of output	Net Margin €/ha
2016	Ave	98	53	303	1330	640	670	53	64
	Min	9.3	6.5	213	789	-112	469	30	-689
	Max	359.4	258	643	1772	1166	1374	109	540
2017	Ave	98.1	52	294	1633	935	698	43	355
	Min	9.3	4.4	256	1305	382	434	11	-213
	Max	314	249	643	2031	1476	1155	75	863

** Average fixed costs such as machinery costs (machinery running, leases, finance and depreciation), professional fees, land maintenance etc. were not analysed as part of this study. **Hectares analysed were for the tillage land farmed only. *** Land Lease cost €/ha (includes conacre, short and long term leased land) incurred is divided over tillage leased land only.*

As seen in Table 10 the average hectares has remained the same year on year while the maximum hectares has reduced from 359.4ha to 314ha (n=57). Similarly the average hectares that are being leased by these discussion group members has remained around 50ha year on year and the minimum and maximum hectares leased has also remained steady. Where there has been a noticeable increase from 2016 to 2017 is in the gross output €/ha figures rising from €1330/ha in 2016 to €1633/ha in 2017 and an increase in net margin €/ha from €64/ha in 2016 to €355/ha in 2017. It is expected that this increase in margins is largely due to the

excellent yields that were achieved in crops in 2017 and this increase in output diluted the small increase in variable costs and reduced the variable cost as a percentage of output leading to a much higher average net margin €/ha.

Table 11 examines the profit monitor figures for 2016 of two groups within the research population (n=31), respondents that are in discussion groups that are more established and have been in operation for more than ten years (Old 10yrs+) and respondents that are in discussion groups that are very new and were started when the KT scheme was introduced (New KT). By analysing the 2016 profit monitor figures it will allow us to see how the respondents in the new groups were performing before they joined a discussion group and will also show us the performance of the more established groups, whose members joined a discussion group in the absence of any financial incentive, before they entered the KT scheme.

Table 11. *Distribution of eProfit Monitor figures for 2016 of the more established groups (Old 10yrs+) and the new groups which started when the KT scheme was introduced (New KT). (N=26)*

Group Type (2016)		**Ha**	**Leased Ha**	**Lease cost €/ha**	**Output €/ha**	**Gross Margin €/ha**	**Variable Costs €/ha**	**Variable Cost as % of output**	**Net Margin €/ha**
Old 10yrs +	Ave	137	118.6	482	1276	693	583	47	197
	Min	19.4	19.4	295	789	139	493	30	-83
	Max	312.6	258	643	1659	1166	715	84	540
New (KT)	Ave	53	39.5	431	1275	541	735	58	6
	Min	9.3	9.3	333	934	-112	469	40	-285
	Max	206	114	503	1628	823	1374	109	277

Table 11 shows us that the more established groups were farming more hectares on average in 2016 than the new discussion group entrants (which corresponds to the findings from the questionnaire in Table 4 previously) and as a result are leasing more land, while new discussion group entrants are paying €51/ha less for land leasing (n=31). Both new and older groups had much the same output €/ha in 2016 but the more established groups had a higher

gross margin of €693/ha compared to €541/ha for new groups. The more established groups also had lower variable costs (€583 vs €735) which lead to a higher average net margin of €197/ha compared to €6/ha for the newer groups. The finding that sticks out the most in Table 11 is the fact that the respondents farming the most amount of land while having higher land leasing costs are achieving a higher net margin. This could be due to many factors such as economies of scale when buying inputs or better use of inputs and crop management, all skills which discussion groups help farmers improve development of.

The same evaluation was completed for these groups for 2017, which for the new groups was their first production year partaking in a discussion group. Table 12 examines how these new groups are now performing against their more established counterparts given the good yields that were achievable in 2017.

Table 12. *Distribution of eProfit Monitor figures for 2017 of the more established groups (Old 10yrs+) and the new groups which started when the KT scheme was introduced (New KT). (N=26)*

Group Type (2017)		**Ha**	**Leased Ha**	**Lease Cost €/ha**	**Output €/ha**	**Gross Margin €/ha**	**Variab-le Costs €/ha**	**Variab-le cost as % of output**	**Net Margin €/ha**
Old 10yrs+	Ave	140	116	478	1556	954	603	41	312
	Min	18.6	18.6	363	1305	538	472	26	-213
	Max	314	249	643	1989	1476	812	60	791
New (KT)	Ave	56	35.5	501	1600	857	743	48	421
	Min	9.3	9.3	444	1314	382	434	31	-125
	Max	201	110.1	558	1949	1155	1155	75	665

The farming area for both groups has remained much the same as 2016 however the new groups appear to have paid more for land rental in 2017. On average the cost of leasing increased by €70/ha resulting in the new groups spending more on leasing than the more established groups in 2017. While the cost of leasing increased for the new groups they also achieved an increase in output of €1600/ha, which is higher than the more established groups' increase in output to €1556/ha. Variable costs rose for both groups compared to 2016 and

even though the more established group had a lower variable costs as percentage of output ratio the new groups achieved a higher net margin figure (€421/ha vs €312/ha) which was a huge improvement on their average net margin of €6/ha in 2016. This increase in performance would be expected to be a result of good yields achieved in the 2017 harvest however could also be due to the influence of the discussion group for crop management in that year.

In comparing the profit monitor figures of the research population to NFS figures for 2016 (see Table 13 below) we can see that while these discussion group members have a larger average farm size of 98ha they produced a lower output (€1330/ha) than the farms surveyed for the NFS in 2016 (€1408/ha), but exceeded the NFS output/ha in 2017 by achieving an average of €1633/ha output. In 2016 the average performing specialist tillage farm had a net margin of -€98/ha (Dillon, et al., 2016) and the research population achieved a net margin on average of €64/ha. As it is unknown the percentage of farms surveyed for the NFS that are partaking in a discussion group it cannot be said that this higher net margin for the research population is due to the benefits of discussion group membership however it could be one of the contributing factors as found in other studies (Moran, 2013; Teagasc, 2013; Teagasc 2014). Teagasc published an 'eProfit Monitor Analysis'(ePM) report for all the tillage farms that completed profit monitors in 2016 and some of the average figures are also compared to the research population's and NFS figures in Table 13 below.

Table 13. *Comparison of NFS, research population and National ePM performance indicators for 2016 (N=57)* (Dillon, et al., 2016) (Teagasc, 2017)

	NFS 2016	**Research Population**	**National ePM Figures**
Farm size (ha)	68	98	78
Output (€/ha)	1408	1330	1387
Net Margin (€/ha)	-98	64	106

In the 'eProfit Monitor Analysis' report Teagasc combined the results for 339 farmers in the country who completed a profit monitor online in 2016 (Teagasc, 2017). These figures

include the results for all respondents in this study along with other discussion group members in the country (involved in the KT scheme or not) and any non-discussion group members who completed one (Teagasc, 2017). The group of respondents in this study on average have a larger farm size than the ePM national average and have a similar output €/ha however where they perform poorer than the ePM national average is on net profit €/ha, as we can see in Table 13 the research population achieved an average net profit of €64/ha compared to the ePM national average of €106/ha. In this study 68% (n=57) of respondents were found to have leased land compared to 46% of farmers in the ePM analysis report (Teagasc, 2017) resulting in the research population having higher fixed costs.

4.6. Summary of Findings

When beginning this study the researcher narrowed down the questions they wanted answers for to just four critical questions, similar to those ask by other researchers in studies on discussion groups in order to gain insight into their performance. From the findings presented it is clear that involvement in discussion groups impacts the farmers' knowledge because they were all very eager to learn and this is why they joined a discussion group in the first place and for many of the research population this decision was made without any financial incentive. Given that so many of these farmers have been members of a discussion group for more than 15 years participation must have a positive impact on their knowledge and attitude considering all respondents would recommend joining a discussion group to their fellow farmers. While it is difficult to say how discussion group membership has impacted on these farmers' behaviour without being able to compare their behaviour now to what it was like before they joined we can still see some changes in behaviour. Given that the majority of farmers feel the social aspect is very importance, they also listen to each other and take on board the advice from other group members as many make decisions on crop management based on group discussion at meetings shows they are influenced by their peers and willing to change their norms.

Discussion groups are a very social affair and require group participation in order to run successfully where members get the full benefit of them. The findings of this study outline how important these farmers feel participation in the groups is. It is apparent that these groups rely on peer-to-peer learning as group discussion influences their decision making and many joined in order to meet people and get information or discuss and solve issues together. The relationships built and feeling of comradery created is one of the biggest benefits of

partaking in a discussion group. While there also appear to be financial benefits and increased adoption benefits to being a member of a discussion these are also very farmer dependant and influenced by many other factors outside of the discussion groups. From the researcher's experience of working with these groups she has observed that group members get an awful lot more from standing out in a field of winter barley chatting about spays, varieties and fertiliser programmes than they will ever fully appreciate.

As only a small percentage of the research population joined a discussion group in recent years they all seem to feel that they are being stimulated enough and very few respondents voiced an opinion of how they delivery of their discussion groups could improve. Although the researcher suspects this could be out of loyalty to their facilitators who have been working with them a long time and they have a good relationship with, they possibly did not want to criticise them. However from the researcher's observations while working with these groups, the more established groups could be challenged a little bit more as they have been together so long now that some complacency has crept in.

The findings clearly establish that for some, membership in a tillage discussion group has motivated them to change their crop husbandry practices. As many aspects to tillage farming are constantly changing e.g. sprays accepted for use on crops, varieties etc. tillage farmers have to be flexible and able to adapt. Given that so many of them change their crop management decisions based on group discussion and take on board the advice from their fellow group members and facilitator, it is obvious that they are capable of changing their practice in order to improve. Making recording components of yield a mandatory task of the KT scheme has introduced the practice to all group members, some of whom had been using it a long time and others only starting as part of the KT scheme. The fact that almost half of the farmers who said they use the information provided by recording components of yield started carrying out the task when the KT scheme was introduced shows a positive impact on adoption of the practice. While there are always going to be a number of people reluctant to adopt and some that probably never will, making recording components of yield a mandatory task of the KT scheme has certainly had a positive impact on adoption.

5. DISCUSSION

The aim of this study was to provide insight into the drivers of performance of Teagasc tillage discussion groups based on those surveyed in Co. Cork, comparing the farmers' expectations of discussion group membership to their actual experiences and unveiling how the information provided at discussion groups is being used on farm. The study looked at how a scheme can impact the adoption of good farming practices, in particular recording components of yields through counting plants and tillers after crop establishment by investigating farmers' perception of the task and the benefits of carrying it out. There were four main research questions used to achieve the aim of this study and some of the important main findings are discussed in this section.

As a means of discovering farmers' expectations, the study explored why they joined a discussion group in the first place. Unlike in other studies such as the evaluation of drystock discussion groups carried out by Moran (2013) and Teagasc (2013), the financial incentive was not found to be an influencing factor for discussion group participation in this study even among the new members. This research population appear to be different as payment is not portrayed as an influencing factor for these respondents. While 11 respondents did join at the introduction of the KT scheme it was more the opportunity the scheme provided rather than the payment according to the results of this study, as when asked why they joined a discussion group only two respondents said for payment and only one said they would cease to attend if there was no longer a financial incentive for participation. Although all of these respondents clearly wanted to enter into the scheme in order to get payment it appears to have been merely to financially benefit from something they were already doing rather than solely for payment.

The study revealed some lack willingness when it comes to adopting the tasks which DAFM feels are important in order to improve productivity, sustainability and profitability on tillage farms. For example the 34% of respondents that carry out plant count monitoring but don't use the information to change management may be just willing to meet scheme requirements but are not convinced of the benefits of the practice, while the 17.5% of the research population that didn't complete plant counts at all are not interested in engaging with the scheme. They just want to attend their group meetings like they always did, get the payment but not do anything extra. This is very similar to Mills et al (2017) theory that those who lack willingness because they only joined the scheme for the financial reward would not change

their attitude, they would just slightly alter their practices to meet the minimum specifications of the scheme, treating it as a tick the box exercise and not undertaking any more than necessary, reverting back to their old ways once payment ceased at the end of the scheme. Given that the majority of respondents are long established discussion group members this lack of willingness will not impact their engagement with the extension programme, however it could impact their level of adoption of technologies and good farming practices.

With regards to adoption of technology or practices and engagement with agricultural extension programmes, factors such as age, education, finances, farm size and type, time, labour and dependency on farm income have been found to either facilitate or interfere with farmers' behavioural change and their ability to progress (Mills, et al., 2017). The findings of many studies suggest that younger farmers are more likely to take part in extension programmes as education has a smaller return for older farmers (Goodwin & Schroeder, 1994; Moran, 2013), however this study does not support those findings. Similar to Lapple et al, (2012) who found that age was not of significance to discussion group membership this evaluation of these discussion groups found that 40% of the research population were over 57 years of age and these farmers were by in large the most active members in the discussion groups. However it is not understood how much these farmers were learning themselves, while they were dedicated to participating in their discussion groups. Although there was found to be no significant relationship between adoption of practices such as recording components of yield and age this could be another contributing factor to why some members are not using the information it provides them.

It has also been found that farmers with larger more intensively farmed holdings are more likely to participate in discussion groups (Goodwin & Schroeder, 1994). This study could support this theory given that 39% of this research population are farming more than 250 acres and such farmers would benefit greatly from receiving support and knowledge from fellow discussion group members as well as benefitting from the networking nature of discussion groups.

The findings of this study would agree with those of Moran's (2013) study that the biggest benefit to discussion group membership is the peer-to-peer support and learning. Lapple et al (2015) discusses how learning is a social process, people learn faster if they work and learn together and this makes discussion groups very successful because peer influences play a major role in adoption. In this study it is made apparent that peer-to-peer learning is very

important for these tillage farmers as 41.5% use the knowledge they gain from group discussions to make decisions on crop management in general and 14.6% of respondents adopt methods used by other group members. The literature suggests that farmers might successfully engage with advice and behavioural change by networking with other farmers (Sligo & Massey 2007; Oreszczyn et al. 2010) in an informal setting where they can share knowledge and experiences this is something these farmers are certainly benefiting from. All the responses given by the research population for how they apply the information gained at group meetings involves peer-to-peer learning. Sewell et al (2017) feels a skilled facilitator is essential for a discussion group to perform well. Considering that none of the farmers mentioned gaining knowledge from their facilitator it shows that the facilitators of these groups must be successfully creating an environment where farmers take ownership of their own learning acting as co-producers of knowledge instead of consumers of knowledge (Sewell, et al., 2017), the more established discussion groups are an excellent example of this.

6. CONCLUSIONS AND RECOMMENDATIONS

This study was carried out as a means of evaluating Teagasc tillage discussion groups in Co. Cork as a possible representation of aspects of tillage discussion groups in other parts of Ireland in order to provide some insight into the drivers of performance of such discussion groups which differ from beef, dairy or sheep discussion groups in some ways but are also very similar. The discussion group method is proven to be effective in increasing farmer's knowledge and adoption of crop management practices. The success of tillage discussion groups is heavily dependent on participation of the group members in sharing their opinions and experiences for others to learn from and it is the role of the extension advisor to facilitate and encourage this participation. In evaluating the study it is evident that the Knowledge Transfer scheme did have an impact on adoption of practices such as recording components of yield and completing profit monitors while it is difficult to say if the high level of practice adoption is due to the requirement to comply with tasks in the KT scheme or influenced by learning through participation in the discussion group, given that many are using the information that these practices provide them shows the scheme is having a positive impact on adoption for these farmers.

The Knowledge Transfer scheme provided Teagasc with an opportunity to increase discussion group membership for tillage farmers in particular, for the first time. This created

a challenge for Teagasc to make an impact on the new discussion group members particularly and to make sure that when the financial incentive is removed that these farmers continue participating in their discussion group. From the analysis of tillage farmers' expectations and experiences of discussion groups is recommended that Teagasc review the delivery of this extension programme for tillage farmers by:

Considering how future schemes similar to the current Knowledge Transfer scheme could help further develop the performance of tillage discussion groups and foster adoption of new technologies and practices.

Ensuring when similar schemes are developed in the future that farmers are involved in the creation and design of such schemes. Getting the views of long established discussion groups could be beneficial by co-constructing a scheme that will satisfy all parties and empower farmers involved to act as agents of change in agricultural practice development.

Completing a follow on study to see how these groups and farmers have progressed after the KT programme finishes comparing their performance in year one to year three and the fall out after the scheme ended.

Completing a similar study in other tillage dense areas as the attitudes of the tillage farmers in this study do not necessarily represent all tillage farmers' attitudes towards discussion groups or what they feel could be done to improve the delivery of the extension tool.

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APPENDICES

Appendix 1: Farmer Survey Information Letter

You are being invited to participate in a research study.

Thank you for taking time to read this information leaflet.

Title of Project

Measuring the benefits of discussion groups for tillage farmers - has the adoption of recording components of yield impacted on crop husbandry practices?

Aims of this research:

Evaluate the impact of involvement in Teagasc discussion groups for tillage farmers.

Evaluate the impact of the 'Knowledge Transfer' discussion group scheme on the knowledge, attitudes and behaviours of group members.

Examine what hinders/aids the successful delivery of a discussion group meeting.

Background

I am a master's student from UCD studying a 'Walsh fellowship Masters in Extension and Innovation' funded by Teagasc and as part of my studies I must complete a minor thesis in an area of interest. Through the guidance of my colleagues in Teagasc and my lecturers in UCD I have selected this topic as I feel it is one of importance to both Teagasc as an organisation and to the industry.

Methods of Research

I hope to collect the relevant data using a survey questionnaire and with participants' permission analyse production data provided by discussion group members for the Farm Improvement Plans for the Knowledge Transfer scheme. I hope to analyse components of yield information in relation to plant counts for spring barley in 2017 and profit monitor data for 2016 and 2017 obtained using the Teagasc online €Profit Monitor financial analysis system.

What will happen if I volunteer?

Your participation is entirely voluntary. If you agree to participate you will be invited to complete a survey at your next discussion group meeting. This survey will explore your experience of being a member of a tillage discussion group. The survey will take approximately 15 to 20mins to complete. After which you will be asked if you would like to continue to participate in the study by giving the research permission to use your production data for group analysis.

Confidentiality, how will my information be used?

You will not be asked to disclose your personal details in the survey, however if you wish to continue with the study a copy of your production data outlined above will be requested by the researcher. This information will be stored in a locked file until the end of the study at which point all information will be destroyed. Your information will be used in an anonymous manner stored in a separate file to your contact details and your identity will be protected using an ID key.

Appendix 2: Farmer Survey

Tillage Discussion Group Questionnaire

1. How many years (approx.) have you been a member of a discussion group?

   _____

2. What was your main reason for joining a discussion group?

   _____

3. Is the social aspect a key element to your attendance?

   ☐ Yes ☐ No

4. Are you using the information discussed at meetings on your farm?

   ☐ Yes ☐ No

   If yes, how?

   _____

5. Do you think your discussion group is stimulating enough for you?

   ☐ Yes ☐ No

   If no, why not?

   _____

   _____

6. Would you encourage other farmers to join a discussion group based on your experience?

   ☐ Yes ☐ No

7. If there was no payment involved would you still partake in a discussion group?

   ☐ Yes ☐ No

8. Do you carry out plant counts as a means of monitoring components of yield of your crops?

☐ Yes ☐ No

If yes, when did you start this and why?

_____

_____

9. Has your use of plant counts to monitor crop establishment changed your decision making or how you manage crops?

☐ Yes ☐ No

If yes, how so?

_____

_____

10. How much land are you currently farming?

Under 30 acres ☐

31 – 60 acres ☐

61 – 90 acres ☐

91 – 150 acres ☐

151 – 250 acres ☐

Over 250 acres ☐

11. What age bracket are you in? (Tick the box)

☐ < 20

☐ 21 – 25

☐ 26 – 30

☐ 31 – 40

☐ 41 – 56

☐ > 57

12. How many years have you been involved in the decision making on the farm?

_____

13. Do you have an agricultural qualification?

☐ Yes ☐ No