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How Knowledge Transfer Impact Happens at the Farm Level: Insights from Advisers and Farmers in the Irish Agricultural Sector

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Abstract: Many studies show that interaction with agricultural advisory services impacts productivity and profitability on farms. However, less attention is paid to explaining how this impact is achieved. This paper explores the factors that determine the implementation of newly learned knowledge from advisory engagement to achieve an impact on farm level performance. Focusing on the Irish case, a series of semi-structured interviews from a purposive sample of advisers and farmers from the more profitable dairy sector were undertaken to analyse the key drivers of impact. Results show that a combination of group-based and individual activities based on relevant content focused on key management practices for grassland, breeding, and financial management were key to achieving impact. Furthermore, positive outcomes were dependent on a high degree of trust between the farmer and the organisation, between the farmer and the adviser, and between the farmer and their peers. The findings indicate that while some barriers remain for farmers to apply newly learned knowledge, those that do implement the practices report a positive impact. This has implications for knowledge transfer design which is timely given the focus on these activities in the upcoming Common Agricultural Policy 2023–2027.

Keywords: knowledge transfer; advisory service; impact; trust

Citation: Cawley, A.; Heanue, K.; Hilliard, R.; O'Donoghue, C.; Sheehan, M. How Knowledge Transfer Impact Happens at the Farm Level: Insights from Advisers and Farmers in the Irish Agricultural Sector. *Sustainability* **2023**, *15*, 3226. https://doi.org/10.3390/su15043226

Academic Editor: Jianming Cai

Received: 29 December 2022
Revised: 27 January 2023
Accepted: 1 February 2023
Published: 10 February 2023

1. Introduction

Many studies show that interaction with agricultural advisory services influences farmer technology adoption, productivity, and profitability [1–7]. Farm advisory services act as a policy lever to influence farmer behaviour that can assist in achieving policy objectives. The new Common Agricultural Policy (CAP) 2023–2027 acknowledges the importance of advisory services as a tool to share knowledge by increasing investment under stronger Agriculture Knowledge and Innovation Systems (AKIS) to boost the dissemination and uptake of new farm practices [8].

Advisory services or Knowledge Transfer (KT) services facilitate the dissemination of advice and learning both from advisers to farmers and also through encouraging peer-to-peer learning through participatory activities, such as discussion groups or events. However, less attention in the literature is paid to the underpinning processes that explain how this impact is achieved. Further, many of the existing studies prioritise the service provision in terms of how the service is organised and delivered, as opposed to examining the experience for the recipient, namely the participating farmer, and the factors that influence their motivation to participate, their learning, and the application of newly acquired knowledge to achieve a positive impact.

This paper develops on this premise by exploring the factors that lead advisory participation to realise a positive impact on farm level performance. This analysis assumes farmers are primarily motivated to participate in KT for productivity and profitability gain as opposed to alternative motivations, such as environmental considerations.

Focusing on the Irish case, quantitative evidence shows that client engagement with advisory services achieved a positive impact on farm profitability, particularly for the dairy system, which has consistently shown to be the most profitable sector in Teagasc National Farm Surveys [9]. Through a series of semi-structured interviews from a purposive sample with both advisers and farmers in the dairy sector, this paper analyses the key themes that drove this positive impact. The paper concludes that a combination of activities, relevant content, and a high level of trust were central to achieving impact.

The remainder of the paper is structured as follows. First, the context for the Irish advisory service is provided, followed by an overview of the existing literature in order to justify the contribution. Next, the methodology is explained along with an overview of the data collected. Next, the results are presented followed by a discussion of their implications. Some final conclusions are then provided.

2. Background and Approach

Agricultural advisory services have facilitated the transfer of knowledge to farmers for several decades with a multitude of formats, activities, and content to influence farmer behaviour, problem-solving, and decision-making [10,11]. The extension service in Irish agriculture is provided by both public and private consultants. Teagasc is the main body for the public delivery of agricultural research, advice, and training established in 1988. Teagasc is unique in that it operates an organisational structure that recognises the importance of combining research with effective KT [12] by allocating 35% of its annual budget to the Knowledge Transfer Directorate, with 23% of this allocated to advisory services and the remainder to education [13]. KT clients also pay a fee for service that generates additional income to fund the KT service.

Teagasc delivers advice to approximately 45,000 clients per annum with the level of intensity of participation dependent on client demand, and ranges from a basic service with access to the latest research, events, and a scheme assistance plan to more intense services that include monthly discussion groups and on-farm consultations. This service is facilitated through 55 locations nationwide with over 250 advisers employed across all functions [9].

2.1. Theoretical Framework

Knowledge can be differentiated from data in a raw format, or information labelled as a pattern drawn from data, by requiring a product of human reflection and experience to process that information [14]. These concepts can be distinguished hierarchically with knowledge setting the contextual background to interpret information that has been initially derived from data [15]. Information is primarily descriptive whereas knowledge can be thought of as prescriptive or an evaluative summary of a particular task, topic, or recommended advice [16]. Within this context, farmers seek advice to improve their knowledge which can frame their decisions, refine their preferences, and create options to improve their performance [17]. This interpretation of knowledge implies a deeper level of 'knowing' than either data or information. Preceding knowledge can help to organise new data and information, but it is knowledge that is needed for interpretation [18].

There are various forms of knowledge defined in the literature that can be divided into explicit or implicit formats which create different challenges for transfer. Explicit knowledge is a codified format that is typically documented into formal rules and processes, whereas implicit knowledge or 'tacit' knowledge is what is known by the owner but is difficult to explain [14]. Tacit knowledge is gained through experience, or 'learning by doing' [19], and is typically retained by the individual alone, as each experience differs. Farmers identify their perceived optimal strategy for production based on their inherent tacit knowledge

of local conditions, as well as their interpretation of explicit knowledge stemming from research [20]. Knowledge can be divided into typologies in the form of 'know-what', 'know-why', 'know-how', and 'know-who' with differing roles for each. Know-what is largely codified knowledge about facts. Know-why is knowledge of principles, technologies, and regulations. Know-how is the skill to practically apply knowledge (largely based on tacit) and know-who is the ability to network to increase knowledge [21].

The agricultural sector embodies various forms of knowledge, but the difficulty of transferring this knowledge is the key challenge. The transfer of knowledge refers to creating knowledge in one location and putting it to productive use in other locations [22]. Knowledge can be transferred explicitly through communication from one unit to another, such as following instructions, or implicitly, for example, when knowledge is absorbed by following a routine [23]. Explicit codified knowledge is less problematic to transfer but overly technical knowledge can pose challenges, such as extracting knowledge from big data [24]. Implicit or tacit knowledge may not be captured through standard verbal reports and an alternative approach is needed to measure its transfer [23,25] but is critical to facilitate innovation and important that farmers are willing to share this knowledge [26]. It is more likely to transfer tacit knowledge in a networked environment that fosters participatory learning [27] or through an apprenticeship format [28].

Agricultural KT services differ from those applied in organisations and firms mainly due to the diverse and fragmented structure of the agricultural sector. Agricultural KT can be thought of as a 'systematic process' that assists farmers in multiple ways [29]. In this study, we assume the primary purpose of agricultural KT services is to improve farm performance by connecting emerging research with farm practices such as through the introduction of new technologies [5]. Agricultural KT aims to enhance farmers' capabilities to improve their farm performance through improved problem-solving skills. The ability of farmers to interpret, learn, and implement new knowledge depends on their absorptive capacity to initiate a successful knowledge transfer [30]. Once the benefit of a KT intervention is recognised, absorbed, and implemented [31], positive spillovers are likely with the 'neighbourhood effect' of peer influence [25], which can be targeted in specific areas to achieve impact [32]. The perceived value of participation and resulting impact is likely to increase the uptake more widely as the knowledge is diffused to larger audiences [33,34]. For example, US farmers adopted products of agricultural biotechnology which required additional knowledge and action once they recognised the advantages over conventional products [35].

There are a number of theoretical complexities surrounding evaluating KT impact given the pluralistic nature of KT services and the varied methodological approaches [36]. A theoretical framework is necessary to refine the focus into a meaningful form to identify a 'best-fit' model to address the research question of interest as advocated by Birner et al. [37]. This framework enables researchers to identify their 'best-fit model' to conduct evaluation studies focused on selected variables [38,39]. Accordingly, this research adapts the framework of Birner et al. to investigate a pathway of impact from KT participation to farm level profitability gains. The Birner et al. model outlines the various factors that can influence KT impact and breaks them down into contextual factors (Boxes A–D), the structure and organisational considerations (Boxes E–H), performance (box I), the change at farm household level (Box J) and ultimately the impact achieved (box K). This study focuses on the performance, household and impact achieved, so we refine the focus to specific aspects of the model (Boxes I–K) to adapt the analytical framework into Phases 1–3 to address our research question. Figure 1 illustrates the adapted framework focused on the key variables from the Birner et al. model to simplify the framework into phases of the KT process that lead to impact.

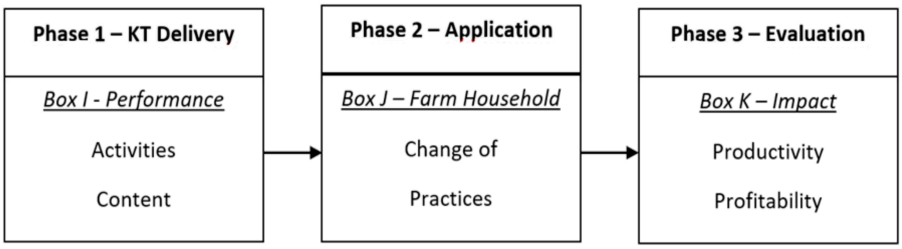

Figure 1. Condensed conceptual framework adapted from Birner et al. [37] —KT process.

This research focuses on the KT interaction where the performance of KT takes place, which involves both advisers and farmers (Phase 1), before focusing on the farmer's decision to implement the knowledge in the farm household (Phase 2), and finally evaluating the impact achieved as a result of that decision (Phase 3). This condensed framework focuses on specific variables within these phases to identify a pathway to impact from KT. The semi-structured interviews were designed to collect data to better understand these factors. The capability of advisers to provide KT is mirrored by the absorption and implementation by farmers to examine the process of how the impact is achieved.

The pathway illustrates where each aspect of KT occurs and the key themes that underpin this help to explain how KT impact occurs. The first phase of focus is the performance phase where the KT interaction is carried out through a particular activity, such as a one-to-one consultation or discussion group, and on specific content related to farm level performance focused on grassland, breeding, and financial management, which are key practices on dairy farms. The next phase focuses on the farm household where the farmer decides whether to utilise the advice and apply the new knowledge or not. The implementation is a key factor in understanding how farm households operate and remain viable [40]. The result of this decision to implement is the key focus of the analysis in order to explain the impact achieved at the farm level. Finally, the impact is defined as the resulting change in farm level productivity and profitability based on the assumption that changes in farm level management due to newly applied knowledge increases yields and, therefore, profitability.

It is important to note that these are the impacts focused on in this study, but there are many other impacts, including environmental and social impacts as illustrated in the Birner et al. framework, which are also important. However, to refine the focus of this study, these phases and the factors that surround these phases are isolated to explain how KTs impact farm level productivity and profitability is achieved. The approach taken here illustrates a pragmatic method to utilise the overarching Birner et al. framework to address a specific research question of interest, and further studies on other impacts could adapt the framework to suit their area of focus.

2.2. Literature Review

The literature on KT is comprehensive in terms of organisations and firms, but is somewhat limited in terms of agriculture given the associated complexities of conducting the analysis. Butler et al. [41] commented on the difficulties of treating 'farms as firms' due to their familial base, multigenerational approach, and specific immobile locations. Studies that focus on the farmer side of KT impact are less common and this study aims to address this research gap. Furthermore, the literature shows that providing and explaining the impact of KT on the farm level can be subject to debate given the complexity of assessing the performance of multi-method activities on a disparate range of outcomes [18,42].

Much existing evidence focuses on the delivery of KT services, as opposed to the receipt of the advice and resulting application and the impact on the farm level. For example, Kilpatrick and Johns [43] used qualitative methods to examine the diverse patterns of how farmers learn, but fall short of explaining how this learning is applied to improve farm performance. Similarly, Ingram [44] identified the ways knowledge can be exchanged between agronomists and farmers through a partnership-based relationship but did not

develop the importance of trust and credibility that underpins these relationships. Prager et al. [12] focused on the influence of the increasingly commercial nature of KT services and how that has impacted the quality of service. They differentiated between the preparation of the advisers, and then the exchange of knowledge that occurs and found that the sector has become increasingly fragmented with a need to further integrate and coordinate the supply of advice. However, in a subsequent paper, they found that this fragmentation can be partially offset though improved linkages and cooperation among actors [39]. These examples highlight that analyses tended to focus on the impact from the perspective of the service provider and to a lesser extent on the subsequent action resulting from applying newly acquired knowledge for the recipient and the resulting impact. This research addresses this research gap by evaluating the farm-related performance due to the application of the knowledge at the centre as a distinct contribution to the literature.

Several key themes emerge from the literature on the aspects that underpin effective agricultural knowledge transfer. These include the motivation to participate in the service [32,45], the learning that takes place in the knowledge exchange [25,46,47], the implementation of newly acquired knowledge [21,48,49], and the importance of trust throughout the process [14,50–52], as well as the respective roles within the process for advisers [53] and participating farmers [54].

2.2.1. Motivation

The motivation to participate in KT services is a key methodological issue to evaluate impact given the voluntary nature of participation [55] based on perceived benefit to the farmer [56]. There is evidence that farmers who participate are inherently different [57], with more skilled farmers more likely to participate [5]. Moreover, farmers who actively solicit advice are more likely to follow the recommendations of that advice gained through KT interactions [41]. In contrast, farmers may not seek advice due to a lack of interest or readiness to cooperate with others which can be based on internal factors, such as a lack of resources or education [40]. The farmers that participate are likely to be more motivated to learn and implement their newly acquired knowledge, but less is known about the resulting action taken and this research extends this gap by examining both the initial motivation to participate, as well as the motivation to implement the resultant knowledge gained.

2.2.2. Learning

Concomitant with the motivation to participate is the desire to learn and improve performance [49]. Learning takes place once new information is combined with existing background knowledge, and upon reflection on the merits of what is learned, action is taken [32,47,58]. However, the learning preferences of farmers are diverse and KT activities are organised to reflect this through the different types provided [59]. The learning is likely to vary for participants based on their absorptive capacity, as well as their preference for learning whether through traditional top-down learning or group-based interactions [25]. Within the context of KT-related impact on farm performance, the types of activities and content that are most relevant are not well understood. This analysis bridges this gap by providing evidence on the type of KT activities deemed to make an impact by participants in terms of group or individual-based formats, as well as the specific content transferred.

2.2.3. Implementation

Following the transfer of new knowledge within a KT exchange, the impact is dependent on the farmer 'taking action' and implementing what they have learned [60]. It is important to distinguish between intent and actual behaviour which may be incompatible in certain cases [61]. However, the process of converting newly learned knowledge into taking action on a farm is not widely discussed in the literature, although it is acknowledged as a result of a rational decision-making process [51]. This decision occurs in the farm household phase of the adapted theoretical model and relies on the acceptance of the new knowledge as beneficial to the farm. The influence of the adviser and peers are

both important factors in the utilisation of KT advice [39]. There is evidence that these influences affect the adoption and accuracy of action taken by participants [42,57], but these studies have not been applied in an agricultural context. This analysis addresses this gap by discussing the factors that motivate farmers to implement new knowledge and improve their understanding of the key influences that drive this decision-making process. Participating farmers were explicitly asked to provide examples of new practices they had implemented as a result of what was learned in a KT exchange.

2.2.4. Change of Practice

A common theme in the literature surrounds the importance of trust in KT exchanges, and that a high level of trust increases the ease of knowledge flow between actors [37,47]. Fisher [50] argued that a farmer's confidence and trust in the process of KT are critical to converting knowledge into action on the farm. This trust refers to trust between the farmers and the organisational individual trust with farmers and their adviser [51], and trust among farmers and their peers within group-based formats [47], which all depend on a shared understanding of common objectives to achieve an impact [46]. This trust is fostered through regular contact and consistent content and service [50]. The dynamics of these relationships and the evolution of the service pose challenges to this trust. For example, the replacement of advisers, or new members participating in discussion groups, or an organisational shift towards innovation-based services as opposed to scheme assistance provide additional challenges, and these nuances are investigated further in the interviews.

2.2.5. Research Question

These themes were central to the research question and design of the qualitative analysis. The overarching research question stems is:

- How is knowledge transferred, absorbed, implemented, and then impact achieved at the farm level?

This research question aims to explain *how* KT makes an impact. This includes the type of KT activities and specific content employed, as well as the respective roles of both advisers and farmers in achieving impact. Further questions stem from the research question that provide additional insight into the perceived 'value' placed on the KT service that motivates farmers to participate and their learning preferences. Furthermore, the nature of the relationship between the adviser and farmer is explored, as well as the importance of trust in the decision to implement new knowledge. By incorporating the key themes discussed, this research highlights the factors that can be harnessed for future strategies to achieve continued impact on the farm level from KT participation.

3. Materials and Methods

Through qualitative investigation, this paper enhances our understanding of the impact of KT [62] by developing the key themes that surround each component of the framework. A qualitative analysis enables the researcher to address the 'how' questions which can be more useful in understanding the social processes that are inherent in achieving impact [63]. Qualitative research has a practical application in deepening our understanding of the motivations for farmers to apply new knowledge. This is the core objective of this analysis.

3.1. Sample

To address the research question, semi-structured interviews were conducted from a purposive sample. The sample focused on clients from the sector that tended to achieve the largest impact on farm margin from KT interaction, namely dairy farmers in the southern regions of Ireland. Quantitative results consistently show this cohort of farmers as the most profitable farmers in the country, and more likely to participate in KT to drive that profit further [64]. Theoretical sampling, defined as a sampling technique where participants are sought to address theoretical considerations, was chosen because the informants were

deemed particularly suitable for providing insights into the underlying factors that lead to impact [65,66]. Although this is likely to cause a form of bias and does not claim to represent the views of the general population of Irish farmers, it is valid to address the research question by targeting farmers where a KT-related impact on farm performance is most pronounced [67]. Accordingly, this criterion-based sampling approach is strategic in that it draws on insights from sources that are most relevant to the research questions [68–70]. The knowledge and expertise of the respondents based on their respective experiences of KT are deemed appropriate to provide in-depth explanations of the factors that drove impact. The inclusion of other farmers from different regions or farm types, or where a KT-related impact may be more limited would likely yield different results that would enrich this analysis and could be the basis of future research.

On this basis, clients and advisers based in the south or Ireland were purposively selected after an initial pilot was carried out with an adviser and farmer. There are twelve advisory regions in Ireland, and the sample prioritised the regions where dairy farming is more prevalent and selected an adviser and farmer from different regions to capture different contexts. Advisers were initially contacted on the basis of their experience with Teagasc. These advisers were asked to nominate a client that has held a KT annual contract with them over a significant period and achieved a positive impact from their engagement. They responded by nominating farmers who they perceived as successful and who were most likely to implement newly acquired knowledge attained through KT engagement. These farmers were labelled as 'progressive', indicating a willingness to utilise extension as a method to learn how to develop their farms [43]. They could be categorised as resource maximisers, in that they behave proactively and strategically to maximise their efficiency of production [40]. The relationship between the adviser and farmer provided an additional layer to the analysis, as all pairs had worked together and established relationships over time as each pairing had worked together for a minimum of 9 years and a maximum of 20 years. These intentionally selected participants have considerable experience with the key concepts being explored [54] and add to the methodological integrity by addressing the research question through insightful experiences [70].

A total of five advisers and five farmers were interviewed from five different locations in the south of Ireland The advisers are referred to as AA, AB, AC, AD, and AE, and the farmers are referred to as FA, FB, FC, FD, and FE. The number of interviews is similar to previous studies that focus on farming and, given the specificity of the research question and sub-questions, data saturation was reached in that no new themes or concepts emanated from the data [40]. The criterion for selection ensured consistency in terms of distinct experiences that provided in-depth information to address the research question [71].

3.2. Interviews

The interview schedule was designed in a semi-structured format to allow for flexibility in the direction of the response [65]. It is important to note that particular questions may not yield the expected evidence [39], which can be problematic if the interviewee departs significantly from the topic of interest and runs the risk of an unstandardised data set that is difficult to code [65]. However, the benefits of allowing the interviewer to ask probative follow-up questions on unanticipated factors can lead to an enhanced understanding of the subtle factors that explain why an outcome is achieved [72]. Accordingly, the questions were designed to stimulate conversational answers so the key themes could be extracted from the responses. To control for the broad and diverse responses, guidance was provided on specific types of KT content, namely grassland, breeding, and financial advice, in line with the key management practices for dairy farms.

The interview schedule was developed based on two main criteria. First, the key themes that emerged in the literature were adopted to ensure the analysis made a distinct contribution. This included the motivation and learning of farmers, the role of the advisers, the importance of trust, and the motivation to apply the new knowledge. Second, the

research question was designed to develop the limitations of existing evidence or theoretical gaps, namely, to explain the factors within the KT process that drive impact.

After an initial pilot, the interviews were refined to a series of questions that were mirrored for both advisers and farmers, with the exception of their roles in achieving impact from KT. Thus, both were asked to provide examples of KT activities that led to an impact on the farm level, and to explain the process involved. The activities and content of most relevance were examined. Advisers were asked about the key aspects of KT that drive farm level impact, their role in the process, and how they can motivate farmers to implement new knowledge. Farmers were questioned on their motivation to participate, their learning preferences through KT activities, their willingness to implement new knowledge on the specific practices of grassland, breeding, and financial management, and to evaluate the impact on their farm.

The interviews were conducted over the period from 17 May to 1 June in 2017. On average, interviews lasted 44 min (range 28–58 min) with advisers and 28 min with farmers (range 24–33 min). All adviser interviews took place in their office whereas all farmer interviews took place on their farm. Interviews were digitally recorded and transcribed verbatim before being coded for analysis. Interviews were conducted on a face-to-face open-ended basis, which allowed participants to elicit and develop their recollections [69]. Thematic analysis was used on the transcripts to identify the key overarching themes and patterns from iterative reviews of the responses [65] and to identify linkages with the themes identified in the literature review.

3.3. Coding

Theoretical coding was undertaken which was further synthesised into key themes. The codes were inferred from the theory, and the data were organised into segments of these pre-selected themes [65,69]. These themes were then supported with quotations from participants. Following Lichtmans' three C's approach of coding, categorising, and developing concepts [73], themes were drawn in line with those identified in the literature. Lichtman identified a six-step process to develop these themes as follows:

i Initial coding.
ii Revisiting initial coding.
iii Developing an initial list of categories.
iv Modifying the initial list of categories.
v Revisiting the list of categories/sub-categories.
vi Moving from categories to concepts.

Concepts are then discussed in detail supported by key quotations from the data and compared to the main themes identified [69]. The coding approach followed the pathway from the adapted Birner et al. framework to categorise the data in a format that captures the pathway to impact from KT participation. The first-order codes were derived from the responses and then organised as per the adapted Birner et al. framework. Next, these codes were classified into second-order codes as per the phases of interest in the KT process. The roles of the adviser and farmer in achieving impact were analysed to illustrate their influence and which themes are most relevant. Finally, these concepts were analysed with the key overarching themes identified in the theoretical discussion to address the research question. Figure 2 illustrates the coding approach.

The findings are presented through a format of 'proof quotes' and 'power quotes', as suggested by Pratt [74]. This method provides credibility to the analysis by highlighting the main 'power' quotations that reinforce the key themes identified, and then supporting these arguments with additional 'proof' quotations. Power quotes are those that are where the informant delivers a point concisely that the author could not improve. Proof quotes, on the other hand, are used to show the prevalence of that point [74].

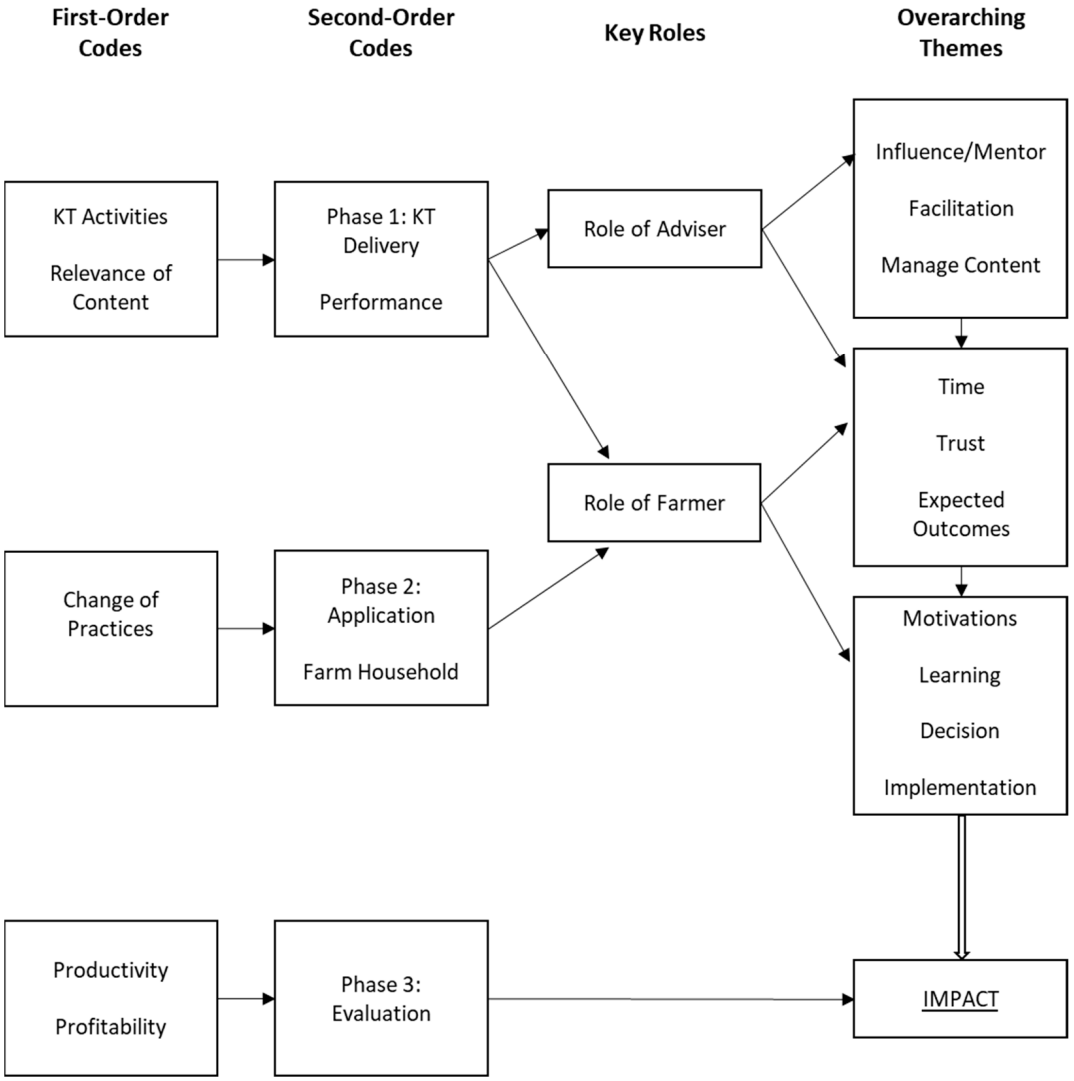

Figure 2. Coding approach.

4. Results

The research question of how the impact is achieved through KT encompassed all interviews and was developed in line with the framework, but participants also offered a general answer in their replies. For example, AB commented that "*if you come back to baseline figures of grass utilised right, you've herd size, animal type, stocking rate, farm management, efficiency, they all ultimately lead to one issue of profitability.*" Similarly, FD noted that "*if you listen to the way they [KT providers] operate their own farms it's all about building condition of the cow, building the grass right, building fertility, building milk solids, it all works together, and if you don't buy into it fully you won't get the results.*" AC commented on the perceived impact received by farmers, stating *"I think that the fact that they're continuing to do it each year obviously means that they're finding it good. So it's obviously having an impact on it."*

Advisers themselves were able to monitor the impact of KT practices implemented on the farm through follow-up discussions with farmers based on their performance reports. "*We can see that milk solids, fat and protein percentages have risen, so we can track that from the report each year"* (AA). Likewise, AC commented that these reports show whether a particular management practice '*is actually working*', with AB commenting that '*the figures coming off a report are what they are*'. AE commented that *"the discussion would be on what he should be doing based on the strengths and weaknesses in that report"* (AE). These quotations highlight the positive impact of KT interactions. The phases as per the condensed Birner et al. model are now discussed in more detail.

4.1. Phase 1—Performance

Within the adapted model, performance is the phase where the knowledge transfer takes place through a particular KT activity engagement. While this phase is labelled as phase 1 in this paper, it is important to note that this phase only happens after the KT has been designed and based on the capacity of the KT provider to provide the activity and content of interest to farmers. This implies a circular process where feedback from end users is fed back into the design of KT, which is an important aspect identified in the overall framework but not captured in the adapted model and, therefore, a notable caveat to this work.

Performance is defined as the range of indicators that capture the quality of services and can be assessed in terms of the accuracy and relevance of the advice, the quality, and structure of the partnerships between participants and efficiency [37]. It is the phase where the KT interaction is 'performed'. In this study, performance refers to the KT activities as identified by Black [59], who describes the roles of advisers and farmers whether for individual 'one-to-one' consultations or through group-based interactions, as well as the relevance of the content delivered on the specific management practices of grassland, breeding, and financial management.

4.1.1. KT Activities

Both the discussion group and one-to-one consultation formats were valued by all interviewees, and both were considered necessary to ensure impact. Both were described as complementary to each other (AB, AD, and FC) but performed different functions based on general content which was effective in group-based environments and more specific and at times sensitive content more suited to individual interactions. AE remarked that *"it's a specific problem that's solved by one-to-one".* This was echoed by FB, who stated *"I suppose the one-to-one is probably on a specific, whereas the discussion group can go to anything really."* FD described the example of how a grassland management overview could be provided in a discussion group that shows the steps involved and present results from specific farms. This would then be followed up with an individual fertiliser plan based on soil samples taken and drafted into a plan by the adviser to be followed by the farmer. FC commented that the group formats introduced guidelines on best practice, whilst the one-to-one would be to do with *"contemplating a building project, or land reclamation, or soil sample results. It would be something personal to me."* This complementary nature of both activities is key when considering the deployment of KT resources, but an important consideration is the role of the adviser within each activity.

The role of the adviser differs depending on the type of KT activity, but their ability to influence farmer behaviour is central in both [75]. AB differentiates his role between both activities, stating: *"well on a one-to-one, you're probably trying to guide, educate and bring guys along… within a group mentality, you're probably trying to get them to share their knowledge, you probably say an awful lot less."* AE echoed this view, describing her role as a '*support*' or a '*coach*' in the one-to-one activity, whereas in a group-based format, the adviser facilitates learning through peer interaction. *"In the ideal scenario you're like the referee, you just throw in the ball and they take off with it, whereas in a weaker group you've to do a lot more talking than you should"* (AD). AA agreed, stating that *"a good group meeting goes when we have as little input as possible and they discuss away themselves, but in other groups you've more input and try to keep the thing going and tease out issues."* FE echoed this view and highlighted the role of the adviser, in that "*she gets the best out of us. She gets the information that we need to tell each other. If we hadn't that maybe we'd go and have a chat about sport."* Evidently, the role of the adviser to stir conversation in the group is a valuable skill developed by the adviser. The consensus was that the lower the level of involvement in a discussion group for the adviser, the more impactful the learning and transfer of knowledge for farmers (AA, AB, AD, FC, and FD). Ultimately, however, the effectiveness of the group-based format depended on the participating farmers and their willingness to interact. FC commented that *"the discussion group is about the people in the group. You can have a great facilitator there but if the boy's just want*

to meet up and chat, then that's all they're going to do." In contrast, on a one-to-one consultation, the adviser was expected to intensively participate to *"sit down with a guy"* (AD), *"find out what's going through their heads and try to take them to an end point"* (AB), and *"come back with stuff to follow up on"* (AA). This ensures the intent and action taken were aligned [51].

The impact of each KT activity on farm level performance divided the participants with advisers identifying the one-to-one as superior and farmers favouring the discussion groups. The advisers argued that an increased number of farm visits would increase the beneficial impact of KT due to more intensive consultations and individual plans. AA argued that the one-to-one *"has the most effective way of making change because you're out there dealing with farmers."* AD concurred, stating that *"the one-to-one visits is where you're going to make the most impact . . . where you will see the benefit."* AD echoed this view by using soil sampling as an example which requires individual contact, but also noted the need for additional time to conduct.

In contrast, the farmers identified the discussion group format as superior, with FB, FC, and FE crediting the group interaction as being the most beneficial for their farm performance. The discussion group format enabled participants to direct the content as per their interests with FD noting that *"some fella might say something that you mightn't have thought of."* Similarly, a discussion group environment offered farmers a chance to view a new practice in action to evaluate its viability. *"I suppose going to see other farmers like and seeing how it's working for them. That'd be one of the big things"* (FB). This also highlights the importance of the visualisation of a particular method or practice to stimulate learning and accelerate subsequent action in terms of adopting a technology or practice. As AC described, *"once a farmer sees that this works particularly well for a farmer, they appear to take it on board quicker than if we're [advisers] are telling them solely."* However, the interviews also provided evidence of barriers to group-based participation for some farmers based on sensitive information as *"Some people don't like mixing with other people when they'd be disclosing personal information"* (FA).

Discussion groups also provided an environment for knowledge sharing which was also identified as a driver of impact. FD stated that *"sharing information at the meetings opens up your eyes to where you are. . . it will kind of push you to improve your figures. It pushes you to improve"* However, the extent of sharing could be limited particularly in relation to sensitive financial information around investment plans, which suggests concern over trust and openness. AA commented that group interactions were effective as farmers were *"discussing issues and problem solving among themselves. . . they'll always come away with something."* Peer-to-peer learning is widely acknowledged in the literature and AD argued that "*it's a lot better because. . . that's exactly what they want to know."* FD noted *"that the more you can learn from other people the more you can change, benefit your farm*." The consideration of multiple sources of advice can improve the judgment and decision-making process of users [42].

The Birner et al. [37] model also identified other forms of impact from KT participation that arose in the interviews. The social aspect of the discussion groups was praised by many participants. AE identified the social aspect as beneficial as it provided an opportunity to socialise and discuss issues with peers, which is important given the solitary nature of farming in Ireland. The farmers also outlined the importance of meeting peers experiencing similar challenges, with FB stating it was beneficial to mental health. FA echoed these sentiments, stating that *"you'd leave less stressful on whatever would be worrying you at that particular time"* after attending a discussion group meeting. This bond developed with participants is central to the 'know-who' element of knowledge transfer [21], where a network of colleagues is developed through the discussion groups. Additional quotations are provided in Table 1.

Table 1. Performance: KT activities.

Informant	Comment
AB	There's some material that can be done and be done quite well in the discussion group format, grassland, breeding a lot of those kinds of things. The general kind of management things. But there's other like, when you get back into nitty gritty of some of individual farm details, they need, basically that needs specific one-to-one direction.
AD	I suppose there are, in a lot of areas especially in the financials there's only so much you can discuss in the meeting, whereas on a one to one you can really delve into what's actually happening there, and obviously they're going to open up an awful lot more.
FD	On the discussion group side, it's more or less learning off the other fellas.
FE	Anytime I've ever had a discussion group I've learned from it like. So I'd say I wouldn't be where I am today now without the actual discussion group. You see what you're learning.

4.1.2. KT Content

The content of interest refers to technical-based advice surrounding grassland, breeding, and financial management. Grassland management and breeding practices, which AA referred to as "*the twin towers*" of content, were chosen as technical-based advice to improve farm performance which was supplemented by financial advice through the E-profit monitor tool, which captures the financial performance of the farm to refine the focus of the study. The importance of relevance and credibility was emphasised in the responses, as well as the ease of use in terms of implementing the new knowledge.

Grassland

The optimisation of grassland productivity requires improved utilisation, sward composition, accurate measurement, and improved soil fertility [76]. Grassland management advice is provided in relation to soil nutrition and reseeding, maximising the quantity of grazed grass in an animal's diet to reduce costs and achieve high performance, and guidelines on the management of pasture during each season [77]. FD listed the tasks under grassland management as *"measuring grass once a week, using a rotation planner, mapping the place and improving soil fertility."* Grassland management advice typically takes place in a discussion group environment where a general overview is provided and supplemented with an individual plan specific to a farm which may require a one-to-one consultation.

The interviews revealed that grassland measurement practices were not ubiquitously adopted although the farmers that had adopted them were impressed with the results. Some of the barriers to adoption included the complexity involved in following plans (AB) or the lack of urgency surrounding the uptake (AD). AD expanded that *"the reality is if they don't measure grass they're not going to go broke either. And there's no deadline on it, and it's not a job that has to be done tomorrow, so it'll always be put off."* This suggests a relatively low opportunity cost for non-adoption which is a challenge for advisers to motivate engagement in the practice. AE noted that some clients had difficulty believing the programme, commenting the following:

> *"so the programme says you need to skip two paddocks and it's about having the confidence to actually do it on the ground, to follow what the computer is saying and that's where we come in. . . Once you get them one field reseeded, it works for itself then and you don't have to sell the message anymore."*

Of the farmers interviewed, FB did not follow a formal grassland management plan but did implement an informal plan. "W*e don't grass measure here but, well, we don't do it on paper but we're probably budgeting away the whole time"* (FB). This implies a more informal acceptance of the principles involved without committing to the formal requirements of documenting grass levels. FB expanded that *"we don't go out and do a farm walk every week*

but we'd have a fair idea of what cows are going into or if you're starting to run tight." In contrast, FD fully implemented the grassland management advice received and stated that *"it was saving me money. I wasn't topping as much fields. I was getting more value from the grass."* FC concurred and stated that the positive impacts of implementing grassland management advice were '*mind blowing*'. Following a stepped procedure, he commented:

> *"to monitor the grass, to go where the grass is, where the correct grass is, you graze it at the correct time, you graze it to the correct residual, watching your soil nutrition, watching your reseeding rate to make sure you're getting enough new ground in", and through this approach the benefits were "instant and then there's more after it."*

Breeding

Breeding advice includes bull selection for insemination, whether through the use of Artificial Insemination (AI) or a stock bull, as well as planning calving systems, and was considered impactful KT content due to the codified format and ease of use. Breeding advice typically took place in a discussion group environment where the farmers may ask for additional individual-based advice on bull selection, but it does not require as intensive of a consultation as a fertiliser plan required for grassland management. In terms of the utilisation of breeding advice, AD described that

> *"they [farmers] were going to be breeding anyway. So it's only a case of changing what you are doing. Whereas they're not going to do grassland measurement so you're trying to get them to do something that they're not doing."*

AE described farmer attitude to breeding advice as generally positive due to their recognition of stock improvements through the Economic Breeding Index (EBI), which is provided to the farmer. The EBI is a single-figure profit index that comprises information from sub-indexes related to productivity, fertility, calving performance, carcass, maintenance, management, and health [78]. Essentially, it outlines a value related to the breeding potential of an animal which assists breeding-related decisions, such as bull selection.

The farmers praised the impact of breeding-related KT in improving their knowledge. "[It shows] certain traits to look for, protein, butter fat and the type of cow I want. Things I knew a small bit about but not enough and frog leaps me [in my knowledge]" (FA). FB concurred, stating his bull selection was based on KT advice, claiming that "we probably would have been pushing for bit more yield along with the solids and we definitely see that coming through in the heifers." This reveals a sense of perceived impact from implementing the knowledge received. FC commented that he would consult with the adviser for breeding advice, but the final decision may differ. "I wouldn't take [the advice from] it as gospel no more than I'd take anybody else's opinion as gospel, but I would value his opinion and take everything on board" (FC). This shows the adviser is a valued and reputable source and that their opinion is considered prior to making a decision [17], but independent reason determines the action taken.

However, the interviews also revealed a level of discontent with breeding advice related to the cross-breeding of dairy cows which divided opinions, with FB strongly opposed to this practice and FD and FE in favour. Cross-breeding refers to moving away from traditional pedigree Friesen dairy herds to herds that are cross-bred with Jersey breeds. The argument for this approach is that it increases desirable traits in milk solids which are the beneficial fats and proteins produced, by taking advantage of the hybrid vigour of both breeds while reducing the negative effects of inbreeding [79]. However, a general dislike for cross-breeding by dairy farmers was noted by several participants, particularly around their appearance as to *"what colour they are"* (AE), that they just *"don't like the look of them"* (FB), and even that they are perceived as *"a mongrel cow"* (FD). From a KT point of view, the main issue of contention was in reference to much of the emerging research focusing on the progress of the cross-bred herds, despite the majority of Irish dairy farms continuing to opt for pedigree herds, rendering this as of limited value. FB commented that research should involve *"a bit more balance. . . I don't think they're [cross bred cows] even 10% [of the national*

dairy herd]." AE agreed, stating that farmers felt "*like the swing is going this way and [if] I'm not going with it and therefore I'm kind of left out."* In contrast, FD and FE openly sought out the latest research on cross-breeding and implemented the approach. This highlights the importance of providing relevant content based on the demands of the farmers, and the challenge to align KT with relevant research. AE described her role in delivering advice on cross-breeding as a brief overview before moving on to other topics of more interest within the group.

> *"Well I suppose I knew from the offset they'd have no interest in cross breeding, but having said that coming to the breeding time of the season you'd spend ten minutes kind of doing the teaching role just explaining it. And that's it like. We don't go into the whole thing because people haven't moved that way here, apart from the odd fella, but no that's not something we spend time on."*

In contrast, FE felt this advice was being 'pushed' on the farmers, although he acknowledged that he had implemented the advice and the results were positive. *"It did actually bring up my EBI an awful lot. But that's only through Teagasc [KT] that brought that on. I wouldn't have done it otherwise and that information actually showed it's worth doing"* (FE). This highlights a reluctance to implement KT advice is a constant challenge, but similar to grassland management, once the practice is accepted and implemented, it led to a positive impact consistent with the underpinning research. It also reinforces the importance of the role of the adviser in translating research findings into a format that is desired and relevant for the farmers.

Financial

Financial advice differs from grassland and breeding advice as it is more focussed on business performance or investment plans and is typically delivered as a one-to-one KT activity, although there was also an annual discussion group meeting dedicated to the topic. One-to-one financially based consultations were often reserved for sensitive investment planning advice or for "*big ticket items"* (AB), such as new buildings or land, as opposed to general principles of financial prudence that could be delivered in discussion groups. *"If you're dealing with five-year business plans for banks and preparing financial data the obviously you can't do that in a group"* (AC).

For the purpose of this study, farmer participation in the E-profit monitor system was the focus for financial-based content in a KT exchange. The E-profit monitor is an electronic support tool provided by Teagasc, where farmers can enter their financial data and generate a report on their profitability. This service is facilitated by the adviser and provides insights into the efficiency of the farm (AB) as well providing benchmarks to create plans (FC, FD, and FE). The E-profit monitor enables farmers to evaluate their performance, including the impact of implementing advice from KT services. Four out of the five participating farmers utilised this tool although, in general, the uptake of the E-profit monitor has been quite low among farmers in the overall population. The interviews revealed a number of underlying barriers to engagement which included concerns about confidentiality, credibility, and necessity. In relation to confidentiality, AD commented

> *"I still have guys that think the coop [milk processor] shouldn't know how much it's costing them [to produce the milk]. The information goes into a national database which is available to pretty much every Tom, Dick and Harry, so they don't want to help that system."*

This indicates a strategic concern, as milk processing companies can use the information derived from the E-profit monitor to restrict the price level provided to farmers. By refusing to engage with this tool, AD implied that farmers felt increased ownership over their costs of production, which can be a useful asset for negotiating milk prices. This showed a concern about trust and loss of ownership of information entered into computer databases and the associated guarantees of its security [14]. Addressing confi-

dentiality or privacy concerns is key to encouraging greater uptake of online tools through KT interactions, particularly for financial information.

The issue of credibility was raised in the context of within-group comparisons where *"other farmers can inflate their figures"* (FB). This relates primarily to how self-reported labour is reported under the E-profit monitor system, with some farmers indicating significant productivity gains without concomitant labour increases, which was perceived as unrealistic. In addition, AD and FD also criticised the tool as failing to take into account loan repayments, taxes, and investments.

The issue of necessity also arose in the responses, where the participating farmers appeared to prefer technical-based advice. FA commented on the lack of engagement, stating *"I suppose farmers think they know best in what they're spending or what they're saving but the E-profit is needed for longer term planning."* The use of accountants to manage the finances of farms was also cited by (FB) as a barrier as they already received a detailed overview of their finances without needing this additional tool. These challenges must be overcome to ensure financial-based KT interactions yield a greater impact for participants. Additional supporting evidence is provided in Table 2.

Table 2. Performance: KT content.

Informant	Comment
FD *(grassland)*	We've probably been improving soil fertility here for the last 5 years so again that was through Teagasc as well.
AA (*breeding)*	I mean you can, we can see farmers there where their yield per cow might be 350 kilos of milk solids 4 or 5 years ago right. Now we can see they're gone way over 400. And their fat and protein percentages have risen also.
AE *(financial)*	[Financial advice] is a good thing because it's a base to measure yourself off of, and how to improve each year and see [performance results].

4.2. Farm Household

The farm household is the phase where the farmer decides whether to implement their newly learned knowledge. The role of the farmer in achieving impact is less common in the literature, although there are studies on farmer learning [43] and KT exchange preferences [44]. However, there is a lack of evidence as to the factors that drive the KT impact, including the motivation for farmers to apply or implement what they have learned. Any impact achieved by KT is dependent on the use and uptake of that service by clients [37].

The decision to implement new knowledge is dependent on intra-household decision-making processes and the farmer's belief in the validity and relevance of the KT content, its suitability for implementation on their farm, and the ease of use. The farmer must *"try to decipher from all the information they're getting to make it [KT content] relevant to them"* (AB). FC commented, *"I personally would find most of it [knowledge] easy to take it back and trial it anyway. I've trialed things and they haven't been suitable. I've trialed other things and they have been suitable"*. This implies a willingness to implement the knowledge without a necessary expectation of impact. Whilst some specific KT content may not suit all farms, taking a holistic approach to the content was of benefit to the farm. *"But if you listen to the whole thing. . . it all works together whereas if you don't buy into it fully, you won't get the results out of it"* (FD). To understand this process more clearly, farmers were asked to provide examples of implementing new knowledge gained from KT on their farms, both in terms of a change of management practice and/or a change in production methods.

Change of Practice

An important influence on the decision to apply new knowledge was dependent on the learning that took place. The farmers interviewed were described by their advisers as 'progressive' and more likely to implement new knowledge on their farms. However, the

responses implied that this may not be the case for all farmers with significant barriers to implementation discussed. FC commented that although he finds it reasonably easy to learn in a KT interaction, "*for a lot of people it's just mental stumbling blocks*" that restrict them from learning and utilising new knowledge. FE and AE also commented on a general reluctance from some farmers to implement new knowledge due to preconceived opinions on the value, with some actions described as a '*waste of time*', particularly for grassland management advice. FD expanded by commenting that "*there's probably an hour and a half walking the farm once a week, and a lot of fellas would say that's too long but it's probably the best time ever spent when you do it*." In addition, a reluctance to implement a new practice based on fear of "*what the neighbour might think*" (AD) referring to farmers walking their land, as well as a fear of confirming financial losses through the E-profit monitor (FE).

Another barrier to implementation raised by the advisers was the associated 'paperwork' attached to a KT initiative in terms of recording and documenting progress. AC commented that "*I think they [farmers] get overwhelmed*' and AE expanded, stating that '*a lot of farmers farm because they like farming animals and driving tractors. They probably never liked figures and this involves figures and writing*." These examples show that incentivising engagement is one important aspect of the KT process, but ultimately it is the application of the knowledge gained that will lead to an impact.

AB argued that the key to effective KT was to provide simple information, giving an example of a grassland management strategy. FA agreed, noting that the knowledge delivered in KT was easy to follow as "*they do explain and go through it slowly and they do it several times*." FB provided an example of his learning experience related to breeding practices, commenting that

> *"where I was starting off, I hadn't a clue what some of the figures meant. . . but we sat down and went through them and that was one of the most important things for me because from then on we've kind of been focusing on what we're looking for."*

The initial learning took place in a discussion group environment followed by a specific breeding plan drafted in conjunction with the adviser on a one-to-one consultation. These examples show a necessity for clear and coherent messages to ensure knowledge is understood and learned in KT interactions, whereas an overreliance on complex information was implied as a significant barrier to absorption by AB, AD, and AE. This raises issues around the "*follow through to correct a problem. . . But once they hear the benefit they're on to run with it"* (AE). The credibility, clarity, and replicability of advice are important preconditions to facilitate learning.

Another factor that influenced the decision to implement a change in practice was the recognition of the value of implementation rather than a coerced imposition enforced by a policy-based regulation. AB commented that "*the problem is if I tell you to take a soil sample because you need to take a soil sample to comply with 3 rules and regulations in terms of nitrates, cross compliance, you see no benefit in the world of doing that."* The challenge for KT providers is to motivate farmers to utilise and implement the advice to ensure impact. FB remarked "*sure you could be giving fellas more advice and information like, but unless they're going to go home and change what they're doing like. . . made the difference money wise."* AB described these farmers as most likely to implement new knowledge on their farm as *"the lads with a greater appetite, willing and looking for this information. Look at, it makes their farm more profitable at the end of the day."* This type of farmer was also referred to as '*go-getter's*' (AE), or '*like-minded, go-ahead farmers that drive each other'* (FC), which refers to the 'progressive' farmers [19]. However, AD cautioned that some farmers may not implement new practices on the farm despite their claims [61]. He explained that "*you have the guys in the group who you ask the question and they have the perfect answer every time. . . and then you go out on to the farm and it's an absolute disaster and they're not doing anything that they're talking about*." AD admitted that the reverse can also occur, stating "*so you do get it both ways*."

The diverse motivations and preferences of farmers were identified as the primary challenge. AD stated that his strategy was that he "*always picked out 4 or 5 lads to focus on, to try and get them to take up the grass [land management] and hopefully 1 or 2 might stay at*

it." This implies the majority may not implement the advice received and signals a role of 'championing a practice', which FE explained as "*it takes a long time to get farmers to do anything I suppose. . . some people will say why are you walking around measuring grass it's a waste of time like*." This refers to the practice of physically walking the land to estimate the grass covers more accurately, which was claimed as "*one of the biggest management changes*" (AB), but one that is time-consuming. FD valued this time, as noted above, to plan efficient grassland management. This reinforces that once the value of a practice is recognised, farmers were more inclined to implement a new practice, and these responses suggest a beneficial impact from that decision. The interviews implied that presenting evidence of impact was still insufficient to persuade all farmers to adopt certain practices and, therefore, additional motivating incentives were required to increase uptake. Additional evidence is provided in Table 3.

Table 3. Farm household: application of knowledge.

Informant	Comment
AD	What I find is that you have a few guys who actually went away from farming and maybe went away to college for a while and they come back and they've great attention to detail and everything has to be measured, and they're the best farmers you'll get. Whereas the lad who was brought up on the farm, the father never did it, the son doesn't do it and it's hard to change that mentality.
AE	We're trying to get farmers to grass measure right. And again there's people who, from the first time it was introduced hopped on the bandwagon and went with it and saw the benefits. And there's some and they're listening to it like all those years later and they'll never grass measure, ever.
FC	It's interaction with other farmers, it's giving you confidence to go a little tighter, to go closer to what is the ideal instead of staying in the comfort zone. Going to see other people and how they're doing it, that look it can be done.
FD	If you don't think it's going to work, you're not going to implement it.

5. Discussion

5.1. Interaction of Key Themes with Condensed Conceptual Framework

The interviews sought to address the key question of this research, namely how KT impact is achieved at the farm level to enhance our understanding of the factors that drive impact. Several authors have acknowledged the complexity of addressing this question given the multiple factors involved [32,36,42]. The findings show that the process of KT is underpinned by multiple factors that lead to impact. The impact was achieved through interaction with a skilled adviser and a trusted network of peers, a combination of KT activities, and relevant, credible, and useable content, the willingness to apply new knowledge, and then the impact of this decision. Both the one-to-one and participatory discussion group formats were considered complementary, although advisers and farmers differed on which activity was more impactful. The relevance of the content delivered in KT must be adapted to the demands and interests of the farmer, to ensure engagement, learning, and application of newly acquired knowledge. An increased role in KT design for farmers would increase the relevance of the content in terms of demand-led focus [72]. The findings also imply that the motivation of farmers to apply new knowledge depends on their learning experience, the visualisation and suitability to try practice on their farm, and how they must trust the process lead to an impact from KT interaction.

These factors align with several key themes in the literature and this discussion aims to synthesise them to emphasise the contribution of this analysis. These themes interact with the phases of the adapted Birner et al. framework [37], as well as include a critical role for both advisers and farmers. The role of the adviser is to lead the KT activity whether as a source of expertise on a one-to-one basis or as a facilitator in a discussion group and to translate the content into an interpretable format for farmers. The role of the farmer centres on their motivation to participate, their learning, and their application of newly

acquired knowledge at the farm level to achieve a positive impact. Figure 3 illustrates this interaction and captures the overlap from within the phases and the differing roles.

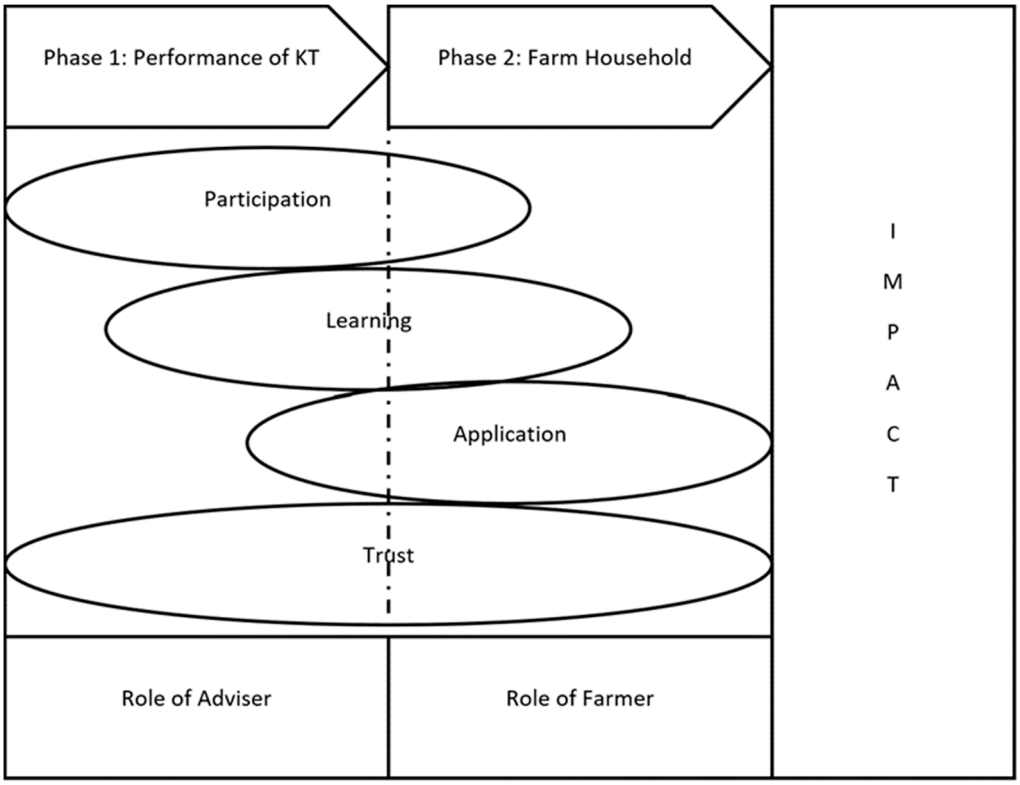

Figure 3. Interaction of KT impact with key themes.

5.1.1. Participation

The data collected confirmed that farmers vary in their motivation to participate in KT programmes, with advisers commenting that 'regular' clients were likely to continue to participate (AE), from a perceived value in the knowledge gained (AC). AD continued that these are the 'stronger' farmers who are proud to showcase their results to their peers but that the vast majority of farmers (estimated at 80% of the total population) do not participate in discussion groups for various reasons, one such example highlighted by AD is that "they know they're not the best farmers in the world, and their figures aren't going to match up". The financial incentive to participate in KT was also raised, with FB acknowledging that it was an influence on his decision to participate in the beginning but, with the exception of five or six dropouts when the incentive expired, the original group members have remained and those farmers were of the most benefit to the group in terms of collaborative learning. This implies that although financial incentives may influence the initial decision to join a group, the continued participation is dependent on the perceived value received in terms of the learnings, particularly from peers. Based on these insights, providing evidence of a positive impact from participation, as well as recruiting farmers of similar motivations, is likely to increase participation further in group-based KT activities.

5.1.2. Learning

The KT activity is important for fostering an environment for learning for farmers, but in order for learning to take place the absorptive capacity [30], the ability to reflect and implement new knowledge [32,41,47] is critical. The findings develop on these themes both from the importance of learning from the adviser (AB and AC) as well as their peers (FB and FD). The diverse learning preferences of farmers have been commented on in the literature [2,43], with a consensus that a 'one-size-fits-all' approach is inappropriate given that the diverse learning preferences and KT service providers have responded by

providing different types of KT activities. The findings reveal a dichotomous view on the impact of the KT activity type, with advisers favoring the one-to-one consultation and farmers suggesting discussion groups as most impactful with the findings, highlighting the importance of trust within each type of KT activity. However, both advisers and farmers acknowledged a need for both types as being complementary to achieve an overall impact and how different cohorts of farmers may or may not participate in group-based activities.

The challenges of learning were highlighted in terms of difficulties farmers may have in understanding often complex material (AB) and dealing with financial information (AA). Experiential learning through the visualisation of a practice was also identified as an effective method for learning (FB and AC). A high level of education was also identified as beneficial for absorbing new knowledge, with young farmers who have gained university degrees identified as the 'best farmers' in that they give the best attention to detail and implement new practices, as opposed to farmers who imitate what their predecessor had 'always done' and tend to miss out on opportunities (AD).

5.1.3. Application

The delivery of KT services is an organisational or adviser-based task, but the application of the knowledge to impact farm performance is the role of the farmer. The farmer must choose to engage, be willing to learn, rationally weigh up the costs and benefits of applying new knowledge, and evaluate its impact thereafter [16,41,42]. "It's what you did at home afterwards that made the difference money wise" (FB). The decision to implement is based on the perceived value of the knowledge learned and the practical capabilities of the farm [51].

The data collected revealed examples of KT-based initiatives that worked well and made a positive impact in terms of grassland management through grass measuring, breeding-related improvements based on herd needs, and financial analysis particularly relative to their own performance year-on-year. However, there was other content not implemented on the farm due to a lack of interest (e.g., content on cross-breeding) or the complexities of the content (e.g., grassland management soil analysis). This suggests that farmers do not always follow the KT recommendations by overweighing their own opinion relative to that acquired through KT [41]. Furthermore, if doubts remain over a new practice or method due to its enforcement or a lack of evidence on the expected outcomes, then the uptake is likely to be lower.

However, once the relevance of the content and practical application was clear, the farmers were more likely to try the new practice on their farms (FC and FD). This level of acceptance is dependent on the credibility and value of the KT content and the method to facilitate learning. When both aspects are aligned, the farmer appears more likely to implement the practice, which ultimately leads to impact. The peer influence from discussion group members was identified as a motivational factor to implement new knowledge and to challenge each other to achieve maximum results (FD). The openness of farmers to share their data was also viewed as important to invite challenges to their methods, yielding additional benefits. The ability of peers to constructively criticise each other and share knowledge is acknowledged as a key factor in driving effective knowledge transfer [37,50,52].

These findings reinforce the challenge to motivate farmers to apply their newly acquired knowledge to achieve a KT-related impact. There is a need to improve understanding of the behavioural factors that influence this decision-making process. The findings show that participants recognise a positive impact once the advice is implemented, but acknowledge that this required a visualisation of the benefit, incentive, or another form of motivation. This could be down to the suitability of the content to farm-specific conditions, the perceived lack of urgency from a change of practice, or the complexity involved and represents a 'kink' in the KT process that reduces the impact achieved. The informants in this research overcame this barrier and their results imply evidence of a positive impact, which

FC described as 'instant'. An enhanced understanding of this motivation would encourage greater uptake from other farmers and yield additional impacts from KT participation.

5.1.4. Trust

A consistent theme raised in the interviews and fundamental to KT participation, learning, application, and the associated impact was the level of trust accumulated throughout the KT process. This trust refers to trust with the organisation, trust with the adviser, and trust with peers within a discussion group. The interviews did not explicitly ask about trust but the responses inevitably raised this issue either directly or indirectly as key to achieving impact.

The credibility and trust of the organisation were influential with the position of Teagasc, as the public provider of KT in Ireland, which is regarded as an advantage with the unbiased and independent nature of the organisation, with no hidden agenda about selling products (AB) and the primary objective to aid farmers (AC). It is imperative that the KT organisation continues to uphold and develop its service, as the utilisation of advice is sensitive to changes in the quality of advice where a good reputation is gained with difficulty; that reputation is easily lost if the quality of advice decreases [16]. The issue of trust in the relationship between advisers and farmers has been discussed in the literature [50,51,80], and the interviews reinforced this view that a good working relationship is essential. FB commented that if his adviser was to leave Teagasc and set up a private organisation, he would follow him, showing the importance of the adviser as a trusted source of KT. Similarly in a group-based activity, it was critical that there was trust among the peers, as acknowledged by all respondents. This shows that the more individuals interact in a networked environment, the more they learn to trust and cooperate with each other [81]. Hansen [47] found that learning outcomes increased when a high level of trust was established among members of discussion groups and the ability to challenge each other yielded additional benefits, and that this was built up over time, which is in line with comments from the interview responses.

6. Conclusions

This analysis expands on existing knowledge by discussing the key underpinning factors that drive KT-related impact. Much of the existing literature focuses primarily on quantifying impact, and qualitative studies are more commonly focused on the perspective of the service provider and not on the farm level impact, which is a gap addressed in this study. In addition, this study utilises the theoretical background for knowledge acquisition to explain the nuance of transfer in an agricultural context and presents an adapted framework as a method to identify a pathway of impact to address the research question by focusing on specific phases of KT and the interaction of these phases with key themes to explain how impact occurs.

The impact was achieved through a combination of KT activities, as highlighted by both the advisers and farmers, which focused on relevant and user-friendly content to stimulate farmer learning and motivate their decision to apply new knowledge. These principles were underpinned by accumulated trust between the organisation and farmers, advisers and farmers, and farmers among themselves. Furthermore, the role of the adviser has evolved into a dual function as a source of expertise in delivering codified knowledge and also as a facilitator to draw out tacit knowledge from farmers in a group-based environment. The role of the farmer to engage, learn, and apply newly acquired knowledge is critical to achieving positive impacts at the farm level.

These findings raise some important implications of particular relevance to KT programme design in the upcoming CAP. The findings confirm that the motivation for farmers to participate requires an incentive in terms of the value of engaging with the content to improve their farm performance. A 'one-size-fits-all' approach to KT is inappropriate given the heterogeneous learning preferences of farmers [2,38,82], with some content more suited to group-based activities and others more suited to one-to-one-based consultations. The

findings also show that the visualisation of a practice, the importance of peer influence, and the compatibility and suitability for their farm, as well as the ease of use, were influential factors in increasing the application of a particular practice or method. However, significant barriers remain, particularly for practices that do not yield short-term impacts, such as grassland management or financial advice. Finally, the importance of trust was key to ensuring the KT-related impact and this depends on the reputation and familiarity of the organisation, the individual adviser, and the other farmers within group formats. The dilution of this trust was considered a key risk to KT participation, and the absence of trust will lower the impact achieved through KT by reducing the motivation to participate.

Author Contributions: Conceptualisation, A.C., K.H., R.H. and M.S.; methodology, A.C., K.H. and R.H.; validation, A.C., K.H., R.H., C.O. and M.S.; formal analysis, A.C.; investigation, A.C.; resources, K.H., R.H., C.O. and M.S.; data curation, A.C.; writing—original draft preparation, A.C.; writing—review and editing, A.C., K.H., R.H., C.O. and M.S.; supervision, K.H., R.H., C.O. and M.S.; project administration, K.H., R.H., C.O. and M.S.; funding acquisition, K.H., R.H., C.O. and M.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Teagasc Walsh Scholarship Programme–Project Reference No. 2012048.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study. Written informed consent has been obtained from the participants to publish this paper.

Data Availability Statement: The data presented in this study are available upon request from the corresponding author. The data are not publicly available due to data privacy agreements.

Acknowledgments: The authors are grateful to the Teagasc Walsh Scholarship Programme for funding this research. In addition, the authors would like to thank the advisers and farmers who participated in the research.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Owens, T.; Hoddinott, J.; Kinsey, B. The Impact of Agricultural Extension on Farm Production in Resettlement Areas of Zimbabwe. *Econ. Dev. Cult. Change* **2003**, *51*, 337–357. [CrossRef]
2. Garforth, C.; Angell, B.; Archer, J.; Green, K. Fragmentation or creative diversity? Options in the provision of land managenet advisory services. *Land Use Policy* **2003**, *20*, 323–333. [CrossRef]
3. Dercon, S.; Gilligan, D.; Hoddinott, J.; Woldehanna, T. The Impact of Agricultural Extension and Roads on Poverty and Consumption Growth in Fifteen Ethiopian Villages. *Am. J. Agric. Econ.* **2009**, *91*, 1007–1021. [CrossRef]
4. Davis, K.; Nkonya, E.; Kato, E.; Mekonnen, D.A.; Odendo, M.; Miiro, R.; Nkuba, J. Impact of Farmer Field Schools on Agricultural Productivity and Poverty in East Africa. *World Dev.* **2012**, *40*, 402–413. [CrossRef]
5. Läpple, D.; Hennessy, T.; Newman, C. Quantifying the Economic Return to Participatory Extension Programmes in Ireland: An Endogenous Switching Regression Analysis. *J. Agric. Econ.* **2013**, *64*, 467–482. [CrossRef]
6. Cawley, A.; O'Donoghue, C.; Heanue, K.; Hilliard, R.; Sheehan, M. The Impact of Extension Services on Farm Level Income—An Instrumental Approach to Combat Endogeneity Concerns. *Appl. Econ. Perspect. Policy* **2018**, *40*, 312–585. [CrossRef]
7. Cawley, A.; O'Donoghue, C.; Heanue, K.; Hilliard, R.; Sheehan, M. The Impact of Agricultural Knowledge Transfer Resources on Farm Level Profitability during the Economic Recession—A Quantitative Study. *J. Agric. Educ. Ext.* **2019**, *22*, 311–325. [CrossRef]
8. European Commission. Building Stronger Agricultural Knowledge and Innovation Systems. Available online: https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/new-cap-2023-27_en (accessed on 5 October 2021).
9. Teagasc. National Farm Survey 2020. Available online: https://www.teagasc.ie/media/website/publications/2021/National-Farm-Survey-2020-Preliminary-Results.pdf (accessed on 1 October 2021).
10. Tamini, L.D. A Nonparametric Analysis of the Impact of Agri-environmental Advisory Activities on Best Management Practice Adoption: A case study of Québec. *Ecol. Econ.* **2011**, *70*, 1363–1374. [CrossRef]
11. Vanclay, F.; Leach, G. Enabling change in rural and regional Australia. In *Shaping Change: Natural Resource Management, Agriculture and the Role of Extension*; Australasia Pacific Extension Network (APEN): Armidale, Australia, 2011.
12. Prager, K.; Labarthe, P.; Caggiano, M.; Lorenzo-Arribas, A. How does commercialisation impact on the provision of farm advisory services? Evidence from Belgium, Italy, Ireland and the UK. *Land Use Policy* **2016**, *52*, 329–344. [CrossRef]
13. Howard, K.; Cawley, A. Teagasc Animal and Grassland Research and Innovation Programme. *Spend. Rev.* **2020**. Available online: https://www.gov.ie/en/collection/daf0c-spending-review-papers-2020/#agriculture (accessed on 14 October 2021).
14. De Long, W.; Fahey, L. Diagnosing cultural barriers to knowledge management. *Acad. Manag. Exec.* **2000**, *14*, 113–127. [CrossRef]

15. Boisot, M.; Canals, A. Data, information and knowledge: Have we got it right? *J. Evol. Econ.* **2004**, *14*, 43–67. [CrossRef]
16. Bonaccio, S.; Dalal, R.S. Advice taking and decision-making: An integrative literature review and implications for the organizational sciences. *Organ. Behav. Hum. Decis. Process.* **2006**, *101*, 127–151. [CrossRef]
17. Yaniv, I.; Choshen-Hillel, S.; Milyavsky, M. Receiving advice on matters of taste: Similarity, majority influence, and taste discrimination. *Organ. Behav. Hum. Decis. Process.* **2011**, *115*, 111–120. [CrossRef]
18. Bruckmeier, K.; Tovey, H. Knowledge in sustainable rural development: From forms of knowledge to knowledge processes. *Sociol. Rural.* **2008**, *48*, 313–329. [CrossRef]
19. Asheim, B.T.; Coenen, L. Knowledge bases and regional innovation systems: Comparing Nordic clusters. *Res. Policy* **2005**, *34*, 1173–1190. [CrossRef]
20. Pasquini, M.W.; Alexander, M.J. Soil Fertility Management Strategies on the Jos Plateau: The Need for Integrating 'Empricial' and 'Scientific' Knowledge in Agricultural Development. *Geograpical. J.* **2005**, *171*, 112–214. [CrossRef]
21. Ingram, J.; Morris, C. The knowledge challenge within the transition towards sustainable soil management: An analysis of agricultural advisors in England. *Land Use Policy* **2007**, *24*, 100–117. [CrossRef]
22. Noorderhaven, N.; Harzing, A.W. Knowledge-sharing and social interaction within MNEs. *J. Int. Bus. Stud.* **2009**, *40*, 719–741. [CrossRef]
23. Argote, L.; Ingram, P. Knowledge Transfer: A Basis for Competitive Advantage in Firms. *Organ. Behav. Hum. Decis. Process.* **2000**, *82*, 150–169. [CrossRef]
24. Garg, R.; Aggarwal, H.; Centobelli, P.; Cerchione, R. Extracting Knowledge from Big Data for Sustainability: A Comparison of Machine Learning Techniques. *Sustainability* **2019**, *11*, 6669. [CrossRef]
25. Coccia, M. Spatial Mobility of Knowledge Transfer and Absorptive Capacity: Analysis and Measurement of the Impact within the Geoeconomic Space. *J. Technol. Transf.* **2008**, *33*, 105–122. [CrossRef]
26. Girard, N.N. Knowledge at the boundary between science and society: A review of the use of farmers' knowledge in agricultural development. *J. Knowl. Manag.* **2015**, *19*, 949–967. [CrossRef]
27. Galindo, I.M. Regional development through knowledge creation in organic agriculture. *J. Knowl. Manag.* **2007**, *11*, 87–97. [CrossRef]
28. Jensen, M.B.; Johnson, B.; Lorenz, E.; Lundvall, B.A. Forms of knowledge and modes of innovation. *Res. Policy* **2007**, *36*, 680–693. [CrossRef]
29. Van den Ban, A.W.; Hawkins, H.S. *Agricultural Extension*; Longman Scientific & Technical: Essex, UK, 1988.
30. Klerkx, L.; Leeuwis, C. Matching demand and supply in the agricultural knowledge infrastructure: Experiences with innovation intermediaries. *Food Policy* **2008**, *33*, 260–276. [CrossRef]
31. Birkhaeuser, D.; Evenson, R.E.; Feder, G. The Economic Impact of Agricultural Extension: A Review. *Econ. Dev. Cult. Change* **1991**, *39*, 607–650. [CrossRef]
32. Läpple, D.; Hennessy, T. Exploring the Role of Incentives in Agricultural Extension Programs. *Appl. Econ. Perspect. Policy* **2015**, *37*, 403–417. [CrossRef]
33. Padel, S. Conversion to Organic Farming: A Typical Example of the Diffusion of an Innovation? *Sociol. Rural.* **2001**, *41*, 40–61. [CrossRef]
34. Rogers, E.M. *Diffusion of Innovations*; Simon and Schuster: New York, NY, USA, 2010.
35. Moeen, M.; Agarwal, R. Incubation of an Industry: Heterogeneous Knowledge Bases and Modes of Value Capture. *Strateg. Manag. J.* **2017**, *38*, 566–587. [CrossRef]
36. Hagger-Johnson, G.; Hegarty, P.; Barker, M.; Richards, C. Public Engagement, Knowledge Transfer and Impact Validity. *J. Soc. Issues* **2013**, *69*, 664–683. [CrossRef]
37. Birner, R.; Davis, K.; Pender, J.; Nkonya, E.; Anandajayasekeram, P.; Ekboir, J.; Mbabu, A.; Spielman, D.J.; Horna, D.; Benin, S.; et al. From Best Practice to Best Fit: A Framework for Designing and Analyzing Pluralistic Agricultural Advisory Services Worldwide. *J. Agric. Educ. Ext.* **2009**, *15*, 341–355. [CrossRef]
38. Faure, G.; Desjeux, Y.; Gasselin, P. New Challenges in Agricultural Advisory Services from a Research Perspective: A Literature Review, Synthesis and Research Agenda. *J. Agric. Educ. Ext.* **2012**, *18*, 461–492. [CrossRef]
39. Prager, K.; Creaney, R.; Lorenzo-Arribas, A. Criteria for a system level evaluation of farm advisory services. *Land Use Policy* **2017**, *61*, 86–98. [CrossRef]
40. Morris, W.; Henley, A.; Dowell, D. Farm diversification, entrepreneurship and technology adoption: Analysis of upland farmers in Wales. *J. Rural Stud.* **2017**, *53*, 132–143. [CrossRef]
41. Butler, A.; Reed, M.; Le Grice, P. Vocational training: Trust, talk and knowledge transfer in small businesses. *J. Small Bus. Enterp. Dev.* **2007**, *14*, 280–293. [CrossRef]
42. Anderson, J.R.; Feder, G. Agricultural extension: Good intentions and hard realities. *World Bank Res. Obs.* **2004**, *19*, 41–60. [CrossRef]
43. Kilpatrick, S.; Johns, S. How farmers learn: Different approaches to change. *J. Agric. Educ. Ext.* **2003**, *9*, 151–164. [CrossRef]
44. Ingram, J. Agronomist–farmer knowledge encounters: An analysis of knowledge exchange in the context of best management practices in England. *Agric. Hum. Values* **2008**, *25*, 151–160. [CrossRef]
45. Lin, L.; Geng, H.; Whinston, A.B. A Sender-Receiver Framework for Knowledge Transfer. *MIS Quaterly* **2005**, *29*, 197–219. [CrossRef]

46. Aalbers, R.; Dolfsma, W.; Koppius, O. Rich Ties and Innovative Knowledge Transfer within a Firm. *Br. J. Manag.* **2013**, *25*, 833–848. [CrossRef]
47. Hansen, B.G. Financial extension that challenges farmers' thinking in discussion clubs helps farmers improve their problem solving abilities. *Agric. Syst.* **2015**, *132*, 85–92. [CrossRef]
48. Massingham, P.R.; Massingham, R.K. Does knowledge management produce practical outcomes? *J. Knowl. Manag.* **2014**, *18*, 221–254. [CrossRef]
49. Minbaeva, D.; Pedersen, T.; Bjorkman, I.; Fey, C.F.; Park, H.J. MNC knowledge transfer, subsidiary absorptive capacity, and HRM. *J. Int. Bus. Stud.* **2003**, *34*, 586–599. [CrossRef]
50. Fisher, R. A gentleman's handshake: The role of social capital and trust in transforming information into usable knowledge. *J. Rural Stud.* **2013**, *31*, 13–22. [CrossRef]
51. Ketterings, Q.M. Extension and knowledge transfer: Adaptive management approaches for timely impact. *J. Agric. Sci.* **2014**, *152*, 57–64. [CrossRef]
52. Swart, J.; Kinnie, N.; Van Rossenberg, Y.; Yalabik, Z.Y. Why should I share my knowledge? A multiple foci of commitment perspective. *Hum. Resour. Manag. J.* **2014**, *24*, 269–289. [CrossRef]
53. Paulin, D.; Suneson, K. Knowledge Transfer, Knowledge Sharing and Knowledge Barriers—Three Blurry Terms in KM. *Electron. J. Knowl. Manag.* **2012**, *10*, 81–91.
54. Legun, K. Cultivating Institutions: Organic Agriculture and Integrative Economic Choice. *Soc. Nat. Resour.* **2011**, *24*, 455–468. [CrossRef]
55. Nordin, M.; Höjgård, S. An evaluation of extension services in Sweden. *Agric. Econ.* **2017**, *48*, 51–60. [CrossRef]
56. Imbens, G.W.; Wooldridge, J.W. Recent Developments in the Econometrics of Program Evaluation. *J. Econ. Lit.* **2009**, *47*, 5–86. [CrossRef]
57. Hennessy, T.; Heanue, K. Quantifing the Effect of Discussion Group Membership on Technology Adoption and Farm Profit on Dairy Farms. *J. Agric. Educ. Ext.* **2012**, *18*, 41–54. [CrossRef]
58. Torock, J.L. Experiential learning and Cooperative Extension: Partners in non-formal education for a century and beyond. *J. Ext.* **2009**, *47*, 6TOT.
59. Black, A.W. Extension theory and practice: A review. *Aust. J. Exp. Agric.* **2000**, *40*, 493–502. [CrossRef]
60. Daft, R.L.; Weick, K.E. Toward a model of organizations as interpretation systems. *Acad. Manag. Rev.* **1984**, *9*, 284–295. [CrossRef]
61. Kennedy, E.H.; Beckley, T.M.; McFarlane, B.L.; Nodeau, S. Why We Don't Walk the Talk: Understanding the Environmental Values/Behaviour Gap in Canada. *Human Ecol. Rev.* **2009**, *16*, 151–160.
62. Hodge, I.; Midmore, P. Models of Rural Development and Approaches to Analysis Evaluation and Decision-Making. *Économie Rural.* **2008**, *307*, 23–38. [CrossRef]
63. Nyanga, P.H. Factors influencing adoption and area under conservation agriculture: A mixed methods approach. *Sustain. Agric. Res.* **2012**, *1*, 1–27. [CrossRef]
64. Läpple, D.; Renwick, A.; Cullinan, J.; Thorne, F. What drives innovation in the agricultural sector? A spatial analysis of knowledge spillovers. *Land Use Policy* **2016**, *56*, 238–250. [CrossRef]
65. Bryman, A. *Social Research Methods*, 3rd ed.; Oxford University Press: Oxford, UK, 2008.
66. Eisenhardt, K.M.; Graebner, M.E. Theory building from cases: Opportunities and challenges. *Acad. Manag. J.* **2007**, *50*, 25–32. [CrossRef]
67. Sarantakos, S. *Social Research*, 4th ed.; Palgrave: London, UK, 2013.
68. Bryman, A. *Social Research Methods*, 4th ed.; Oxford University Press: Oxford, UK, 2012.
69. Creswell, J.W. *Research Design—Qualitative, Quantitative, and Mixed Methods Approaches*, 3rd ed.; Sage Publications: London, UK, 2009.
70. Levitt, H.M.; Creswell, J.W.; Josselson, R.; Bamberg, M.; Frost, D.M.; Suárez-Orozco, C. Reporting Standards for Qualitative Primary, Qualitative Meta-Analytic, and Mixed Methods Research in Psychology: The APA Publications and Communications Board Task Force Report. *Am. Psychol.* **2018**, *73*, 26–46. [CrossRef]
71. Creswell, J.W.; Plano Clark, V.L. *Designing and Conducting Mixed Methods Research*; Sage Publications Ltd.: London, UK, 2007.
72. Mabry, L. Case Study in Social Research. In *The SAGE Handbook of Social Research Methods*; Alasuutari, P., Bickman, L., Brannen, J., Eds.; SAGE Publications Ltd.: London, UK, 2008.
73. Lichtman, M. *Qualitative Research in Education: A Users Guide*; Sage Publications Ltd.: Thousand Oaks, CA, USA, 2013.
74. Pratt, M.G. From the editors—For the lack of a boilerplate: Tips on writing up (and reviewing) qualitative research. *Acad. Manag. J.* **2009**, *52*, 856–862. [CrossRef]
75. Cliffe, N.; Stone, R.; Coutts, J.; Reardon-Smith, K.; Mushtaq, S. Developing the capacity of farmers to understand and apply seasonal climate forecast through collaborative learning processes. *J. Agric. Educ. Ext.* **2016**, *22*, 311–325. [CrossRef]
76. Teagasc. Grass10—Grassland Excellence for Irish Livestock. *Grassland Management*. Available online: https://www.teagasc.ie/crops/grassland/grass10/ (accessed on 15 January 2018).
77. O'Riordan, E. Managing your grass. In *Grazing Guide Book*; Teagasc: Carlow, Ireland, 2011.
78. Teagasc. Understanding the Economic Breeding Index (EBI). *Breeding Management*. Available online: https://www.teagasc.ie/media/website/animals/dairy/Understanding_EBI_PTA_BV_Spring_2014.pdf (accessed on 8 March 2018).

79. Teagasc. Dairy Cow Breeding. *Breeding Management*. Available online: https://www.teagasc.ie/media/website/animals/dairy/Breeding.pdf (accessed on 8 November 2017).
80. Dillon, E.J.; Hennessy, T.; Howley, P.; Cullinan, J.; Heanue, K.; Cawley, A. Routine inertia and reactionary response in animal health best practice. *Agric. Hum. Values* **2018**, *35*, 207–221. [CrossRef]
81. Raymond, L. Cooperation without Trust: Overcoming Collective Action Barriers to Endangered Species Protection. *Policy Stud. J.* **2006**, *34*, 37–57. [CrossRef]
82. Vanclay, F. School principles for agricultural extension to assist in the promotion of natural resource management. *Aust. J. Exp. Agric.* **2004**, *44*, 213–222. [CrossRef]