

LUPG

*The UK statutory
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and environment agencies*

Transitions to Agroecological Systems: Farmers' Experience

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<https://www.nidirect.gov.uk/contacts/contacts-az/northern-ireland-environment-agency>

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<http://www.sepa.org.uk/>

FOREWORD

At this critical time for farmers and farming in the UK, it is more important than ever that we understand the motivations, attitudes and experiences of those who have successfully adopted more sustainable agricultural practices and systems.

Farming practices and systems have a profound effect on the environment – on our landscapes, our wildlife and biodiversity, the quality of our soils, air and water. As the case examples in this study show, farming systems which work with nature can be profitable and productive while providing environmental, social and personal benefits.

If we are to improve the resilience of our cherished landscapes, we will need farming and other land uses to further reduce the pressures on the environment and use natural assets wisely, including contributing to greater resilience to droughts and floods and to a changing climate.

Farmers who are environmentally aware, skilled and knowledgeable have much to offer. More environmentally sustainable farming, such as the agroecological approaches considered in the study, provides opportunities to develop new business ventures, in turn helping to develop the rural economy and support rural communities. The study shows how important social networks in our farming and rural communities are to achieving real change.

We warmly welcome this report, which makes a valuable contribution to the evidence to inform our advice on future options for farming and environment policy in the UK.

Rob Cooke
Natural England and Chair of LUPG

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- At GWCT: Amelia Woolford, Jim Egan and Alastair Leake.

SUMMARY

The term agroecology is used mainly to describe an approach “*emphasising ecological principles and practices in the design and management of agroecosystems, one that integrates the long-term protection of natural resources as an element of food, fuel and fibre production*” (Lampkin et al., 2015, P9).

Agroecological approaches in farming can make a major contribution to the sustainable intensification of agriculture in the UK (APPG Agroecology)¹, but in the policy context of the UK, there is no specific framework for ‘agroecology’, although some practices (for example organic farming) are supported under the Rural Development Programmes.

We undertook a social science study aiming to explore how farmers make and experience their own personal transition from conventional agriculture to farming using agroecological practices and to draw some conclusions on how such transitions can be supported.

Background

The study builds on the LUPG report by Lampkin et al. (2015) on the contribution of agroecology to sustainable intensification, previous work by the authors and related studies in the UK, including an unpublished review of social science evidence regarding farmer behaviour for Natural England. We reviewed factors and spheres that influence farmer decision-making and considered mainly two models of the stages of transition. We interviewed fourteen farmers in England, Scotland and Wales about their experience of transition towards agroecology, including agroforestry, pasture-fed livestock systems, organic and integrated farming in a case study approach. We used semi-structured interviews and encouraged the farmers to tell us how the management of their farms has changed, to recall important decisions, positive and negative experiences, and the impact on the relationship with staff, other farmers and the local community, useful information sources and the relationship with government agencies.

Main findings

The motives and events that prompted the farmer to engage with transition to agroecology, the challenges experienced and the opportunities, as seen by the farmers, are almost as varied as the fourteen farms we studied. Although never intended to be a representative sample of UK farmers the sample is socially distinct, as all farmers are members of networks that engage with sustainable agriculture. The results show that social processes are very important and most farmers make reference to issues that could be seen as social capital, such as inspiration through contact with others, wider social networks including support from NGOs and engagement with the local community, as well as the importance of peer-to-peer knowledge exchange. The majority of the case study farms are owner occupied with above average educational status.

“*The biggest step is getting started*”. Other big challenges mentioned included issues related to self (symbolic capital – self-belief, prestige, reputation) and to other people (transitioning being seen as different from the mainstream resulting in negative attitudes of other people, problems with staff), financial (access to finance, cash-flow problems, rejected grant applications) and technical problems (failure to establish crops and trees, problems with silage or weeds). Structural and farm-specific factors were very important as motivations for shaping the transition, such the ability to diversify the farming activities (e.g. taking over the family farm, access to more land) as were personal beliefs (e.g. concerns about the soils,

¹ <http://agroecology-appg.org/wp-content/uploads/2014/04/AgroEco-A5-Leaflet-v4.pdf>

dislike of pesticides). The transition process appears to be shaped by the interaction between the farmer and his/her farm as well as by external events. There is a need to improve the understanding of these links between personal, farm-specific and external drivers of change and the interaction between agronomic and human challenges.

Transition to agroecology on the farms studied was an active learning process. Overlapping stages of a learning cycle of triggers, active assessment, implementation and evaluation can be identified, but did not necessarily occur in sequential order. They should be seen more as conceptual and not chronological stages. Apart from taking over the farm or business, key triggers included meeting inspirational farmers in the UK or study periods abroad as well as attending courses. Some farmers wanted to future-proof their farm, e.g. through investment in soil fertility, as well as through premium prices from quality labels (such as organic farming, pasture-fed), direct marketing or engagement with supply chains as well as seeking cost-savings on inputs. They carried out on-farm experiments, sometimes unintentionally, and this helped them to gain self-confidence. Some farmers reported cognitive shifts in their understanding of farming ('change the mind-set', 'weeds as forage', 'accepting mess', and engaging with the local community) as well as emotional shifts in enjoying new skills and knowledge and increasing self-reliance ('finding your own agronomic solutions', 'doing your own budgets'). They abandoned some old rules and norms, and sought more long-term financial and environmental outcomes. Having started with some agroecological practices, and seeing positive outcomes emerge, they then considered adopting others.

A common model of the transition to agroecology is the Efficiency–Substitution–Redesign model. We identified all stages present on several farms but not occurring in sequence. On-farm experiments mainly featured practices aimed at increasing the efficiency of input use and the substitution of inputs/technologies with more suitable alternatives. Examples of redesign on the case study farms included: integrating grassland and livestock in arable farms and rotations; planting trees for agroforestry systems; and adopting new grazing management or direct drilling. Our findings suggest that the redesign of the farm did not necessarily follow on from improving the efficiency of input and technology use.

The farmers' descriptions of their relationships to government agencies ranged from good to mixed but also included 'avoiding contact' as well as comments regarding a mismatch between their way of farming and the grant criteria.

Conclusions

In meeting the sustainability challenges of UK farming, 'redesign' of farming in line with principles and practices of agroecology could help identify answers to many of the problems farmers face, especially those growing arable crops. The study presents some conclusions on how redesign can be supported.

- **Recognising the importance of inspiration and social capital.** The farmers' experiences described highlight the crucial importance of seeing practical examples and of social networks. This suggests a need to create more opportunities for farmers to be inspired by seeing working agroecological farms in the UK and through study tours (for example to France, where agroecology is more widely supported)
- **Providing improved access to practical information about agroecology** through training and education, through digital media and by providing more access to sound financial information about the likely short and long-term impacts on yields, cash-flow, investment and exposure to risks.
- **From knowledge transfer to knowledge exchange.** Agroecological transition is an active learning process, not a simple 'switch' from one way of farming to another.

This is encouraged through social, peer-to-peer learning and networks related to specific agroecological approaches.

- **Developing accepted indicators of resources and sustainability.** Farmers need accepted definitions, measurements and indicators of the state of their resources and sustainability so that they can judge for themselves how well they are performing and how they can manage the risks to their farming business. For the farmers, long-term economic profitability is an important part of sustainability.
- **Providing access to grants.** UK Governments can encourage the transition to agroecology by clearly identifying the redesign of farming that follows agroecological principles and practices. This is an important part of the future of farming which is worthy of public support. Further work is needed to develop support options (for example as part of tiered support schemes) that encourage a systems-level change; the organic farming support schemes operating in England, Scotland and Wales under the current RDP provide examples. A coherent support programme should be aimed at the transition phase, rewarding the delivery of public goods. It should also be directed at the social side of transition to agroecology and training and education.

The study also highlighted some questions for further research.

- There is need for an improved understanding of the links between personal, farm-specific and external drivers of change, considering farming as a human activity system. This should aim at further consolidating **models for policy-making** by considering available social evidence and by linking the different perspectives.
- Future research should also aim to get a better understanding of **how farmers assess the feasibility of redesign** as part of transition to agroecological approaches. This is essential to the development of support mechanisms and tools that meet farmers' needs.

GLOSSARY

ADAS	Agricultural consultancy company
AHDB	Agriculture and Horticulture Development Board
BASE	Biodiversity, Agriculture, Soil and Environment
CSA	Community Supported Agriculture
Defra	Department for the Environment, Food and Rural Affairs
EA	Environment Agency
ELS	Entry Level Stewardship (England)
ESR	Efficiency–Substitution–Redesign
FBS	Farm Business Survey
FSR	Farming Systems Research
FWAG	Farming & Wildlife Advisory Groups
GWCT	Game & Wildlife Conservation Trust
HLS	Higher Level Stewardship (England)
EIP AGRI	European Innovation Partnership Agriculture
LEADER	Liaison among Actors in Rural Economic Development (Part of RDP).
LEAF	Linking Environment and Farming
LUPG	Land Use Policy Group
NE	Natural England
NGO	Non-Governmental Organisation
NRW	Natural Resources Wales
OELS	Organic Entry Level Scheme (England)
OF&G	Organic Farmers and Growers
ORC	Organic Research Centre
OSR	Oilseed Rape
PFLA	Pasture Fed Livestock Association
RDP	Rural Development Programme
RSPB	Royal Society for the Protection of Birds
SA	Soil Association
SEPA	Scottish Environment Protection Agency
SNH	Scottish Natural Heritage

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1 INTRODUCTION

Agroecology involves the understanding of ecological principles and processes and applying this knowledge to the design and management of agricultural production systems. The term is used mainly to describe an approach “*emphasising ecological principles and practices in the design and management of agroecosystems, one that integrates the long-term protection of natural resources as an element of food, fuel and fibre production*” (Lampkin et al., 2015, P9). However, the term ‘agroecology’ is also used to describe a scientific discipline, agricultural practice, or political or social movement (Wezel et al., 2009).

Agroecological approaches in farming can make a major contribution to the sustainable intensification of agriculture. According to the All Party Parliamentary group for Agroecology in Westminster, agroecology provides a much needed new approach, concentrating on farms within their social and environmental context and integrating biology, technology and socio-economics.²

This report presents the results of a study on farmers’ views and experience of a transition towards agroecological systems of farming, carried out by the Organic Research Centre (ORC) in collaboration with the Game & Wildlife Conservation Trust (GWCT).

It was commissioned by Scottish Natural Heritage (SNH) acting on behalf of the Land Use Policy Group (LUPG) of the UK environmental, conservation and countryside agencies. It complements a first study produced by the same contractors on the role of agroecology in sustainable intensification (Lampkin et al., 2015) for the LUPG. This study reviewed the evidence for a large range of agroecological practices and made a close comparison between conventional agricultural systems and integrated agriculture, organic farming and agroforestry, comparing them on the basis of productivity, profitability, energy use and greenhouse gas emissions, soils and water, and biodiversity.

Lampkin et al. (2015) identified a need for better information and knowledge exchange systems on agroecological approaches, building on tacit farmer knowledge and active farmer participation, together with a stronger focus on agroecological practices and systems in education provision and vocational skills, as well as in research and innovation. The report also argued for agri-environment schemes, payments for ecosystem services (PES) and market-based policies (e.g. product certification) to be used in encouraging the adoption of agroecological approaches.

A further study for the LUPG (Mottershead and Maréchal, 2017) investigated the national circumstances, policies and programmes promoting the adoption of agroecological systems in two other European countries, France and Germany, and compared their findings with the situation in the UK.

The current study contributes to developing an understanding of the transition towards agroecological approaches from the farmer’s point of view. It investigates the motivations and pathways for a transition to agroecology, as they are shaped by a range of factors including personal/psychological factors, farm-level issues and macro drivers such as policy or market conditions. On the premise that agroecological approaches can contribute to more sustainable agriculture, the main focus of this report is the experience of farmers who have undertaken significant shifts in their methods of production.

² <http://agroecology-appg.org/wp-content/uploads/2014/04/AgroEco-A5-Leaflet-v4.pdf>

The aim of the study is to provide insight into the transition process from conventional to agroecological approaches, as perceived by a group of UK farmers that have all transitioned to agroecological practice on their farms, including organic farming, direct drilling, conservation agriculture, pasture-based farming and agroforestry. The qualitative sample includes farms from a range of farm types, farm sizes and different locations throughout the UK. All farmers interviewed have in common that they are members of networks associated with sustainable agriculture.

The detailed objectives of the study were to:

- Undertake a social science study of farmers' experience of transition towards agroecological approaches in the UK;
- Identify motivations, challenges and opportunities encountered, together with the perceived benefits and disadvantages associated with the transition;
- Gain an understanding of individuals' trajectories in context, including social, economic, biophysical, cultural and psychological dimensions.

The background section in Chapter 2 contains a brief review of the literature that informed the development of the methodology and the interpretation of the results. This builds on issues already addressed in the report on Agroecology and Sustainable Intensification by Lampkin et al. (2015) and mainly two models of the process of transition or conversion to agroecology / organic farming.

Chapter 3 sets out how the case study approach was developed with the aim to elicit stories from farmers to depict their trajectories and understand determining factors through a semi-structured interview; it also presents an overview of the case farms.

The presentation of results in Chapter 4 aims to reflect the farmers' own points of view rather than adopting a specific theoretical lens and includes quotes to allow the farmers to speak for themselves. This starts off with a short summary of the main transition story of each farm, followed by sections grouped by specific themes.

Chapter 5 discusses the motivations, challenges and opportunities and stages of the transition process in the context of some of the literature. Chapter 6 presents conclusions about the transition process, implications for supporting agroecological transitions and questions for further research.

2 BACKGROUND

The process of transition to agroecological practices and farming systems has been looked at from a number of perspectives. The literature review presented here had two main purposes: supporting the case study methodology, including the development of the interview guide; and supporting the interpretation of our results.

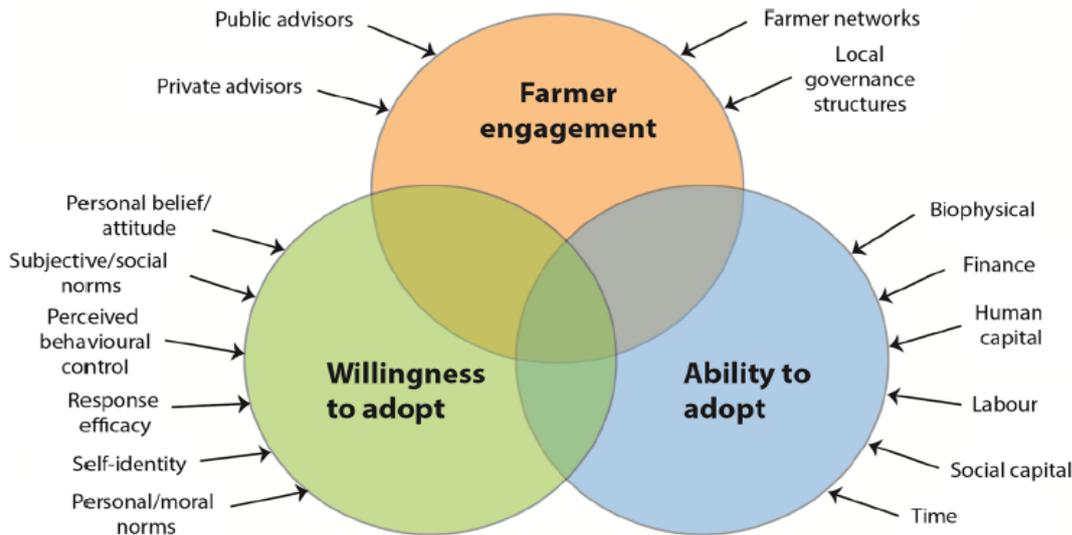
The review builds on the study by Lampkin et al. (2015) for the LUPG, on previous work by the authors on factors influencing the transition to organic farming (Padel, 2001, Padel, 2002). We have also considered similar studies carried out in the UK (e.g. Sutherland et al., 2012), suggestions from project partners (e.g. Soil Management Initiative)³ and an unpublished review carried out for Natural England by Hall (2014).

We focus mainly on two aspects in the literature: factors that influence farmer decision-making (e.g. Mills et al., 2016) and models that aim to understand the process of transition and its stages (Hill, 1985; Padel, 2001; Padel, 2002; Sutherland et al., 2012). For the former, we paid particular attention to a variety of internal and external factors and how in particular their interaction can impact on change processes. In the review of different stage models, we brought together studies that further develop stages of adoption from the Adoption–Diffusion model (Rogers, 1983) with a model conceptualising the stages of agroecological transition (Hill, 1985). This helped to phrase the interview questions, whilst remaining open to how the farmers reflected about their own experiences. We also briefly considered attempts to develop typologies of farmers (various as reviewed by Hall, 2014) and to apply more general theories of behavioural change to policy design (Pike, 2008; Hall, 2014).

2.1 Factors and spheres of influence

There is a substantial body of literature related to behavioural change and some attempts have been made to relate this to farming. Some literature has focused in particular on farmer decision-making in relation to environmental changes (such as Dwyer et al., 2007, Mills et al., 2016). Pike (2008) attempts to ‘de-mystify’ the numerous concepts and translate them into non-academic language, mainly for the purpose of policy-making. He notes a shift in policy design from recognising mainly external factors (e.g. financial incentives and information) to also considering internal drivers for behavioural change. Reference to the theory of behavioural economics adds more awareness of the importance of the social dimensions in change processes (Pike, 2008). Padel (2002) presents factors influencing the conversion to organic farming in the three categories of personal, farm-specific and external factors. Mills et al. (2016), referring to Dwyer et al. (2007), use a different categorisation of factors, when referring to three influencing spheres of willingness to adopt, ability to adopt and farmer engagement with environmental advice (see Figure 1).

³ The UK Soil Management Initiative is an independent organisation created to promote the adoption by UK farmers and advisers of systems designed to protect and enhance soil quality.



Source: Mills et al. (2016)

Figure 1: Factors influencing farmer environmental decision-making

In relation to agroecology, Lampkin et al. (2015) identified a number of factors that might influence the process of transition. These include profitability, policy support, regulatory and market issues as well as social factors. Institutional factors may be relevant, for example negative reactions from advisers, land agents or bank managers. The report notes that social issues can also be important – both in terms of position in the local community, as the decision to change can be seen by the peer group as a rejection of what they are doing, and within the farm household, where inter-generational and other family relationships can be influential (with evidence that the spouse can be a major driver of change processes). In Table 1 we have summarised the factors from the studies in the three broad categories of internal, external and social factors, distinguishing in the category ‘internal’ between farmer- and farm-specific factors.

Table 1: Summary of personal, farm-specific, external and social factors influencing transition

Internal		External	Social
Personal (internal)	Farm-specific		
Personal characteristic	Biophysical farm resources	Relative profitability	Norms
Background	Yields	Support payments	Acceptance of practices
Age	Farm size	Input & output prices	Farm household
Gender	Farm type	Subsidies	Spouse
Goals, objectives, values	Enterprise structure	Institutional factors	Farmer networks
Lifestyle and health	Capital resources	Markets	Family
Farming experience	Labour resources	Availability of information and support	
Farming style	Profitability	Access to capital	
Personal attitudes	Routes to market	Regulatory issues	
Subjective norms	Tenure		
Perceived level of control	Other income sources		
Self-identity			

Source: Lampkin et al. (2015), Hall (2014), Mills et al. (2016), Pike (2008) and Padel (2002)

Social factors deserve specific attention in the context of agroecological transitions. There is growing recognition of the role of farmers' networks where active participants in agricultural knowledge systems contribute to knowledge construction (Koutsouris, 2012). For example, in Learning and Innovation Networks for Sustainable Agriculture (LINSAs), social learning emerged from a shared interest in a problem, challenge or activity. Various actors contribute expertise in processes of trust building, trial and error and of mutual support (Moschitz et al., 2014). Tacit knowledge is seen as very important in implementing sustainable agriculture at various locations (Curry and Kirwan, 2014).

2.2 Stages of transition

Several models of the stages of transition were considered. This included the Efficiency–Substitution–Redesign (ESR) framework (Hill, 1985), which was developed in the context of the adoption of integrated pest management and organic/ecological systems, but has recently been more widely discussed and applied to agroecology. The Adoption–Diffusion model (Rogers, 1983) set out stages of the adoption process for innovation at the farm level which have been applied to conversion to organic farming by Padel (2001) and Padel (2002). Finally, Sutherland et al. (2012) present a conceptualisation outlining the importance of 'trigger events' for major changes in farming practice (e.g. changes in the farm household through succession, injury or sudden death, new market opportunities or failures, which led to the realisation that system change is necessary) .

2.2.1 Efficiency–Substitution–Redesign (ESR)

Hill (1985) introduced the Efficiency–Substitution–Redesign (ESR) framework, which has been used or cited in the context of agroecology by numerous authors (MacRae et al., 1990, Nicholls et al., 2016). The stages can be summarised as follows (based on various authors):

- The first stage, *Efficiency*, starts with adopting more efficient use of inputs, such as optimal use of fertiliser with minimal waste.
- In the second stage, *Substitution*, certain inputs considered to be harmful to the environment are replaced by more benign ones. The replacement of outdated technologies with more efficient ones falls into this category.
- In the final stage, *Redesign*, a systems management approach is adopted to reduce the need for inputs in the first place. This means "*the design of agro-ecosystems to deliver the optimum amount of ecosystem services to aid food, fibre and oil production whilst ensuring that agricultural production processes improve natural capital*" (Pretty, 2016).

From an agroecology perspective, a system redesign approach based on ecological principles is considered more likely to get closer to a sustainable end-point (e.g. Nicholls et al., 2016). According to Hill (2014, P. 402): "*These ecologically redesigned/designed systems aim to minimise problems and dependence on purchased inputs, increase resilience, and enable self-maintenance, self-regulation, sustainability, and ability to provide the needed ecosystem services and support for achieving the well-being of all*". Sustainable intensification, if focused mainly on producing more with less, represents only the first step or potentially the first two stages of this process.

There is a broad consensus that achieving agricultural sustainability is a process or journey involving incremental steps or improvements (Lampkin et al., 2015). Whether the process is always as linear as the stages in the ESR model imply is questionable. Besides, no agricultural system can claim to be perfectly sustainable, given the multi-objective nature of the concept and the inevitable trade-offs when objectives conflict.

Similarly, Lamine and Bellon (2008) present input efficiency and system redesign as paradigms, which frame discussions about transitions in agriculture, but conclude that the literature often minimises the importance of transitional aspects and trajectories, and rarely approaches conversion (in this case organic farming) as a longer-term process than the legal duration specified in regulations.

Hill (2014) argues that there are psychological as well as scientific and technological dimensions to addressing the challenges of large-scale farming, simplification and fragmentation. According to Hill, the psychological dimension can include feelings of disempowerment and associated lack of awareness and confused (often compensatory) visions and values which can lead to low resilience associated with 'denial of consequences'. This highlights the importance of not ignoring underlying psychological issues or trying to oversimplify them, when trying to understand transitions to agroecological practices.

At a conference on sustainable intensification in 2016, Pretty (2016) referred to the ESR model as extremely helpful in understanding what we might have achieved on a path towards sustainability in agricultural and food systems. He describes the first (Efficiency) stage as important, but also makes clear that such changes are now considered good practice. Substitution approaches can lead to compelling differences on the path towards sustainability, but redesign is the real "*game changer*".

In this study of farmers' experience of transition to more agroecological practices, we apply the *Efficiency–Substitution–Redesign* model directly to the process of transition at the farm level. In particular, it is interesting to explore three questions:

- Do the transition trajectories follow distinct sequential stages from efficiency to substitution to redesign or do those categories instead have overlaps in practice?
- How do the farmers go about redesigning to build sustainable agroecosystems?
- Is there an endpoint to the transition?

2.2.2 *The stage model of the Adoption–Diffusion Model applied to the transition process*

The Adoption–Diffusion model of Rogers (1983) is an important model describing the process of change on farms and the diffusion of innovations into the rural community as well as the characteristics of people that typically adopt innovation at an earlier or later stage of the process of diffusion. It is useful for understanding transition, despite a number of limitations of the model that have to be recognised. For example, the model was developed using the experience of farmers adopting new maize cultivars rather than more complex systemic changes (such as introducing irrigation, organic farming or conservation agriculture) and it has an inherent pro-technology bias (see Padel, 2001, for further details).

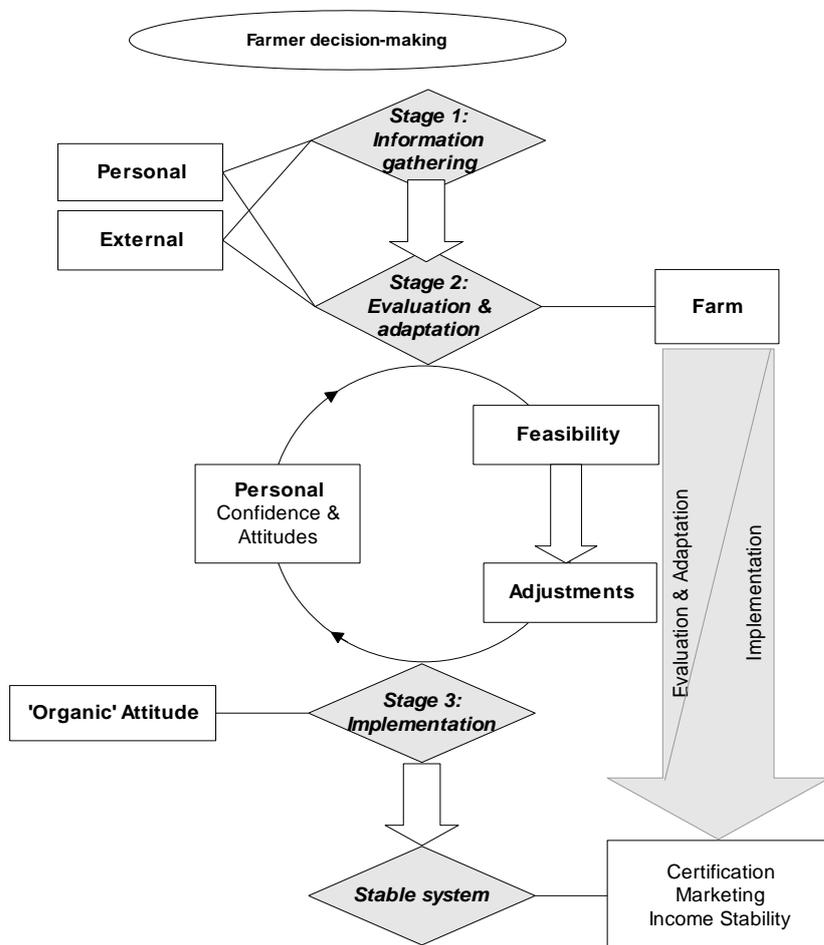
In the context of this study of the transition to agroecological practices, the four stages of the adoption process are however relevant. These are: 1) awareness 2) information seeking 3) adoption on a trial basis, and 4) full adoption.

This stage model assumes adoption, but it is likely that not all transitions will result in success and full adoption. Padel (2001) and Padel (2002) applied the Adoption–Diffusion model (Rogers, 1983) to the process of conversion to organic agriculture. Padel (2001) compared elements of the model that identify innovators' typical sociological characteristics with the first organic farmers. These showed similar characteristics to other environmental innovators, such as a higher education and a wide social network and being new entrants into the profession. They were also faced with problems that were typically associated with the innovation stage, such as opposition from the farming community and social isolation. According to Rogers, diffusion depends upon the social networks through which information

can flow and fails where such networks do not exist – or where trust is low and people are reluctant to share information that gives competitive advantage.

Based on case studies of UK farmers' conversion to organic farming, Padel (2002) concluded that the stage of adoption on a trial basis frequently involves experimentation, and can result in modifications to how organic farming is applied on the specific farms, and that this may happen several times before a new stable system is reached. This study also showed that each case study farm found its own distinct approach to practising organic farming rather than following a pre-set blueprint solution.

Similarly, Hall (2014) (based on Orr, 2005) describes the development of eco-literacy as a process in which farmers take the time to watch wildlife, experiment with different types of land management, observe the impact and then improve their land management. In many cases, such experiments tend to be restricted to marginal parts of the farms to reduce exposure to risk and to avoid negative responses from other farmers. This illustrates the potential but also identifies the barriers to farmers experimenting with agroecological transition. The term 'experiment' here and in the rest of the report describes any change the effects of which are monitored and evaluated.



Source: Padel (2002)

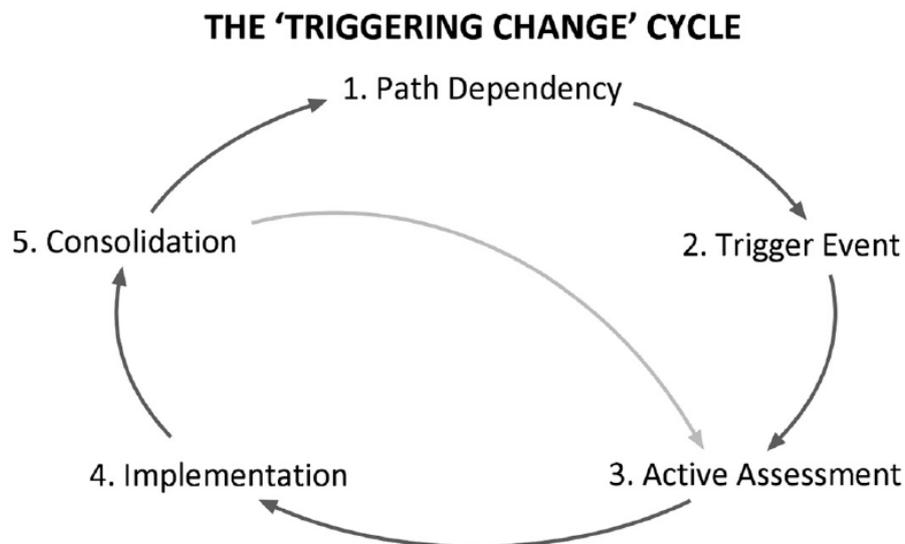
Figure 2: Stages of the organic conversion process⁴

⁴ Note that most agroecological transitions - apart from organic conversions – do not require registration with a control body and/or fulfilling specific requirements of organic standards or regulations.

2.2.3 Triggering change

Sutherland et al. (2012) presented a new conceptualisation of major change processes in agriculture, illustrated with empirical examples drawn from qualitative interviews with organic and conventional farmers in two English case study areas. They identified stages similar to those described in the Adoption–Diffusion model, but characterised the farm-level processes in the form of a change cycle rather than a linear process (see Figure 3). This conceptualisation was based on the analysis of interview data with 48 farms comparing farms that converted to organic with a non-organic sample; they did not however cover other agroecological practices. There is strong overlap with the stages proposed by Padel (2002) but also some key differences. Farming is characterised by ‘path dependency’ both in terms of practicalities and in farming culture. The concept of ‘trigger events’ implies that path dependency is normally strong and triggers are required for major or more strategic changes, whereas minor changes happen incrementally. Such trigger events can happen over a period of time (e.g. several years of loss, drought, generation change). Once seeking change, contemporary farms clearly have a variety of possible options open to them through pluri-activity, diversification, direct and indirect marketing, environmental programmes and the decoupling of agricultural subsidies from commodity production, so their options are much more complex than simple adoption of a new technique (Sutherland et al., 2012).

On this basis, the interview guide for this study included a question about ‘farm stories’, in which participants were asked to describe the history of their farm. This question was found to be very useful for the trigger point analysis.



Source: Sutherland et al. (2012)

Figure 3: The ‘Triggering change’ cycle’

2.2.4 The change model of the Soil Management Initiative (SMI)

SMI is an independent organisation that promotes the adoption of appropriate soil management practices, especially conservation agriculture, within England. The Initiative produced a guide to managing crop establishment (SMI, 2001). This set out the route to ‘progressive adoption’ of conservation farming, acknowledging that change to such practices is a more long-term process and that an overnight switching is unrealistic.

The SMI model describing the change process refers to the following steps:

1. Select drilling systems
2. Change/ select secondary cultivation
3. Change primary cultivation
4. Determine system and follow plan

These steps are mainly guided by the choice of machinery that needs to be bought to carry out soil conservation practises, including a calculation of available work days, based on local historic rainfall data, soil type, acreage and machinery available. This helped farmers to work out machinery needs. The steps do not fully consider what happens before these investment choices come into effect. These have to do with information gathering and with experimenting, which is also discussed in the report. The case studies presented in the guide make clear that a farm-specific solution was developed in each case.

2.3 Farm typologies

The literature identifies a number of separate typologies or farming styles of farms and operators, each with pathways that the farmers are expected to follow. For example, van der Ploeg (1994) used a combination of quantitative (account-derived) and qualitative data to identify groups of farmers that share values and attitudes and show similar behaviour. He distinguished between 'cowman', 'greedy', 'huge', and 'intensive' farmer and 'cow breeder' among dairy producers in Friesland, Netherlands. Among arable farmers in New Zealand, Fairweather and Keating (1990) found the styles of 'dedicated producer', the 'flexible strategist' and the 'environmentalist'. In the UK, Defra developed a farm segmentation model, which allocates users into five groups: 'custodians', 'lifestyle choice', 'pragmatists', 'modern family business' and 'challenged enterprises' (Pike, 2008). A study using the Defra segments with farms participating in the Farm Business Survey found that farm businesses did not fit comfortably into the segments, pointing out that farmers did not relate to the family-based descriptors and labels such as 'challenged'. The authors advised policy-makers of a need for caution when attempting to 'segment' the farming and horticultural population (Wilson et al., 2013).

Overall, the use of farm typology implies that farmers of one type will behave in a particular way, but both Pike (2008) and Hall (2014) emphasise that farmers are an incredibly diverse occupational group who differ in wealth, class, education and self-confidence.

Farm typologies were not considered in the approach of this study for two reasons.

- Firstly, several of the case study examples referred to in the change models presented above (e.g. Padel, 2002; Sutherland et al., 2012; SMI, 2001) illustrate the need for flexibility – there is no one-size-fits-all solution, as contexts (soils/climate but also business size and orientation) are different on each farm. It is therefore likely that more static farm typologies would not necessarily reflect the more radical change which the transition to agroecological practices is likely to imply.
- Secondly, in this study we are working with a relatively small but diverse group of farmers in a case study approach. The farms have in common that they have all undergone a transition stage to agroecological approaches, but they vary in many other aspects, such as farm size, dominant enterprises, location, etc.

We therefore did not consider the approach of farmer typologies to be useful for the data analysis.

3 METHODOLOGY

This study elicited stories from farmers to depict their trajectories and understand determining factors. We have therefore chosen a case study approach, which is particularly appropriate for process-orientated inquiries (Patton, 1990) and for uncovering farmers' perspectives (Albrecht, 1986). Yin (2014), one of the important scholars of this method, explains that the case study is an empirical inquiry in which the focus is on a contemporary phenomenon within its real-life context, and the boundaries between the phenomenon and its context are not clearly evident. Case study findings can place stakeholders at the centre of developing action-oriented insights for analysis and use (Yin, 2014). The case study method has been used in farming systems research (Maxwell, 1986) and appears particularly suited to study change processes on farms, such as conversion to organic farming (Padel, 2002) or transition to agroecology, because it allows the researcher to consider not only personal, farm-specific and external factors that impact on the transition process in isolation, but also the interactions between them.

In this study, we used multiple case studies, treating the transition of each farm as a separate case, using face-to-face, semi-structured interviews. Each farm was visited once and an interview was carried out, involving the principal farmer and, if possible, other members of the farm household involved in decision-making. Where a farmer has published articles, blogs, etc., relating to the transition process, these were also consulted as part of the material to be analysed. This study did not attempt to collect farm performance or time-series data.

3.1 The case study farms

We were seeking to identify farms that had undergone a transition towards using some agroecological practices on their farms. We used a purposeful sampling strategy, aiming to recruit 14 farms that were diverse in terms of farm type, location, agroecological practices and stage of transition, including some female farmers and some small but still commercial holdings.

The case study farms were identified using several organisations that engage with sustainable agriculture. We considered farms that have had contact with ORC and GWCT and asked other organisations to provide support in identifying farms, such as Linking Environment and Farming (LEAF), Farming & Wildlife Advisory Groups (FWAG), the Farm Woodland Forum, the Woodland Trust and organic certification bodies. We used our knowledge of and contacts within these networks to ensure a suitable sample of commercial producers, i.e. farmers that are aiming to earn their main income from farming. We did not seek to include non-commercial producers for this study, for example from within the permaculture networks.

Each farmer was at first contacted by e-mail, and where appropriate through the organisation that provided the suggestion for the farm. This was followed up by a phone call to confirm willingness to take part and to arrange the full interview. Most farmers were willing to take part, but four did not respond positively and were replaced by further farms with similar characteristics from the initial table of suggestions. The final sample is summarised in Table 2 below and some further details of each farm are included in Annex 1.

Table 2: Overview of the case study farms and farmers

Farm ID	Minimum as per tender	Sample															
			A	B	C	D	E	F	G	H	J	K	L	M	N	O	
Farm type																	
Arable	2	4		x	x			x					x				
Mixed	2	5	x						x		x				x	x	
Dairy	2	3				x	x					x					
Horticulture	2	2						x						x			
Upland cattle/sheep	2	1								x							
Location																	
Northern England		3						x		x						x	
Midlands & East		3		x	x	x											
South East		2	x							x							
South-West England		2					x						x				
Scotland	2	2							x							x	
Wales	2	2										x		x			
Management system																	
Integrated	2	5		x	x			x	x							x	
Pasture-fed	2	2	x								x						
Organic	2	10	x			x	x		x	x		x	x	x	x	x	
Agroforestry	2	4			x	x	x							x			
Woodland eggs	2	1														x	
Size																	
Large (>300ha)		8	x	x		x		x	x	x			x			x	
Medium (150-300 ha)		3			x		x									x	
Small (<150 ha)	2	3									x	x		x			
Stage of change																	
Early stage	4	4			x			x					x			x	
A few year into it		10	x	x		x		x	x	x	x		x	x		x	
Gender																	
Male		11	x	x	x	x	x			x	x		x		x	x	x
Female	2	3						x				x		x			

Source: Own data

In terms of farm type/dominant enterprise, we included four mainly arable farms, two farms with a horticulture focus, two dairy farms, one upland farm, four mixed farms and one farm with woodland eggs as a specialist enterprise. Farms were identified at six broad locations in Britain (no farm interview was carried out in Northern Ireland):

- North (comprising North East, North West, Yorkshire and Humber, 3 farms),
- Midlands and East (East and West Midlands, East, 3 farms),
- South East (comprising Berkshire, Buckinghamshire, Oxfordshire, Surrey, Sussex, Hampshire, Kent, 2 farms)
- South West (comprising Cornwall, Devon, Somerset, Dorset, Wiltshire, Gloucestershire, 2 farms),
- Scotland (2 farms) and
- Wales (2 farms).

We recruited three farms that were identified as transitioning to direct drilling⁵ (i.e. soil conservation or integrated management), two farms identified as pasture-fed, four organic farms, four agroforestry farms and one woodland egg producer, but during the interviews it became clear that on seven farms more than one agroecological practice had been implemented during the transition process (see below).

We included six farms that are in the earlier stages of their transition and three farms that are run by a female farmer. Eight farms were large (i.e. more than 300 ha), three farms were of a medium size (between 150 and 300 ha) and three farms were below 150 ha. The accurate farm size and location are not included in the report to protect anonymity.

Because we adopted a purposeful sampling strategy for the identification of case study farms that have transitioned to agroecological practices, the results cannot be considered to be representative of UK farming. However, during analysis we tested emerging ideas against the data from other farms and the literature, in particular in relation to the stages of transition. All the findings were reviewed by an external consultant not directly involved in the data collection and analysis and through peer review.

3.2 The interview guide and interview process

An interview guide for semi-structured interviews was developed, based on the literature review and feedback from the project steering group (see Annex 2). After a general introduction, the interview guide included a table with facts about the farm and about the person, which were partly covered beforehand. Thereafter, the interview guide aimed for a conversation with the farmer.

The literature presented in Section 2.1 highlights that different stages of the transition process can be distinguished. The interview guide reflected the following elements:

- Encourage farmers to tell the story and how they experienced it
- Some prompting for the timeline, 'Did this happen before that?'
- Ask about experimentation on farm and how confidence was gained
- Ask about problems and positive experiences during the transition

The interview guide contained questions about the main story of the farm and how it developed under the current management; important decisions and problems encountered during the transition process; the impact of the transition on the relationship with other farmers and the local community; information sources used and their usefulness; and a final closing section. The interview guide also included a question about whether the farmers had considered giving up with the transition or with farming.

The interview guide was pre-tested in one interview with a farmer, and this was also used as a training session for both interviewers, including being aware that the farmer might find negative experiences difficult to relate.

Interviews took place at 14 farms between January and March 2017. They were carried out by Oliver Rubinstein from ORC and by Amelia Woodford from GWCT, under the supervision of Susanne Padel (ORC) and Jim Egan (GWCT). All interviewees were informed about the purpose of the study and gave written consent, confirming their willingness to take part (see Annex 3).

⁵ Direct drilling refers to farms that have stopped ploughing, which goes further than engaging in minimum tillage.

All interviews were successful in so far as a good conversation between the farmer and the interviewer took place. Three interviews involved a second person for the whole time or for part of the interview. In two cases it was the wife and one other case both the farm manager and the owner of the farm took part. Most farmers were very open and willing to share their story and also their problems, and the interviews were conducted in a relaxed but business-like atmosphere.

In some cases, there were short interruptions due to phone calls or family members. On three farms, the interview had to be adjusted slightly, for example in one case where the interview fell into the lambing period (Farm C) and in two other cases (Farms D & E) because the farmer arrived after the agreed time.

4 RESULTS

4.1 The case study farmers

The sample is socially distinct as all farmers interviewed have in common that they are members of organisations and networks associated with sustainable agriculture and have engaged in a process of transition.

Table 3 shows some characteristics of the case study farmers that were not considered as part of the selection. The farmers were between 31 and 55 years of age. In terms of education, 5 farmers had an agriculture degree, 2 a higher national diploma, 3 a national diploma or certificate and 4 have learned farming through experience and/or continuous professional education, such as BASIS or FACT. Farmer B has a university degree in an unrelated subject. It is also noteworthy that 6 of the 14 farmers have been Nuffield Scholars, which is likely to be a much higher proportion than across the industry as a whole, as every year about 20 scholarships are awarded in the UK.

Table 3: Additional characteristics of the case study farms/farmers

Farm ID	A	B	C	D	E	F	G	H	J	K	L	M	N	O
Tenure	family owned	family owned	owned & rented	owned & rented	rented	family owned	family owned	owned & rented	family owned	family owned	owner occupied	owner occupied	owner occupied	owner occupied
Manpower (FT/100ha)	0.7	0.3	0.5	1.6	1.5	0.5	0.5	0.8	2.9	2.0	0.2	27.3	1.2	17.7
Farmer														
Age	36	34	55	42	47	42	50	45	51	31	54	40	42	55
Education	BSc	Exp (BSc)	ND	BSc	HND	Exp	BSc	HND	ND	ND	Exp	Exp	BSc	BSc
Years in farming	13	7	40	19	33	12	20+	25	37	14	6	8	20	28
Nuffield scholar	yes	yes		yes	yes						yes		yes	

Source: Own data

4.2 The transition process as experienced by the farmers

All farmers were asked to describe the main story of their farm under their management and to share their own personal and farm-specific experience of transition processes. In presenting the results, we have tried to focus mainly on telling the story from the farmer's point of view, starting here with a short summary of the main transition story of each farm.

All the case study farms started from different positions and have adopted different agroecological practices. It is therefore not surprising that the transition processes are farm- and farmer-specific and no two stories are the same. For each case, we have included some positive experiences as they were mentioned by the farmers, as a first indication of how they felt as they were transitioning and seeing the first results of their decision. A summary of farm characteristics and the farm transition is also presented in Annex 1.

4.2.1 Short summary of the individual transition processes on the case study farms

Prior to the transition, **Farm A** was a large-scale arable farm (1000 ha in South East England) taken over by the current farmer after a period of joint management with his father in 2010. After a strategic review of the business, the farmer introduced diverse herbal leys (with several legumes, herbs and grasses) to improve soil fertility on about half of the cropping area. This was followed by the introduction of livestock, fed utilising the forage in a mob grazing approach. The farmer aimed to convert more solar energy into human usable

energy and to diversify the enterprises of the farm. In a second transition, the farm is now converting to organic to benefit from the premium market for meat and milk. The farmer aspires to further improve the marketing, creating business opportunities for others on the farm and to develop direct sales. He is pleased when people thank him for the great food he produces.

“I really enjoyed walking through fields, seeing blackgrass and knowing that I don’t need to do anything about it, and coming back 8 months later and there is no blackgrass.”

“Holistic management has totally changed the way I think.”

Farm B is also a large arable farm that transitioned to integrated farming (Midlands & East). After taking over the management of the farm, the farmer started experimenting with direct drilling and with using cover crops grazed with sheep. He then took some land out of arable production, introducing herbal leys grazed by cattle. The farmer believes himself to be open to change, and in future would like to do more companion cropping, but did not specify this in more detail, and is considering introducing agroforestry.

“The direct drilling of beans was a great success with great yield, also for spring peas. Not cultivating fields saves a lot of time (and costs) which is easily outweighing a small dip in yields.”

Farm C is a medium-sized farm (Midlands & East) that used to be farmed in partnership with other farmers *“from hedge to hedge”* and has transitioned to agroforestry. The farmer began looking for an alternative to intensive farming (*“I tried it the big way but did not like it”*), which led him to leave the partnership. Instead, the farmer opted to involve the local community in the creation of an edible woodland project and the development of an ecocentre, whilst maintaining economic viability on the rest of the land. The planting of the edible woodland is in an early stage; in total about 4,000 fruit and nut trees were planted⁶. The rest of the farm is farmed in collaboration with one neighbouring farm, following the ideas of integrated farm management as a member of LEAF. The farmer himself focuses on the agroforestry and livestock and aspires to even more closely integrating with the local community, by offering opportunities to get involved with the planting and management of trees and in decision-making.

“The way the land looks and engaging with the community rather than working on your own all the time, which can be quite lonely, I also like working with the livestock.”

Farm D is a large-scale dairy farm (Midlands & East) that transitioned to organic farming more than 20 years ago. The farm has recently also started a transition towards agroforestry with a specific focus on a silvo-pastoral system, intended as a nutritional and medicinal resource for the cows; it is too early though to evaluate any benefits. The trial on the farm is supported by the nearby agricultural college and the Woodland Trust and includes mainly four species, chosen for their likely nutritional benefits: sycamore, hornbeam, small-leaf lime and elm. One of the aspirations for the future is to avoid TB, in the belief that trees may play a role despite the badger sets on the farm.

“The local college was very supportive and I probably would not have done it without them. I am expecting some financial benefit from the trees but it is too early to see this.”

Farm E is a medium-size dairy farm in the South West of England, recently taken over by the new tenant who we interviewed. The farm, which used to be an intensive conventional dairy farm, has been converted to organic farming. The farmer could build on his personal experience with organic farming on other locations and is now diversifying into goat farming

⁶Fruit species include apples, pears, cherry, wild cherry, plum, currants, gooseberry, raspberry, damson, whitebeam, elder, mulberry, wild service tree, apricot, quince, lime, Japanese silverberry, rowan, dog rose, sea buckthorn, medlar, hawthorn and crab apple. Nut trees include sweet chestnut, walnut, hazel and almond.

and ice-cream making. One of his aspirations is to get more capital so that he can develop the processing, a care farm for assisted therapy and visitor attractions.

“Getting the farm was a bit of a high, I did not expect that. And if we can sell ice-cream directly to the walkers, it will be major success.”

Farm F is a large stockless arable farm in Northern England which transitioned to integrated farming with “*stewardship*”, using a range of options and introducing some horticulture. The farmer has also aimed to engage with the community through setting up allotments on the farm. A variety of non-farming diversification options were implemented, such as solar PV, biomass boiler, and a children’s nursery on site. Aspirations for the near future include getting through Brexit and maintaining viability with reduced subsidies so that the farm can continue to provide a living for the family.

*“Seeing results both environmentally and economically, the LEAF audit has shown that”
“Having more personal time, better soils and better wages for the staff.”*

Farm G is a large mixed farm in Scotland which transitioned to organic on parts of the farm. Aiming to increase soil organic matter and the micro fauna and flora, the farmer started with doing research into direct drilling, before engaging with organic farming for the livestock enterprises in 2007. At present, the farm is part organic and partly farmed following the ideas of conservation agriculture but using some inputs. Reducing the cultivation intensity (“*using the plough sparingly*”) and introducing livestock are both considered as key to success and increasing resilience. The farmer wants to further reduce reliance on artificial nitrogen and explore mob grazing.

“The soil health and spin-offs coming from this, like future proofing. Carbon into the soil is like money in the bank, and the livestock are paying their way.”

Farm H is a large sheep and beef farm in the uplands in Northern England which recently converted to organic, after some additional land had been acquired. The farmer is now also introducing chicken (layers). He sees the mix of livestock species (cattle & sheep, now poultry) and having cattle manure as important, but also values experimenting with new ways of doing things in an integrated approach. The focus on the family is very important and the farmer wants to tell the story of this family farm.

“The cattle and their muck are crucial to the system; high health status of the animals; new grass seeds and clover varieties are great.”

Farm J is a small livestock farm keeping suckler cows on mainly permanent pasture in the South East of England which transitioned to pasture-fed livestock. After doing some research into soil fertility, the farmer introduced mob grazing in the pasture-only system. The farmer considered the change as minor rather than a fundamental transition but is pleased with the health of cows and pasture and wants to further increase the direct selling of livestock products through a pop-up farm shop.

“I really enjoy moving fences and spending time with the cattle every day. It is amazing to see how healthy the cows can be.”

Farm K is also a small livestock farm, keeping dairy cows in Wales, which transitioned to organic farming. The farmer recently bought the current holding, having up-scaled gradually from a smallholding with sheep. The organic conversion started when taking on more land, and a large reseedling programme to improve the soils followed. The holding includes 6 hectares of woodland (in a Glastir scheme), where the farmer started coppicing and tree planting to produce and sell firewood and charcoal for tourist businesses in the neighbouring county. The farmer is also experimenting with using woodchips in the cow cubicles instead of burning the hedge trimmings. He had applied for organic support but was “*gutted*” when he learned that his application had failed. The farm is now undergoing organic conversion without grant funding. The farmer aspires to be as pasture-based as possible and make the farm viable in the near future.

“Seeing productivity rise is great; the hedgerows are back and looking good, and I like seeing our charcoal in the local shops.”

Farm L is a large mainly arable farm in the South West of England which transitioned to organic farming. When the farm was taken over by the current owner, the land seemed pretty run down but there was an Organic Entry Level Scheme (OELS) agreement on parts of the land. The favourable comparison of organic with non-organic margins and the opportunity to collaborate with another farmer who wanted land for dairy replacements both contributed to the decision to convert the rest of the farm to organic. The farmer would like to grow some of the seed for overwintering cover crops in future.

“I would be regretting it if I hadn’t decided to go organic. I get a big kick from good soil samples and seeing the soil after a three-year ley and the premiums on grains are very satisfying.”

Farm M is the smallest of the case study farms, in the early stages of establishing an agroforestry system in Wales on land that was clear felled and is now gradually being regenerated. The farmer is passionate about trees and has built his own house on the holding. He has planted various species to establish the edible woodland, complemented by blueberries and other berries for sale. The farmer also keeps some livestock (pigs and poultry) to help with the cultivation and aims to plant an even greater variety of trees in the future, as well as bring school children onto the farm.

“It was great to see the pigs planting apple trees. I love the fact that people have said ‘you’ll never be able to grow that here’ and I have.”

Farm N is a large mixed farm in Scotland that was set up new by buying land from several farms and is now converting to organic management on parts of the farm, with the intention to convert the whole farm to organic. The farmer was experimenting with various improvements to cropping and soils, such as reduced nitrogen use in conventional production, and decided for organic conversion because, unlike other schemes, organic offers a premium. He feels that compared to establishing the farm in the first place, the transition to organic is not a very big change at this stage. The farmer wants to contribute to improving consumer perception and be more involved in the marketing of his products, but also have a bit more time off.

“The soil health gives us confidence that we are heading in the right direction. Several small farms that we brought together were pretty much unworkable on their own and they have now come into reasonable health.”

Farm O is a medium-size farm in the North of England, with a main focus on free-range layers, some of which were converted to organic, when seeing the organic market growing. The farm has planted some trees and produces woodland eggs, and some grazing is rented out.

“This is more about management, less about chemicals which is always good. We enjoy working with the marketing chain. Fits our ethos.”

4.2.2 Farmers adopting several new practices

The farmers were recruited because they had been identified as having been involved in transitioning to one agroecological approach, but during the interviews it became clear that seven farms had introduced more than one agroecological practice as part of their transition.

This illustrates that farmers might engage with different ideas either at the same time or following on from each other. Table 4 provides an overview of the combinations found on the farms. Some combinations include organic and agroforestry (Farms D, E, O), mob grazing and organic (Farm A), mixed farming at landscape rather than farm scale alongside organic (Farm L), integrated farming and agroforestry (Farm C). Because of the small sample size,

for each different type of agroecological practices, we have not attempted to analyse whether there are any differences between the transition trajectories to organic and other agroecological practices.

Table 4: Agroecological approaches represented on the case farms

	Total Number	Number also engaged in				
		Integrated Farming	Pasture-fed	Organic	Agroforestry	Woodland eggs
Integrated Farming/ Direct drilling	5			2	1	
Pasture-fed	2			1		
Organic	10	2	1		2	1
Agroforestry	4	1		2		
Woodland eggs	1			1		

Source: Own data

For several of the farms that were mainly arable before their transition started, the integration of livestock was considered very important and the farm changed from being specialist to being more mixed. This is discussed in more detail in Section 4.3.4.

The interviews also illustrated the importance of financial considerations, e.g. cash-flow budgeting and comments on the high cost of inputs in conventional farming, which are discussed in more detail in Section 4.3.5.

In the literature about transition stages, the stage of active assessment or adoption on a trial phase was highlighted as very important. We asked specifically about any experimentation that the farmers did as part of the transition – these results are presented in Section 4.5.2.

4.2.3 Key influences and specific events mentioned as important

The interview guide included some prompts about key influences, or specific events that might have prompted the change. From the way farmers talk about their experiences, it is difficult to always capture the sequence of events that led them to seeing the agroecological practices as the way forward, but some timelines are included also in Annex 1. Some farmers clearly related the change to an event; in other cases the association with an event emerged as part of the analysis. Similar factors might also apply to other farms even if not directly mentioned in the interview.

Building on Table 1 above, we have grouped the points made into farm-specific factors and personal factors (both seen as internal), financial factors (including both internal and external influences, as it appeared difficult to separate them) and social factors (including engagement with other farmers) (see Table 5).

Table 5: Factors and events mentioned by the farmers as influencing change

Factor	Motivation or trigger event	Farm ID	No.
Internal farm-specific factors			
Human – Taking over farm	Succession	A, B, D, F, G, H, J	7
	New business	E, K, L, M, N	5
Biophysical farm resources	Taking on more land	G, H, K	3
	Low yields in one season	A, L	2
Increasing farm diversity and diversification	New farming activities	A, B, C, D, E, G, H, L, M, O, N	11
	New food-processing enterprises	E, N	2
	Taking on various non-farming activities	C, F, K	3
	Increasing solar capture on the farm	A, D	2
	Engaging with Stewardship	F	1
Integrate livestock	New livestock enterprises	A, B (currently not present), E, H, K, N	6
	Collaborate with neighbour who keeps stock	L	1
Internal personal factors			
Beliefs & attitudes related to farming	Concerns about soil health	A, B, G, J, K, L, N	7
	“Getting off the treadmill”	N	1
	Wanting to be a farmer: “you don’t do this for the money”	K	1
	Loving trees and turning that into a profession	M	1
	Not a big change, the farm was similar anyway	J	1
	Seeing the organic market grow	O	1
	Doing things differently and changes in the mind-set	A, B, C, E, G, H, J, N	7
Professional beliefs - dislike of using agro-chemicals	Pet dying from eating slug pellets	A	1
	Wanting to keep things natural	J	1
	“I am not a chemist”	L	1
	“We wanted to use less N fertiliser”	N	1
Internal and external financial factors			
Financial	Long-term /strategic review of farm profitability	A, G, H, L	4
	Low prices for conventional products	K, N	2
	Not having to pay the up-front investment	D	1
	Security of Stewardship payments	F	1
	Reducing costs for inputs or through low-input farming	A, B, J	3
Financial – specifically organic farming	Ability to access price premium	A, L, N, O	4
	Availability of organic support schemes	G, H, L (successful) K, M (not successful)	5

Factor	Motivation or trigger event	Farm ID	No.
Social factors			
Farmer engagement	Visit to or contact with inspirational farmers	A, B, D, E, K, L	6
	Attending a course or event	A, D, J	3
Professional beliefs – Seeking stronger engagement with the community	Create an eco-centre, allotments and work with vulnerable groups	C, E, F	3
	Creating opportunities for new entrants through new enterprises	A	1
	Wanting to change the perceptions about farming in the local community	F, N	2

Source: Own data

4.2.4 The challenges encountered

We asked all the farmers about the biggest problems that they encountered during their transition (Table 6). The answers are very illustrative of the range of technical, financial and social challenges and issues that go along with such a transition. Eight farms (Farms A, C, D, F, G, J, N, O) refer to their own attitudinal and self-belief issues. On seven farms (A, C, E, F, K, N, O) problems mentioned are mainly social, such as staffing, relationships with farmers, the landlord, buyers and other people. Five farms (Farms B, D, G, H, L) refer to technical problems, such as yields, crop failures and problems with crop or tree establishment, slugs, silage-making, fencing or grain storage. Also five farms (Farms E, K, L, M, N) refer to financial issues which include both farm cash flow and also problems with grants. This illustrates the importance of personal values, beliefs and attitudes and social issues in relation to transition processes, but also suggests that failure can be an important part of the learning processes.

Table 6: Biggest problems (up to three) from the farmers' point of view

Farm A	Staff; other people's influence; having faith that it will work.
Farm B	Crop failures; slug problems; crop establishment.
Farm C	Loneliness (<i>can be quite isolating</i>); time management; work/life balance.
Farm D	Electric fencing; trees not establishing; making it fit in with the rest of farming.
Farm E	Access to finance; social enterprise grant; understanding of the landlord.
Farm F	Staffing; self-belief (but everything has worked out); blackgrass.
Farm G	Yields, accepting that it all looks messier; silage making (i.e. struggling against the norms of tidy 'good' farming).
Farm H	Establishment of clover in the first year.
Farm J	Having to change the mind-set (" <i>everything is turned on its head</i> ").
Farm K	Lack of conversion funding; financing the herd; staff.
Farm L	Terrifying cash-flow; lack of grain storage.
Farm M	Lack of conversion funding; problems with tree establishment; weeds.
Farm N	Disconnect with grants; problems of fitting in when doing this differently; leaping into marketing and developing a relationship with buyers.
Farm O	Arrangements with letting out grazing; attitude of mind; organic regulations.

Source: Own data

4.2.5 *Overcoming problems and recommendations to other farmers*

As one of the closing questions, we also asked the farmers what advice they could give to other farmers considering their own transition. This illustrates the lessons the farmers learned in overcoming the problems.

The farmers gave much encouragement to just get on and do it (Farms J, M, N, O) summed up by “*The hardest is to get started*” (Farm A) or “*Think long and hard, take a deep breath and then go for it*” (Farm E) and “*keep things simple*” (Farm H) or to “*believe in it as it is all about the long-term*” (Farm K).

Two farmers (Farms D, M) wanted to encourage other farmers to plant trees “*they always have use*”.

Some farmers encouraged others to do small-scale experiments; carefully plan steps forward and not be afraid of trying new things or thinking outside the box. Others pointed out that options really need to be right for the farm and that there are no blueprint solutions, as every farm is different and trying to understand why some things are not working as expected (Farms B, F, G, L).

There are other recommendations referring to the human side of the transition, like needing to plan for life, as well as the business, and making sure there is enough time to do other things; and one farmer recommended that farmers should consider counselling and accepting the help from others that want to provide support (Farms A and C). Others encouraged ignoring peer-pressure. A bit ‘tongue in cheek’ but also illustrative of the transition experience was the recommendation to “*Find [...] a wife that enjoys paperwork*” (Farm H). Many of these points illustrate the importance of networks and reciprocal exchange as a major factor in the transitions.

4.2.6 *Specific issues related to organic farming*

Nine of the case study farms have undergone a transition to organic farming and several commented on this; the farms that are not engaging with organic farming also expressed views on the subject. The comments summarised in this section illustrate that this is often not a straightforward decision.

Two of the farmers started out along agroecological lines and then decided to pursue organic certification. Farm A started the transition with planting herbal leys for pasture-fed livestock but is now converting to organic to get access to premium markets for livestock. During the discussion, it became clear that the farmer was almost surprised about this direction and certainly had not planned to take the farm this way when starting out. A similar attitude was apparent with Farmer N, who opted for organic conversion because it was the only approach that appeared to promise premium prices for his way of farming.

Two farmers (Farms B and F) who transitioned to using direct drilling did not consider organic farming to be a good option for them. One had not seriously considered organic conversion, because of attitudes in the family, and one believed it to be difficult because of the lack of livestock on the farm. The pasture-fed Farm J felt that the cost of organic certification was too high and the potential benefit to be low hence the farmer had not joined the scheme.

Some of the farmers going organic nevertheless made some critical remarks about the way organic farming is presented. For example, Farmer L commented on the fact that whilst the organic sector is open and welcoming, there is also a “*tendency to take the moral high ground*”. Farmer N found the “*‘mud-slinging’ of some in the organic sector hard to defend*”.

4.3 Significant motivations, threats and opportunities mentioned by the farmers

4.3.1 Taking over the farm and farm related factors

Succession or taking over a new business can be considered an important trigger for change. Seven case study farmers mentioned that he/she had taken over the business from the family (Farms A, B, D, F, G, H, J, K) and on five farms the transition was related to taking over a new business (Farms E, K, L, M, N). The length of time from taking on the business to the start of transition varied from immediately to up to 15 years later (Farm H). On farms where there was a longer time between the succession and transition, other factors may also have been important triggers. For example, Farm H felt only able to go organic once more land could be purchased.

Structural changes were reported by several farms, such as the ability to expand the land base of the business (Farms G, H, K) and collaboration with another farmer which allowed one farmer to integrate livestock (Farm L) (see also Sections 4.3.3 and 4.3.4.).

4.3.2 Concerns about soil health

Lampkin et al. (2015) highlighted a new focus in recent years on soils, i.e. the crucial role of soil as natural capital, delivering ecosystem services for the environment and the economy. Concern about soil health was a central theme for seven mixed and mainly arable farms (Farms A, B, G, J, K, L, N) in some cases with a direct link to farm profitability.

On one farm (Farm A) flat-lining crop yields and increasing costs encouraged the farmer to look to including grassland in the rotation to improve soil fertility and soil organic matter content. Similarly, Farmer L knew – when taking over the tenancy – that the soils on the farm were very tired and that something needed to be done to improve soil fertility. Also on Farms B and G, soil health and future-proofing were central topics during the interviews. Both farmers investigated and persevered with direct drilling, unlike many others, who were “*abandoning it after a couple of years*”. “*My ambition is to increase organic matter and micro/macro fauna. If you create the habitat for the wildlife, it will come.*” Farmer K was convinced that the soil is the engine of the farm. “*If I don’t get my soil right, I can’t feed the farm*”. Farmer J was told about various mineral deficiencies in the soil, which encouraged her to look for new ways to improve pastures for her stock. Farmer N was typical for many attitudes expressed when he said: “*Soil health gives us confidence that we are heading in the right direction*”.

4.3.3 Diversifying farming activities

Diversification of farming activities was an important topic on several farms. Diversity is associated with agroecology, with diverse species and a greater diversity of crops and livestock – together expected to create resource-use synergies and system stability. For example, using species and varietal mixtures as alternatives to monocultures is understood to have positive effects on the control of diseases, pests and weeds, influencing both epidemics and the evolution of pest and pathogen strains resistant to control mechanisms. Diversification is a strategy that has also been widely advocated as a way for farmers to create additional sources of income and reduce risk.

The theme of diversification was mentioned on eleven case study farms. This included the diversification of cropping or farming enterprises, realising more opportunities through direct selling, through engaging with the market or rather creating new markets, to engaging with the local community and to becoming less reliant on outside expertise and advice. Some

farmers also mentioned diversification into non-farming activities, such as providing specific services aimed at the local community.

Six farmers (Farms A, B, G, H, L, N) talked about diversifying their cropping. This included companion cropping, intercropping, mixing oilseed rape and cereals with various legumes, introducing grassland or lucerne into mainly arable rotations, and growing a wider range of cash crops.

Four farmers (Farms C, D, M, O) diversified through planting trees. Farm D planted trees as resource for the cattle with nutritional and medicinal benefits. Farm C is planting an edible woodland. Farm M added berries to the edible woodland planting as an additional source of income. On Farm O, the trees form the basis for the woodland egg production.

Other diversification activities include engaging with an environmental stewardship scheme (Farm F) and diversifying into non-farming and community-facing activities (Farms C and F) including renewable energy, office development, allotments, space for a children's nursery on site and a community eco-centre. Using existing woodland on the farm, Farm K developed an alternative income stream by selling charcoal and Farm E diversified into on-farm processing and direct marketing. Farm N is building food production units to support a small business that can use farm products.

4.3.4 Mixed farming and integrating livestock

Agroecological systems are often associated with mixed production of crops and livestock, which allows for the utilisation of fertility-building crops not suitable for human consumption, and the co-operative use of farmyard manures. However, converting an arable enterprise to a mixed one has capital implications regarding purchase of stock, as well as fencing, buildings and water supply.

Following on from the concerns about improving soil fertility, the ability to integrate livestock, and to utilise the fertility-building capacity of ley were considered to be crucially important to the change process on some of the mainly arable farms.

Two arable farmers (Farms A and B) started up a livestock enterprise. Farm A integrated grasslands because of declining arable yields and is now developing new sheep and dairy enterprises, with the aim of generating new business opportunities for new entrants through share farming agreements. Farm B also started utilising grassland with beef cattle, but is now experimenting with shorter-term leys to see the effect on the soil and following arable crops.

Two farmers (Farms E and H) diversified the number of livestock enterprises (adding goats on Farm E and beef on Farm H). In the case of Farm E, on-farm processing and direct marketing were also mentioned.

The important issue of the capital required to build up a herd was mentioned on three farms (Farms A, E, K). To solve this, Farmer A worked out that the purchase of livestock for new enterprises could be financed by savings in arable inputs through doing a cash-flow budget. Farmer E was able to rent rather than buy the cows, which reduced the capital needs in the start-up phase of the tenancy, whereas Farmer K had to find the capital to start his herd, but was now aiming to grow the herd from replacements.

Farmer L described the opportunity to collaborate with a neighbour as follows: *“The game changer was being able to collaborate with a nearby farm that wanted land for young dairy stock”*. This opened up a way to have an income from the grassland areas and allowed the farmer to work with longer-term leys (more than 3 years) and more diverse mixtures.

Even if not mentioned directly as a key event during the transition, farming with livestock was also considered to be quite important on many of the case study farms. Farm B mentioned livestock as important for being more sustainable and, whilst letting out grazing at present, is expecting stock to return to the farm in the long term.

Also, Farms G and H both consider livestock and manure to be essential to make the system work, albeit under different circumstances. For Farm G, creating enough fertility was seen as crucial for the success of the organic side of the business. Farmer F made a similar point, when considering the farm to be not suitable for organic farming, because there was no livestock.

On farms that had livestock prior to the transition, the topic was not mentioned in the discussion. For example, Farms H and N added a new livestock enterprise (sheep) but as both farms had livestock before, this change was not seen as important for the transition even if it further increased the diversity of enterprises.

4.3.5 *Financial issues*

Financial issues are obviously very important. On nearly all farms, regardless of the management system which they transitioned to, financial considerations were mentioned during the interviews. Many of the case study farmers are taking part in benchmarking schemes, where they compare their own farm's performance with other similar farms; they apply physical and financial indicators, either at the enterprise or whole-farm level. Transition can impact on the financial situation of the farm in positive and negative ways, as illustrated by the case study farmers.

A negative impact on profitability can arise from reducing yields, but this point was not discussed in detail by any of the farmers we interviewed, indicating that once the decision for change was made this was no longer important. Transition can also lead to a need for new capital investment, e.g. for machinery (Farm B), for livestock and related buildings/fences (Farms A, E, K), for trees (Farm D) or for on-farm processing (e.g. Farm E).

On the positive side, reducing input use can also lead to cost savings (mentioned explicitly by Farms A, B and J). Higher income as a result of transition can occur if products are sold at a better price directly to the consumer (Farms E and J), through access to premium markets and certification schemes, such as PFLA (Farm J), LEAF (Farm E) or organic farming (e.g. mentioned directly as a motivator by Farms A and N). Higher income also occurs if the farms have access to support payments during transition (e.g. Farms F and H).

On six farms (Farms A, G, H, L, N, O) financial considerations and the anticipation of better profitability in the long term were explicitly mentioned as an important motivator for the change process, but it is likely that expected long-term profitability was also important for the other cases.

- Farmer A did extensive reading and a study trip on farm economics, prior to making changes on the farm. A financial review of the business showed that the savings on inputs for arable could help finance new livestock enterprises. Farm A also moved to become organic to be able to access premiums for meat and milk. With that the farm now also receives payment under the organic support scheme, but this is not mentioned as a motivator by the farmer.
- For Farm G, the transition was about future-proofing the farm (soil fertility) and reducing fixed costs. The farmer takes part in benchmarking comparisons, but remains rather sceptical about the direct value of such schemes to the business.

- Farm H valued the security of the five-year organic support payments. The farmer takes part in several benchmarking schemes and mentioned that other farmers were surprised that they are doing so well financially, despite being organic.
- Farm L was part-organic when the farmer took on the business and the farmer could observe better organic margins at first hand, which influenced the decision to convert the rest. The farmer also reflected that a more long-term perspective in farm economics is needed, one that views investment in soils as a capital investment.
- Farm N, a newly established farm, saw organic farming as a way of getting a reward for an extensive way of farming in the long term, even if premiums could not be realised in the early stages of the transition process.
- Farm O watched the growth of the organic market and decided to get on board, at least with parts of the farm, because of the potential profitability. *“It seems to be what the customers want.”* However, the farmer also noted the lack of a clear advantage of organic in terms of profitability on his farm.

On three farms (Farms B, D, F), the financial impact of the transition was expected to be neutral. Farm B saw saving costs and time as important benefits of direct-drilling. Farm D considers the farm to be of average profitability. One concern of the transition to agroforestry was that it should not have any negative impacts on labour organisation (moving fences, bringing the cattle in for milking). The financial support from the Woodland Trust covering the costs of tree planting was seen as crucial. The farmer expects some financial benefits from agroforestry in the long term, but this cannot yet be measured. For Farm F, considered to perform above average beforehand, the transition made financial sense, with access to stewardship funding offering some welcome stability. Like many others, the farmer is now worried about what will come after Brexit.

Five farmers (Farms C, E, J, K, M) expressed some concerns about the long-term financial stability of their farms, and in some but not all cases these relate directly to the transition. All these farms are either medium (Farms C and E) or small farms (Farms J, K, M) (and/or farm start-ups). Farm C reflected on the fact that the returns on investments in agriculture can be very small. The biggest challenge for Farm E was to get access to capital to invest into the business, but renting rather than buying cows saved some cost. The cost savings associated with low input farming had been a major attraction for Farm J, but concerns about the long-term viability of the small business remained.

Farmer K is passionate about being a farmer, but knows that viability is borderline. The start-up has involved a considerable amount of capital investment for the stock, buildings and fencing – partly supported by a young entrant’s grant, even if the farmer tried to keep investment in machinery low to keep fixed costs down. Being unsuccessful in getting access to the organic grant has been very disappointing, but the farmer wanted to continue his transition to organic farming. However, the farmer had only learned about the grant rejection very shortly before the interview. Farm M is a newly established small-holding with edible woodland. The farm is not yet profitable and the organic grant application was also rejected.

4.4 The social side of transition

In this final section, we have summarised the farmers’ feedback on the impact of the transition on their relationships with other people. ‘People’ includes a mixture of non-professional and professional networks. We also asked the farmers about the importance of some key information sources for their transition. The experiences presented clearly illustrate the important role of social issues in the transition to more sustainable land management practices.

4.4.1 *Spouse, staff, neighbouring and other farmers*

On most farms, the family or spouse is described as supportive in the transition; on Farms D and H the spouse took part in the interview, at least for some time. In contrast, on Farm B and Farm J there was a mention of some 'politics' within the family, illustrating that the farming family can be a very strong factor impacting on any such change. In both cases the interviewed farmer said that the family had spoken against them taking the farm in a particular direction, such as conversion to organic farming. A similar point was made by Farmer A in reference to peers from college who are prevented by the older generation from farming the way they would like to.

Regarding the impact on staff, the results are mixed, with examples of positive and negative experiences; some farms had no staff or no specific issues were mentioned. On five farms (Farms D, G, H, N and O), staff are broadly supportive of the changes. However, Farmer G noted that at times the staff struggle to understand the reasoning for certain practices. Farmer O describes that staff like this way of farming because "*people want it* [referring to consumers]". In contrast, conflicts with staff are mentioned on two farms. Farmer B characterised his farm manager as a very conservative person who used to tell him that what he proposed would not work. The farmer said he had now given up trying to convince the farm manager, but does not feel constrained by this any longer. Farmer E highlighted that finding good staff can be very difficult. Farmer A also reported that staff had been a problem in the past and he now prefers to create opportunities for other people to develop their own business on the farm rather than having staff.

It is interesting to note that most farmers we interviewed did not consider the relationship with neighbouring farms to be very important or influential. For example, Farmer F appeared typical for many when saying "*I am not too worried about other farmers*". Some know that "*they look over the fence*" (Farm A), but "*they don't understand what I am trying to do*" (Farm H). However, Farmer K mentioned that particularly one neighbouring farmer is quite sceptical about his farming methods, and the female Farmer J believes that her mainly male neighbours consider her to be "*a bit mad*", so she has little direct contact. The farmers appear to be more independently minded but may have also turned that way in response to criticism experienced. On the other hand, there is also one example of a farmer who has a close relationship with the local farming community: Farmer D, who farms a well-established dairy farm, is also the chairman of the local farmer discussion group and appears to be well respected amongst his direct peers.

4.4.2 *The local community*

Several farmers are strongly motivated by wanting to engage more with the local community. The goal of Farm C is to let the land to be useful for the community, and alongside the edible woodland, the farmer has created an eco-centre (currently let out) and is looking to develop educational and care farming activities. However, the farmer is frustrated about how difficult it has been to get wider support for this and comments on the lack of working together in the industry at local level. Farm E tried to develop direct sales enterprises for the people in the local community. Farmer F has engaged with community-facing activities that allow people to experience farming, such as setting up allotments, a children's nursery and glamping (luxury camping for farm tourism). The farmer is excited about future community support. Farm N is now more community facing than in the past and was positively surprised how supportive the local community has been. Also Farmer A mentions that whilst the local community appeared mainly positive about the change, there have been some problems with dog walkers and the newly introduced sheep enterprise.

4.4.3 *The relationship with government agencies*

All farmers were asked to describe their relationship with the government agencies with which they had dealings in their respective regions. Such relationships with government agencies can be important to the transition and are likely to affect the degree to which these affect farmer's 'buy-in' to the policy frameworks. The answers referred mainly to the agency administering agri-environment schemes and reflect a variety of views, ranging from the broadly supportive to limited interaction.

Three farms describe having a good relationship with the government agencies. Farmer F describes the relationship with government as very good, apart from some ups and downs with form filling, and also Farmer G sees the government as broadly supportive. Farmer H understands the need for paperwork and for inspections.

Four farmers describe their relationship with government as mixed. Farm C found the stewardship application process to be helpful and the relationship with the adviser is good, but the farmer described trying a LEADER application as "*horrendous*". Similarly, Farm E has a good relationship with the local adviser from Natural England, who was encouraging, but is annoyed with some delays in the payment and frustrated about the social enterprise grant application process. Farm J was in the ELS and had good relations with local advisers but finds the new stewardship scheme too rigid and suggested that the options need to look at individual farms and be more flexibly applied. Farm N describes the relationship as broadly supportive but hard work and has some complaints about the level of bureaucracy involved.

Six farmers commented negatively on existing schemes and the associated paperwork. Farmer A felt that his way of farming does not fit the existing options. Farm J commented on the new stewardship scheme Farm B has limited engagement at present, but some past interaction with Catchment Sensitive Farming. being too rigid and the lack of flexible options. Farm K felt that schemes did not allow any thinking outside the box. Farm N commented on the level of bureaucracy involved and felt that this might discourage farmers from applying. Farmer L felt that some options did not stack up when using a contractor to do the work. Farm D had some discussion on tree numbers per hectare, so the farmer decided to stay on the safe side and plant less than 150 per ha. The farm also was in the HLS and is now trying to get into mid-tier and finding that a bit frustrating. This indicates a belief amongst the farmers that the regulators have not fully considered their way of farming, but this was not explained in greater detail by any of them. Several farmers commented on uncertainty of support schemes because of Brexit.

Three farmers prefer to have limited engagement with government or consider that their farming activities do not really fit into the current stewardship schemes. The farmer would like to see specific agroforestry support. Farm L takes part in the organic support scheme but prefers to avoid government agencies if possible and at present feels that stewardship options do not suit the farm and have little financial benefit for the current way of farming. Farm O puts up with government and just wants to get on with things.

Perceptions of farmers varied in the different parts of the country and included positive and negative experiences. However, government support was not a central topic in most cases and the sample is too small to allow any robust conclusions to be drawn from this.

4.5 Learning to doing things differently during the transition process

The farmers referred to changes that they had undergone themselves during the transition, which impacted also on the way they were running their farm, which we have summarised in this section. The first section refers to changes in the mind-set, followed by some reflection on experimenting and some specific issues that were mentioned in relation to farmer attitudes to organic farming.

4.5.1 *Changes in the mind-set and management approach*

Several farmers refer to changes in their personal and professional beliefs and the need to change mind-set, in relation to soils and weeds, and the management of the environment, but also about the relationship with buyers, in particular focusing on the long term, going hand-in-hand with their transition.

- For example, Farmer G mentioned the importance of changing attitudes (*"it's a mind game, we were so used to seeing black soil"*). He also referred to the need to focus more on the monitoring for the long-term goals of the farm (improving soil fertility by getting more carbon into the soil), rather than short-term profitability, even if there are short-term set-backs, for example in terms of yield penalties. The farmer sees a need for being patient and flexible.
- Long-term goals were also mentioned by Farmer A, who sees setting and reviewing of personal goals, and bringing the business in line with those, as important during the transition.
- Farmer H talked about the need for having the right mind-set, for example *"I learned to love the weeds; they are also forage"*. Farmer J learned *"seeing docks and thistles totally differently"* in the course of the transition.
- Farmer C is convinced that for the transition to be successful, the management of the environmental areas needs to be given the same attention as that of the cropped areas.
- Farmer N expressed that they are now farming in a more reflective way, questioning their own practices and why they are doing things in a certain way. One important learning process during transition was also to engage with buyers and the whole supply chain and not just primary production.

Several farmers comment on the fact that they have developed their own skills and consider themselves now less reliant on outside expertise. For example, Farmer B commented *"I have started to give much more thought to agronomy rather than just relying on the agronomist"*. Farmer G *"wanted to understand it all myself"* and Farmer E *"loves the challenge of having to find your own solutions"*.

One comment in particular illustrates that perspectives do change and that once engaged, the transition process seemed less daunting than it was anticipated beforehand. *"The biggest step is getting started"* (Farmer A).

4.5.2 *Experimenting on the farm with improving efficiency, substitution or redesign*

Several of the change models presented in the background section refer to *'trying things'* before they are fully introduced. Nearly all the case study farmers mentioned that they constantly try new things, on their own, as part of college projects or with local discussion groups set up by advisory organisations.

Some comments illustrate the importance of experimenting and learning. Farmer G considered trials on the farm to be worthwhile, even if they created some hassle in the short term. Farmer M considered the whole thing to be an experiment and pointed out that some failures were an important part of the process, forcing them to *"think outside the box"*.

Farmer N said that they were experimenting all the time, both deliberately (e.g. with growing bread wheat and malting barley) but also by making mistakes and learning from them.

The transition stories and the nature of the experiments on the case study farms can be categorised using the framework of transition stages of the ESR model presented in the background Section 2.2.1. Those three aspects occur in various combinations and sequences in our farm cases. Redesign need not follow from prior substitution measures, and neither do they need to follow from efficiency measures (see Table 7).

Table 7: Presence of efficiency, substitution and redesign stages on case study farms

Farm	Efficiency	Substitution	Redesign
F	N efficiency	cover crops	n/a
B	seed rates, fertiliser	pest control without neonicotinoids	livestock integration
H	seed rates	machinery, livestock genetics	new livestock species
N	N efficiency	new cash crops	new mixed farms
O	early lambing	machinery	tree planting
G		direct drilling, intercropping	wider rotation
J		livestock genetics	new grazing management
K		teat sealant	establishing the farm with new livestock enterprises
L		compost teas	ley into rotation
A			livestock integration
C			tree planting
D			tree planting
E			new livestock species
M			tree planting

Source: Own data

Farm F mainly illustrates the first two stages: This farm is undertaking trials in increasing the efficiency (N sensors to improve efficiency in oilseed rape, fertiliser trials) and substitution (e.g. cover crops) and has made some changes that can be classed as diversification or non-farming business ventures (e.g. solar PV, biomass boiler, barn conversion to offices, local nursery, setting up allotments).

Four farms illustrate all three stages of the ESR model, but not necessarily in sequential order.

- Farmer B talked about several on-going experiments that include elements of efficiency (seed rates and fertiliser applications) and substitution in terms of both inputs (replacing the use of neonicotinoids in oilseed rape with alternatives; perceived to be less harmful to bees) and machinery (replacing the seeding equipment) and some element of redesign (e.g. integrating livestock which led to wider rotations). Also changing to a direct drill system can be considered a redesign activity; the Soil Management Initiative considers this a major change that affects all farming operations.

- Farm H has engaged with increasing N efficiency (e.g. variable rates of use), with substitution (e.g. machinery replacements, new livestock genetics, reseeding of pastures, crop mixtures) and with redesign by introducing cattle in a previously largely sheep-based system which allowed him to widen the crop rotation.
- Farm N was newly 'designed' but the farm also shows activities in the efficiency (precision farming and N reduction) and the substitution stages (e.g. replacing less well-performing cash crops with others considered to be better performing, introducing clover as ground cover).
- On Farm O, efficiency can be found in terms of experimenting with early lambing, substitution in the form of experimenting with a range of new technologies for the layer hens and redesign by engaging in tree planting to support the poultry.

Four farms illustrate the Substitution as well as Redesign stage.

- On Farm G, the introduction of direct drilling represents both an element of substitution (replacing one drilling cultivation system with another) but also an element of redesign if it is considered that the crop rotation is widened as a consequence. The farmer did several experiments with companion cropping (e.g. cereal legume mixtures) which fall somewhere between substitution and redesign, and now practiced more widely on the farm.
- Farm J carried out a substitution experiment with livestock genetics but found it not to be working well under the farm-specific circumstances. The farmer redesigned the grazing system, adopting a mob-grazing approach in the grassland management.
- Farm K is a new farm set-up that did some experimentation with input substitution (teat sealant instead of using antibiotics for drying-off cows), but this has not yet been a full success.
- Also Farm L illustrates elements of substitution by experimenting with compost teas, but also aspects of redesign by introducing grassland and letting out the grazing to improve the fertility-building phase of the rotation.

Five farms mainly illustrate the redesign stage not always following from substitution measures.

- Farm A, one of the previously mainly arable farms, was changed to a more mixed farming system with integration of new livestock enterprises.
- Redesign on Farm C occurred with the planting of woodland, and in developing community engagement.
- Farmer D planted trees and made clear that when doing this it can take quite a long time until any direct impact can be seen in the farming business.
- The transition process on Farm E can probably be characterised as a redesign at the point of taking over a new tenancy, when the goats and dairy processing were added to the existing dairy herd. However, the farmer is convinced that in the future, technology (e.g. substitution of simple mechanical weed control with GPS/computer-guided technology) will be beneficial for the business in the long term.
- The establishment of edible woodland on a clear-fell site on Farm M is clearly one example of a design-led approach, but because there were no farming activities beforehand, the term redesign seems misleading.

4.5.3 *Study periods, Nuffield scholarships and courses*

Several farms had an interest in alternative ways of farming to start with and applied for and were granted periods of study in the form of study trips. Others were attending courses and conferences with agroecological themes, some of them with a strong peer-to-peer learning focus. However, it appears difficult to disentangle whether interest in different ways of farming encouraged the farmer to go on study trips, or whether the places seen inspired them to try a different way of farming.

Many of the case study farmers were Nuffield scholars and this seems to have opened their eyes and given them the confidence to do things in a different way. A Nuffield scholarship is awarded to agricultural professionals (farmers and other professionals such as consultants) for an intensive period of study visiting farms abroad on a specific theme which results in a published experience report⁷.

The themes of case study farmers' scholarships included farmer discussion groups, soil fertility, farm economics and Community Supported Agriculture (CSAs). They were not always directly related to the transition, but the community of Nuffield scholars as well as reports were also mentioned as an important source of information by other case study farmers. One farmer described them as "*an interesting bunch that you can interrogate*".

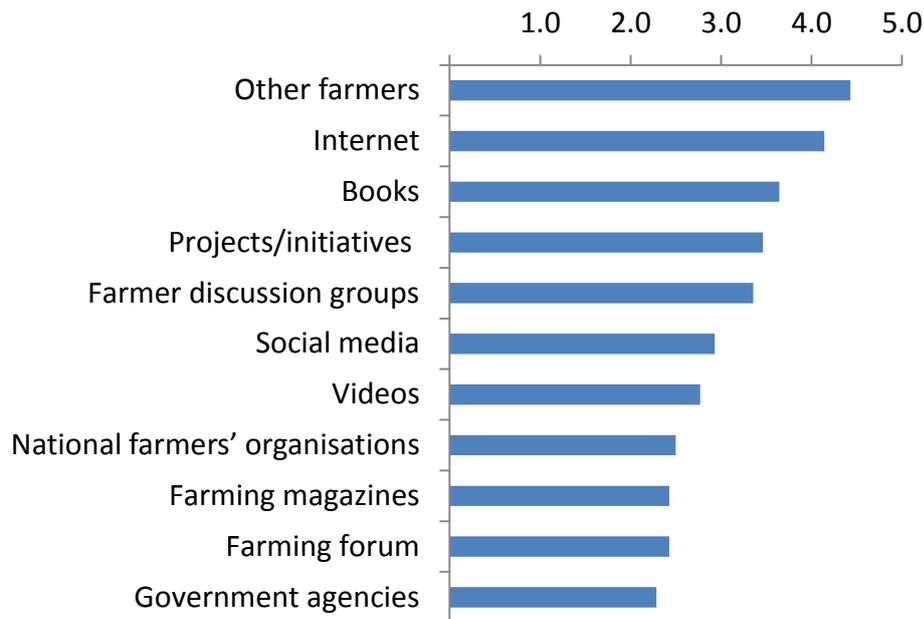
Other study activities included self-organised study trips or attending other study tours, for example to France. Two farmers specifically mentioned having done a holistic management course which they found a very positive experience; both are now also active members of the Pasture Fed Livestock Association (PFLA). One farmer found it useful to attend free conservation-related courses in the area and several farmers have attended UK farming conferences with agroecological themes. It is likely that all those trips and events will not only have given the farmers access to inspiration and knowledge, but also have helped in developing social networks and peer groups with similar interests and aims.

4.5.4 Use of information sources

As part of the interview, the farmers were also asked to score a number information sources on farming on a scale of 1-5, which gives a qualitative indication of their preferences (see Figure 4). Other farmers, the internet, books, projects and discussion groups receive above-average scores. The preference for other farmers corresponds with our case study farms frequently mentioning other farmers (in the UK or abroad) as a source of inspiration and highlights the importance of peer-to-peer exchanges. For example, Farmer K mentions a neighbour, "*who is a real ambassador for organic farming and has been a big help*" as a mentor.

Visiting or having contact with somebody or a group of farmers sharing similar interests was an important factor in the transition on about half of the case study farms. In this context, Farmer L observed that groups of organic farmers are welcoming and Farmer E commented that they are more willing to share knowledge and discuss success, but also their failure, than non-organic farmers. Two of the direct-drill farms referred to being in touch with a small network of farmers working in a similar way. Two farmers found it helpful to be members of a group of like-minded farmers (e.g. PFLA) where they can get some answers and practical support. The results illustrate that other farmers can be a great source of inspiration, but some farmers also mentioned discouraging comments.

⁷ The Nuffield Farming Scholarships Trust awards approximately 20 individuals each year with the opportunity to research topics of interest in farming, food, horticulture or rural industries. <http://www.nuffieldscholar.org/>



Source: Own data

Figure 4: Helpfulness of information sources for the transition process (Average scores - 1= least, 5= most helpful)

Some other comments from farmers reveal other important information sources, even if at times the comments seem contradictory. The internet scored above average and some farmers have made extensive use of it – “especially YouTube, would be lost without it” – or as a place for “meeting people with similar interests” and “as instant access to information”. In contrast the internet-based Farming Forum received a below-average score and the comments of the farmers ranged from “very useful” to “faceless, threatening and negative” or “too much machinery” (from a livestock farmer), indicating that this particular forum does not appeal to all the farmers we interviewed.

Books also scored above average and some farmers mentioned specific titles that have influenced them, such as *Carbon Fields* (G. Harvey), *Dirt* (D. Montgomery), *Holistic Management Handbook* (A. Savory), *The Lean Farm* (B. Hartman), Michael Pollan’s books, *Organic Farm Management Handbook* (Lampkin et al.), *Organic Farming* (N. Lampkin), and *Restoration Agriculture* (M. Shephard).

In contrast, the printed media of farming magazines had a below-average score. Some farmers made dismissive comments about the relevance of the content to them: “Stopped all subscriptions”; “Aim toward the middle of the road-farming”, “Nothing about trees”.

Direct-drilling and agroforestry farmers believe that there is very limited expertise related to these topics in the UK. For example, Farmers B and G refer to the fact that there are only about 50 or so farmers, who only use direct drilling and never plough in the UK, even though reduced tillage is far more widespread. Several agroforestry farmers mention the same person as the main source of inspiration, support or advice. This reflects the fact that the community of agroforestry practitioners in the UK is also small.

A couple of farmers mentioned some organisations as sources of support or information. These include, in alphabetical order⁸: Abacus, ADAS, BASE, Farming Connect (Mentoring), FWAG, Innovative Famers, LEAF, Local Wildlife Trust, OF&G, ORC, PFLA, RSPB, Savills, Soil Association, Woodland Trust. It is not clear why these organisations received a more favourable view from some farmers than indicated by the below-average score for farming organisations as a whole. Though several of these organisations offer a mixture of peer-to-peer contact opportunities, access to information and one-to-one advice, the positive mention may also arise from a specific individual whom the farmer considered to be inspirational or knowledgeable on certain agroecological practices.

Two farmers were surprised by some experiences they had during the transition. Farmer J was surprised that it was a commercial representative who suggested contacting the PFLA, whereas the levy body-led discussion group had been quite dismissive. Farmer L was positively surprised when the local financial consultant was not prejudiced against “...*this middle-aged woman who wants to go organic*”. However, there was also one case (Farm M) where the farmer felt that they had not received much support from anybody.

It appears that the opportunity to have contact with other farmers, including in other countries, can be very inspirational. Across the UK, there appear to be a number of helpful sources of information, but no one body/organisation appears to be the “go-to-place” for information about agroecological practices.

⁸ See Glossary for Acronyms

5 DISCUSSION

The case study results illustrate the trajectories, challenges and opportunities that occurred during transition. Though the farms cannot be considered a representative sample for all UK farmers undergoing similar transitions, but the method of comparative case studies is particularly suited for ‘how’ and ‘why’ research questions, where the investigator has no possibility to control the events (Yin, 2014). Our results thus provide insights into the thought processes and behaviours of individual farmers and this contributes to a better understanding of such processes and to theory building. The discussion below contrasts the results with different theoretical models of transition processes, and the results confirm elements of several models, illustrating that different perspectives can be useful. However, because the sample is relatively small, we have not attempted to propose a new model of farm-level transition processes.

5.1 The case study farmers as typical innovators

Our sample is socially distinct: all the farmers are members of networks that engage with sustainable agriculture. The results show that social processes are very important and most farmers make reference to issues that could be seen as social capital (Pretty and Ward, 2001), such as inspiration through contact with others, wider social networks including support from NGOs and engagement with the local community, as well as the importance of peer-to-peer knowledge exchange.

The study illustrates the heterogeneity of farmers engaging in the transition, and this is also highlighted in the literature (Hall, 2014). Farmers, including those engaging with transition, are a diverse occupational group, with differences in wealth, class and education and also with different levels of self-confidence with regard to environmental management.

The majority of the case study farmers either owned all or parts of their farm or were renting from the family. In many ways, the farmers we interviewed showed the characteristics of typical *Innovators* or *Early Adopters* as described by Rogers (1983). The educational status of the case study farms is mixed but appears to be above average for UK farmers. About 35% of our sample farmers have a BSc in agriculture, and a similar proportion has, taken together, a Higher or National Diploma. They appear strongly self-motivated and many do not pay that much attention to what other farmers might say about them. This is a characteristic that Rogers clearly attributed to Innovators, who are better educated and draw on wider networks compared to later adopters. In Rogers’ model, there is a clear difference between innovators, who are often incomers and do not care so much about what the farming community thinks, and later adopters. The second group, labelled by Rogers as Early Adopters, is likely to be more embedded in the local farming community. Several of our case study farmers show some characteristics of this category. For example, Farmer D and Farmer O appear well anchored and respected in their local farming community.

It appears that interest in agroecological practices is growing in the wider farming community, as illustrated by this recent column from a local newspaper:

“Agroecology may provide the answers to many of the problems farmers face, especially those growing arable crops. Degraded soils, the impact of climate change, a productivity plateau, resistance to pesticides and the withdrawal of many crop protection products are all conspiring to make progress difficult” (Davis, 2017)

5.2 Factors and spheres impacting on the transition process

In the literature, the factors impacting on the process of change have been grouped in different ways, mainly trying to distinguish between internal (i.e. personal and psychological factors: Hall, 2014; Pike, 2008) or spheres of influence (e.g. Mills et al., 2016). The results make clear that the motives and events that prompted farmers to engage with transition, the challenges experienced and the opportunities as seen by the farmers are almost as varied as the number of farms we studied.

Table 5 shows the influencing factors mentioned by the case study farmers under the headings of farm-specific and farmers' personal factors, as well as financial and social factors, which represent a combination of internal and external categories. Motivating factors mentioned frequently include farm-specific factors, such as taking over the family farm or taken on a new farming business (twelve farms) or attitudes about farming, such as seeking to diversify into new farming activities (eleven farms). Concerns about soil health (mentioned by seven farms as a motivation) illustrate the close linkages between farmer and farm and the difficulties in categorising factors. The soil health concern was categorised as professional belief, but the underlying reason for farmers mentioning this might be an observation of declining soil organic matter on their farms, which should be categorised as a farm-related factor, comparable to observations of low yields or specific weed problems.

Structural and farm-specific factors were very important in motivational factors shaping the transition, such as the ability to diversify the farming activities, for example through to access to more land or capital. The importance of the biophysical resources of the farm in the farm stories suggests that in aiming to describe farm transition processes and farmer behaviour, the "Relationship to Nature" (referred to by Hall, 2014) is important, but also the relationship to the farm, to the soil and to the diversity on the farm, in terms of both of the range of species farmed (crops and livestock) and the wildlife in the natural environment.

Mills et al. (2016) identified three spheres of influence i.e. willingness to adopt, ability to adopt and farmer engagement, and categorised farmers' engagement with environmental stewardship according to which sphere appears to dominate. In reviewing various models of behavioural change, Hall (2014) distinguished between the farmers' relationship with 'Other People', with the 'Self' and with 'Nature'. Both of these categorisations could be applied to the data, an indication that all these spheres were relevant in influencing decision trajectories. This illustrates the close interaction between the farmer and the farm in the transition process and the limitation of applying a strict categorisation of factors to this qualitative data set derived from 14 case studies.

Personal beliefs, as illustrated by 'changes in the mind-set' (seven farms) are also important. These farmers refer to their own personal transition, whilst changes on the farm are ongoing. in terms of cognitive shifts in understanding cultivation and marketing processes ('changes in the mind-set', 'weeds as forage', 'accepting mess', engagement with the supply chain), as well as emotional shifts in enjoying new skills and knowledge (finding your own agronomic solutions, involvement in marketing, discussions with community) and gaining confidence. Hall (2014) refers to the importance of 'Self' in farmer behaviour models. Among the farmers there appears to be a more active 'will' to adopt – rather than the more passive 'willingness to adopt' (Mills et al., 2016). Besides, both the various experiments carried out, and the learning from mistakes, contribute to shifts in understanding and attitudes and to gaining increased self-confidence.

The complexity of factors impacting on the transition and the linkages between them is also illustrated by the farmers' recollection of their biggest challenges, which includes a range of issues related to people (such as self-belief, problems with staff and the attitude of other people), technical issues (failure in the establishment of crops and trees, problems with

silage, weed problems such as black-grass) and financial problems (access to finance and grants, cash-flow problems).

However, nearly all the farmers were positive about the transition. They were proud of how their farms looked now, especially regarding soil improvements, reduced weed problems, better animal health and improved value to the landscape and biodiversity. Several of these positive outcomes also represent public goods that would warrant public and state support, but we did not aim in this study to quantify the public good benefits and outcomes.

The farmers also talked about financial improvements through taking part in grant schemes (environmental stewardship, organic support scheme), seeking premium prices in the marketplace (through organic, LEAF Marque and PFLA certification) and receiving other support (e.g. the Woodland Trust paying for the costs of trees and some help with tree planting). They seek premium prices from quality labels or from short supply chains such as direct sales; they must devote substantial time to develop the skills and build the relationships. In some organisations working with agroecology or organic farming, there is a widespread belief that farmers who state financial motives for their transition have the 'wrong reasons' for change. This belief could discourage more business-minded farmers from considering agroecological options. Several farmers actually emphasised the more long-term financial benefits that they were expecting from the changes they had made, such as future economic benefit from trees.

The farmers who received grants valued the grant support received (environmental stewardship and organic support), but three farms were disappointed with their lack of success in their grant applications (two organic support, one LEADER). The main reasons for failure were budget restrictions resulting in the introduction of competitive entry requirements. Five farmers commented that they felt that the grant criteria do not fit their specific practices and that they have a disincentive to apply for such funds, or that there is a mismatch between the options and criteria in the stewardship scheme and their specific way of farming.

5.3 Conceptualising the stages of the transition process

One aim of the study was to get a better understanding of individuals' trajectories in context, including social, economic, biophysical, cultural and psychological dimensions of the transition process. In this section, we discuss the experience of the farmers' transition in the context of a small number of models of the stages of transition which we presented in Chapter 2. The section starts with a discussion of the results in relation to the framework of Efficiency–Substitution–Redesign (Hill, 1985), followed by the concept of 'trigger events' for major changes in farming practice as described by Sutherland et al. (2012), which builds on the stages in the Adoption–Diffusion model (Rogers, 1983), followed by some concluding remarks. Elements of the stages of both the ESR model (Hill, 2014) and the Trigger Event model (Sutherland et al., 2012) are clearly present, but the stages did not occur in the same order on all the farms.

5.3.1 Efficiency, substitution and redesign

As part of their transition, the case study farms were actively engaging with experimentation in a variety of ways. In Section 4.5.2 we categorised the farmers' experiments using the Efficiency–Substitution–Redesign (ESR) framework of Hill (1985) (see Section 2.2.1).

Efficiency-related activities were found on five farms, and included experimenting with seed rates, fertiliser and N efficiency and with earlier lambing. Pretty (2016) described the efficiency stage as "*brilliant basics which should be done by all diligent farmers, but will*

probably not be much noticed when undertaken". On all these case study farms, efficiency-related activities occur in combination with other stages. At least on these case study farms, efficiency does not appear to present a distinct stage.

Substitution-related activities (albeit sometimes mainly as experiments rather than full implementation) happened on nine farms, and on one farm substitution is the dominant feature of the transition. The farmers are positive about their experiences and feel that this strategy has led to improvements in the sustainability of their farms. This is in line with Pretty (2016), who believes that *"Substitution approaches can result in compellingly different systems on a considerable path towards sustainability"*.

There is evidence of redesign in most (13 out of 14 farms) of the transition processes on the case study farms. In five cases, redesign is the dominant feature of the transition, if we include two newly set-up businesses where a farming system was designed, whereas on eight farms redesign occurs alongside substitution- and/or efficiency-related activities. Gliessman et al. (2017) characterise redesign as a fundamental change of overall system design to eliminate the root causes of problems rather than trying to control them after they happen. According to Pretty *"Redesign is a game changer"*, illustrating that there is no single solution to the productivity and sustainability challenges faced by agriculture. The need to find many solutions places a new emphasis on learning and on developing farming systems, addressing new opportunities and challenges as they emerge. Trying some agroecological practices on a smaller scale is part of the process (e.g. establishment of clover in some fields, intercropping or small-scale tree-planting) and becomes evidence for extending or modifying the initial changes.

However, 'redesign' goes beyond an experiment, in the sense that the tangible effects have multiple causes, and thus are less easily comparable with a baseline. It appears that the full redesign of farms cannot really be tried out on the farm through experiments alone, even if continuous adjustment itself is a kind of experiment. There are very few indications of tools farmers may have used to explore the impact of farm redesign. One farmer specifically mentioned exploring the implications of strategic change through the forward budgeting of cash flow.

The results suggest that the stages of Efficiency–Substitution–Redesign do not necessarily represent stages in a sequential process. The trajectories and the entry point vary, even if it is difficult to determine the reasons for the differences. Some pathways start by improving fertiliser efficiency or including cover crops, whereas other farms go more or less directly towards redesigning a more complex integrated farming or agroforestry system. Similarly, in talking about agroecological food system transition, Gliessman et al. (2017) refer to levels of change rather than linear processes and also observe that engaging with each level does not necessarily occur in sequential order. Farmers may enter at different levels, depending on their situation, location, and history (Gliessman et al., 2017).

Some redesign towards agroecological systems occurred on nearly all the farms studied, but this is highly likely to be a reflection of the recruitment process. However, the trajectories give no clear indication that the steps of the ESR model of efficiency or substitution were encouraging farmers to move to redesign their system. The five farmers that did not show any engagement with efficiency or substitution referred to a business review, desire for engaging with the community, personal commitment to diversification, meeting an inspirational person and passion for trees as motivating. Of the four farms that showed all three stages, there appears to be some element of learning from the substitution experiments towards redesign in three cases (Farms B, H, N) but no connection in the fourth case (Farm O), and five farms moved straight into redesign without any mention of efficiency or substitution experiments.

The results do not give a clear answer to the question as to how farms progress beyond experimentation towards system redesign, and how this progression can be supported effectively. Hill (2014) argues that there is an in-built paradox in that the more effective any efficiency and substitution initiatives are, the more likely they are to protect and perpetuate the design and management characteristics of systems that are the root causes of the problems. Depending on their form and motivation, cyclical experiments may pre-empt a full redesign rather than facilitate it.

5.3.2 *Trigger events and learning cycles*

The model of Sutherland et al. (2012) (see 2.2.3) refers to the concept of 'trigger events' which allow farmers to break out of 'path dependency', leading to major or more strategic change. The model distinguishes five different stages, which are discussed in more detail below, and emphasises the nature of the transition process on farms as a learning cycle (see Figure 3). The first stage of path dependency is less relevant in this particular study, because only farmers that have undergone some change were interviewed. The transition processes varied considerably between the farms in this study. In the sections below we have set out elements associated with the stages of 'Trigger Events', 'Active Assessment', 'Implementation' and 'Consolidation' as mentioned by the case study farms.

5.3.2.1 *Trigger Events*

We use the term 'Trigger Events' here as it is used by Sutherland et al. (2012), who refer to farmers encountering or anticipating one or more triggers (e.g. changes in the lifecycle of the farm household or the financial status of the farming business) leading to the 'Trigger Event', i.e. the realisation that something needs to change. Trigger Events can be both external and internal.

A range of Trigger Events can be identified on the case study farms. On eleven farms (78%), the transition was related to taking over the business, making this one of the most important Trigger Event identified. This included seven case study farms (50%) that had recently taken over the family business and five (36%) that had taken over a new business. Five farmers (35%) mentioned in this context the aim to secure or improve the long-term financial viability of the business. Other triggers mentioned include contact with other farmers and inspirational people engaged in agroecological farming – including in other countries and attending courses that acted as inspiration for the transition.

Some negative experiences were also described as triggers, for example low yields in one season, low commodity prices, concerns about soil fertility and/or the long-term financial viability of the business. Several farmers also mentioned a dislike of chemicals and that they wanted to show the community the good side of farming, e.g. benefits to the local environment. This illustrates that negative experience can stimulate reflection and learning. However, negative experiences were also mentioned as problems during transition, such as the negative attitude of staff, loneliness and issues surrounding self-belief.

Elements of structural change, such as taking on more land or being able to collaborate and integrate livestock were described as triggers by the farmers. Farmer L talked about collaboration with neighbours for grazing stock as a game changer. However, it could also be argued that these farmers were already considering change and the new opportunities allowed them to move from the idea to implementation. For example, when Farmer F talked about more land becoming available, he said that allowed him to pursue the organic conversion that he had already been thinking about. Similarly, when Farmer N referred to the desire to reduce N as "*hitch onto the organic side*", he expressed his existing preferences for farming that way which resulted also in an organic conversion.

This illustrates clearly that the stages in this model should be seen as conceptual rather than chronological stages of a transition process.

5.3.2.2 *Active Assessment*

The Active Assessment stage of the learning cycle is clearly very important and can take a considerable amount of time (Sutherland et al., 2012; Padel, 2002). This stage involves more intensive scanning for information focusing on available options. It may also involve farmers experimenting and exploring the economic, managerial and social implications of changing the system. All case study farmers engaged in assessing their options; in some cases they were rejected. Farms B and F considered but rejected organic farming, whereas Farm B is now considering introducing agroforestry.

The data from the case study farmers also allow tentative exploration of what criteria the farmers used to judge which option was 'right' and or 'wrong' for them. The financial impact on the business appears to be the most important criterion, indicated by the fact that many case study farmers were either part of a benchmarking group or expressed an interest in taking part. There is also indication that the farmer might change over time in what they judge to be 'right' or 'wrong' for them. The farmers pointed out that they are now more interested in the long-term rather than short-term financial success of their business. This may reflect the fact that the majority of the case study farms are owner- or family-owned and therefore the farmers are probably less worried about short-term dividends on the capital invested. This may also be an indication of growing self-confidence that the choices are the 'right' ones for a variety of reasons. The active assessment of options includes also assessing the need for working capital (e.g. for buying livestock) or for investment in infrastructure (e.g. grain storage or processing facilities).

Another important criterion used by the case study farmers is the impact on soil health, although the farmers did not elaborate on how they judge or measure improvements. Organic matter content could be a suitable soil quality indicator that is robust, easily measured and long established, but there is no clear indication among the case study farmers that they regularly monitor soil organic matter content. For several farmers, the ability to increase diversity of crops grown, livestock, farming and non-farming activities also appeared to be an important criterion.

Some change in criteria goes together with what is described as the need to "*think outside the box*" or "*the change of mind-set*". Farmers refer to accepting that their farms look differently now and reflect on the fact that what they previously used as criteria to judge their success now seem wrong or misleading. This may explain why some prefer to trust their intuition or refer to the need to "*have faith*" that it will "*come alright in the end*".

Part of the Active Assessment stage is also experimenting with various practices, or as one farmer said "*constantly trying new things*". This was a dominant theme on nearly all the farms; one farmer even went as far as advocating that all farmers should have access to their own R&D support. However, as we have argued in the previous section, whilst experimentation is clearly very important in the transition of all the case study farms, it is difficult to explore the potential and impact of system redesign through experiments alone because experiments rarely consider the changes and implications on the whole farm. There is some indication that budget forecasting did play a role in reflecting about the structure of the farm and the enterprise mix on some farms.

In terms of access to information and knowledge, the case study farmers accessed a variety of sources of information. Some referred to the fact the community of practitioners in the UK is very small, for example in relation to farmers that use exclusively direct-drilling. There is, however, a much larger group aiming to reduce tillage, even if reverting to the plough in

certain situations. Those who had adopted agroforestry also mentioned the limited number of practitioners. On the whole, there are a number of helpful individuals and sources of information in the UK, but not a 'go-to-place' for information about agroecological practices. Several farmers also commented on the fact that they have developed their own skills and consider themselves now far less reliant on outside expertise.

5.3.2.3 Implementation and Consolidation

The Implementation stage follows on from Active Assessment. Once a choice is made to which the farmer is committed, financial investments and structural change follow, as well as developing the skills, knowledge and networks around the new systems (Sutherland et al., 2012). The narratives of most of the case study farmers make clear that financial questions remain top of their mind at this stage. Most case study farmers concluded that the transition was either financially beneficial or that there was no substantial financial disadvantage, although one farmer stated that "*You don't do this for the money*".

The Consolidation stage is the confirmation stage, where the success or failure of the transition is evaluated and a new learning cycle may start. On seven (50%) of the case study farms, we observed a second transition that followed on from the first one. For example, organic conversion followed on from introducing leys or grasslands into the rotation and agroforestry followed on from organic farming.

5.4 Concluding remarks

Our results confirm that the transition to agroecology is an active learning process. Trigger, Active Assessment and Implementation (Sutherland et al., 2012) are present on the case study farms but do not necessarily occur in the same order. We agree with the conclusion of Sutherland et al. (2012) that the transition to agroecological practices has some similarities to the adoption of innovation as described by Rogers (1983), but it is not a simple process of replacing one input with another.

In our case studies both the trigger and inspiration involve farmers' prior commitments, which go beyond external influences. A trigger will only result in transition on a farm when it is combined with willingness and/or ability to change. The farmers are then actively assessing their options and experimenting with various practices, adapted to their specific circumstances. Some farmers pointed out how important discussion groups with like-minded individuals were at this stage; others mentioned books, videos, the internet and attending courses. Others commented on the need to move away from established knowledge sources, by doing their own budgets, making their own agronomic decisions and relying less on outside expertise as well as no longer reading farming magazines. It is also important at this stage to learn from mistakes and 'unintended' experiments. Through all these activities, farmers gain knowledge and the self-confidence associated with improved expertise on to how manage their own farm. This then forms a crucial basis for emboldening farmers to make decisions about their farm.

A key aspect during the transition process is on-farm experimentation with new practices. We categorised the experiments which the case study farmers told us about using the Efficiency–Substitution–Redesign model. Nearly all on-farm experiments either related to practices that aim to increase Efficiency or involved Substitution of specific inputs or machinery, technology, such as optimising seed rates, fertiliser applications, experimenting with cover crops and intercropping, different ways of pest control or new machinery (see Table 7). Like a small scientific experiment, a farmer can correlate specific input changes with tangible effects, e.g. yield, resource availability, or enterprise margins.

The measure of EIP AGRI operational groups, currently offered in England, Scotland and Wales as part of the Rural Development Programme, is one measure that could be used to support farmer-led innovation and on-farm experimentation of agroecological practices rather than just technology-focused solutions, especially if whole-farm and more-long term impacts are considered.

6 CONCLUSIONS

6.1 Supporting the agroecological redesign of farming systems

In meeting the sustainability challenges of UK farming, 'redesign' of farming that considers the principles and practices of agroecology is the game-changer to address the root causes of problems, rather than trying to control them after they happen (Pretty, 2016; Gliessman et al., 2017). Most of the case study farms engaged in some redesign of their farms when transitioning to agroecological approaches, such as agroforestry, widening their rotation as a result of introducing direct drilling, pasture-fed livestock, woodland eggs and organic farming. However, our findings suggest that redesign does not follow on from improving the efficiency of input and technology use, which is the common narrative in how to respond to the sustainability challenge in UK agriculture.

Below we draw some conclusions as to how redesign could be supported, drawing from the results chapters. However, further work would be needed to develop a coherent support programme for agroecology in the UK.

The importance of inspiration and social capital. The farmers' experiences described highlight the crucial importance of social networks. The majority of the farmers we interviewed were motivated to engage with agroecological approaches through seeing practical examples and meeting inspirational people, in the UK and abroad. At present, such peer-to-peer contact opportunities with experienced practitioners of agriculture are valued but scarce. This confirms the conclusion by Pretty and Ward (2001) that in developing support for agroecological transitions, it is important to pay attention not only to the agronomic challenges but also to social processes. Several farmers talked about a very small number of farmers practising, in particular direct drilling and agroforestry, in the UK. Even for organic farming, which is practised by more than 3,000 farms in the UK, regional networks that provide opportunities to meet other farmers are absent in many areas. So, there is a need to create more opportunities for farmers to be inspired by seeing working agroecological farms, for example by supporting UK farmers who have made a transition to share their experiences (for example by making short videos) and by supporting study tours to countries where agroecology is more widespread (e.g. France).

Improved access to practical information about agroecology. In addition to inspiration, there is a need for easy access to information about specific practices. This can use established channels (e.g. through offering training to farmers and consultants) but also digital media. There is also a need to introduce teaching of agroecology in agricultural education at colleges and universities, as well as to offer relevant training courses for farming professionals in continuous professional education. Given the high importance placed on the impact on the business, access to sound financial information about the likely impact of change is important, both the short-term impact on yield, investment and cash-flow and the longer-term implications, as well as exposure to risks. However, improved information provision alone will not trigger change in farmers' behaviour (Keohane, cited by Hall, 2014).

Active and social learning rather than knowledge transfer. Agroecological transition is an active learning process, not a simple 'switch' from one way of farming to another. Each transition and evolving farming system we encountered is unique and several farmers are engaged with several transitions. In designing support mechanisms, there is a need to move towards a model of supporting social learning and active knowledge exchange – rather than uni-directional technology and knowledge transfer. This is in addition to the need for improved access to practical information and to outcomes of scientific experiments. Social learning through peer-to-peer discussion groups is particularly important, in groups where

trust develops through mutual support, so that both positive and negative experiences from trial and error can be explored, and learning emerges from a shared interest in a problem or challenge (Moschitz et al., 2014). Support could be directed towards broadening the networks related to specific agroecological approaches (such as direct drilling, organic farming, agroforestry and pasture-fed livestock) and reward farmers who have engaged in such practices for hosting visitors, becoming active participants in discussion groups and mentoring other farmers.

New rules and indicators for the long term. For most farmers, economic profitability is part of long-term sustainability. A common theme emerging during the interviews is farmers seeking a long-term economic perspective on future-proofing their farm, e.g. through investment in the natural capital of soil and soil fertility. Soil improvements are relatively slow and require long-term commitment. The results illustrate that the case study farms use a variety of ways to judge their successes. Although they abandon some old rules and established norms, they are uncertain about what indicators would be more important to measure. They are looking for more long-term financial indicators, alongside indicators of soil fertility, diversity and/or animal health. In some areas such indicators do exist, for example soil quality indicators are quite well established, but these are not necessarily widely known and used. Support mechanisms need to reflect the long-term nature of any change. Both Buckwell et al. (2014) and Hill (2014) argue that farmers need accepted definitions, measurements and indicators of the state of resources and sustainability so that they can judge for themselves how well they are performing and how they can manage the risks to their farming business.

Access to grants. Farmers engaging in agroecological transitions should have access to grant schemes that support the public goods delivered, both in the initial start-up phase but also in the longer term. Lampkin et al. (2015) examined more closely the public benefits that agroecological approaches can contribute to. The list includes reducing non-renewable energy consumption, maintaining or increasing biodiversity and the output of related ecosystem services, helping maintain natural capital in the form of soil and water resources as a result of careful management (e.g. reduced or zero tillage) and reduced or restricted use of potentially polluting inputs. Lampkin et al. also argued that agroecological methods could help maintain or increase the profitability of farming systems through more efficient input use, reducing costs, diversifying the range of outputs and by developing specialist markets and shorter supply chains.

- UK Governments can encourage the transition to agroecology by clearly identifying the redesign of farming following agroecological principles and practices as an important part of the future of farming which is worthy of public support (see also All Party Parliamentary Group for Agroecology⁹).
- Further, it is important to identify any mismatch between agroecological practices and grant criteria, which may deter applicants, as was indicated by some of the case study farmers. At present, the management options in the RDP schemes tend to be focused on specific practices rather than systems-level change (Lampkin, 2015) (except organic). The criteria could be made more appropriate for farmers who want to innovate and 'think outside the box' towards an agroecological transition.
- Tiered agri-environment support systems can include whole-farm options that encourage system-level change, for example as part of mid-tier options. The organic farming support schemes operating in the UK¹⁰ provide examples of how to support change at the farm-system level. Support for agroforestry, direct drilling or pasture-fed livestock could be designed in similar ways. Such schemes could complement

⁹ <http://agroecology-appg.org/wp-content/uploads/2014/04/AgroEco-A5-Leaflet-v4.pdf>

¹⁰ Organic support in England, Scotland and Wales as of part of the Rural Development Programmes

other mid-tier options, aimed at supporting species, biodiversity or other environmental public goods.¹¹

- There is also an opportunity to consider payment for ecosystem services, for example in relation to agroforestry for carbon sequestration¹² or organic farming for the protection of water quality in catchment areas, but there is a need to find workable solutions for the verification of such outputs without placing an undue administrative burden on the farmers and high transaction costs.
- Support should be directed not only at agronomic changes but also at the social side of transition to agroecology as well as training and education (see above).

6.2 Questions for further research

A key question for future research arising from this study is how farmers that have been encouraged to think about change, through external or farm specific or personal trigger events, can be best supported going forward.

Improve the understanding of the links between personal, farm-specific and external drivers of change in models that support policy-making. The results suggest that the transition process to agroecological farming practices is influenced by the interaction between the farmer and his/her farm, and the resulting continuous learning and adaptation, as well as being shaped and influenced by external events. The models we considered all make an important contribution; the transition stage models of trigger events/learning cycles and of the ERS stages portray the stages as distinct. Our results illustrate that stages in both models should rather be seen as conceptual and not chronological stages of a transition process.

The Farming Systems Research (FSR) tradition has argued that the social, cultural, ecological and economic context should be considered together when studying farms (Bawden, 1995, Gilbert et al., 1980). Bawden in particular referred to 'soft' systems thinking according to Checkland (1999), who describes the human activity as a central part of the system. This appears highly relevant to future studies of the agroecological transition.

However, in practice, there is a tendency to view internal and personal processes as separate from external factors and to separate agronomic from human challenges. It could be argued that available social evidence has not been properly integrated in agricultural policy-making and mechanisms of support to encourage change, and the delivery of public goods. To further improve the understanding of agroecological transitions on farms and how farmers can be encouraged to rethink their farming, it is important to consider linkages and interactions between the farm system, the farmer, his/her social network, and other external influencing factors as contributing to her/his learning or impacting her/his ability to undertake change. A practical model for policy-makers and the agricultural support sector needs to aim to consolidate existing models by linking the different perspectives.

Assessing the feasibility of redesign. More work needs to be done to understand how farmers decide in practice whether or not to redesign their farming systems. Redesign requires awareness of the synergies between farming activities, such as the role of grasslands/leys and livestock for arable farming or the contribution that hedges and landscape elements can make towards pest management. There may be some role for decision-support tools (DST) and models in this respect, but recent work as part of the

¹¹ GWCT is currently in the process of developing a proposal for such a tiered agri-environment scheme. For further updates please contact Alastair Leake

¹² Currently under consideration for the woodland carbon code

Sustainable Intensification Platform (Rose et al., 2016) found poor uptake of such tools among UK farmers and consultants. It would need to be explored in more detail whether any existing farm planning tools consider agroecological principles and practices and could play a useful role in assessing the implications of redesign; and if so, how farmers (and consultants) can be encouraged to use and feedback on existing DSTs. Further development of such tools should involve farmers that are considering or engaging in agroecology and establish their needs. This area is closely related to understanding how farmers can measure their success and monitor their progress in relation to long-term financial resilience and other aspects of sustainability (see above).

More work should also be done to address the following questions:

- What aspects of agricultural education/training most help farmers to start an agroecological transition?
- Given the public goods that result, how are these rewarded?
- How could public goods be better rewarded and extended?
- What role can payment for ecosystem services take and how can the verification of such services be organised in such a way that farmers are not discouraged from participating?
- What are the key metrics with which farmers can track their own progress in becoming more sustainable?
- As farmers attempt to engage more with short food supply-chains, what are the current opportunities and difficulties associated with such efforts?

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ANNEX 1: DESCRIPTION OF THE CASE STUDY FARMS

Farm A

Size	Large (>300ha)
Tenure	Family owned
Manpower (FT/100ha)	0.65
Farm type as described by the farmer	Mixed
Crops	48%
Pasture & Grass	52%
Sheep	Share farming
Finished cattle	Not specified
Dairy	Intended
Woodland	25%
Specific habitats	2% wetland, some game cover
Agreements	Organic support
Farmer	Male
Age	36
Education	BSc
Years in farming	13
Nuffield scholar	Yes
Transition to	Pasture-based, followed by organic farming
Main triggers	Taking over the farm, Nuffield scholarship Low yields, long-term finance review, soil health
Biggest challenges	Staff; other people's influence; having faith that it will work
Experiments/ESR stages	R: grazing crops and livestock integration
<p>The farmer finished his agricultural degree in 2004, and took over the arable operations of the farm, having been travelling to New Zealand and Australia during his studies. The father retired from active management six years later, and the farmer took over the whole business. This was followed by a Nuffield scholarship in the US on farm economics, where the farmer saw examples of what he considered to be sustainable intensification and read about economics.</p> <p>Seeing the crop yields flat-lining, whilst the costs kept increasing, made him realise that something had to change. The farmer started to look for a different way forward to keep the business financially viable and began exploring other options, such as putting land into grass to increase soil organic matter and developing livestock enterprises. A financial review of the business showed that the savings on inputs for arable could finance the purchasing of livestock for a new enterprise, providing return from the newly planted leys.</p> <p>The first real change on the farm happened in 2012, i.e. 8 years after taking over, when after terrible weather about a third of the farm, 360 ha of less productive land, was converted to grassland and the farmer worked with the neighbour to learn more about sheep farming. In 2014, the farmer did a course in holistic management and has since then been expanding the livestock, moving away from sheep towards a mobile organic dairy unit. The farm is now in the organic support scheme.</p>	

Farm B

Size	Large (>300ha)
Tenure	Family owned
Manpower (FT/100ha)	0.3
Farm type as described by the farmer	Arable
Crops	No data provided
Suckler cows	None currently; the farmer kept a herd of 80 in the past
Specific habitats	0.01% of area
Agreements	HLS; ran out in October
Farmer	Male
Age	34
Education	Experience; also BSc in non-farming subject
Year in farming	7
Nuffield scholar	Yes
Transition to	Conservation agriculture with direct drilling.
Main triggers	Coming back to the farm Soil improvement Study trip
Biggest challenges	Crop failures; slug problems; crop establishment
Experiments/ESR stages	E: Seed rates, fertiliser S: Pest control without neonicotinoids R: Livestock integration

Until 2010, when he returned to the family farm, the farmer worked in the media. At that stage, the farm was still pretty conventional using reduced tillage with rotational ploughing. A year after returning home he became interested in direct drilling and controlled traffic and started his first experiments with direct drilling. Two crops, wheat and oilseed rape, were always drilled direct, but the land was ploughed before the other crops.

Some cover crops were introduced and grazed off with sheep. Two years after returning home, the farmer started to make management decisions. He took a first field out of the arable rotation, which was sown with a diverse ley and grazed with cattle and he got further interested in how to improve soils. This was followed by a Nuffield scholarship, looking at soil improvement. In 2016, the farmer decided to stop the beef enterprise of 80 suckler cows, grazing on the farm, because the cows were *“a bit of a pain”* and he also wanted to see what effect putting field into a herbal ley is having, before he commits further to long-term decisions. In his own words, it is likely that some stock will come back, because *“it feels like they’re a pretty key part to more sustainable practices”*.

The farmer made clear that saving costs and time are important benefits of a direct-drilling system, but did not mention financial considerations directly as influencing the decision-making. He believes that new practices need to be tried on the farm and the success measured to know what works under the specific circumstances.

Farm C

Size	Medium (150-300 ha)
Tenure	Owned & rented
Manpower (FT/100ha)	0.45
Farm type as described by the farmer	Cereals and sheep
Crops	82%
Pasture & Grass	16%
Sheep	200
Dairy	20 goats
Woodland	4%
Specific habitats	Edible woodland
Agreements	HLS, ELS
Farmer	Male
Age	55
Education	National Diploma
Year in farming	40
Nuffield scholar	No
Transition to	Agroforestry and integrated farming
Main triggers	Building a community legacy Aiming for more diversity
Biggest problems	Loneliness (can be quite isolating); time management; work/life balance
Experiments/ESR stages	R: tree planting
<p>The farm has been in the family since 1933. Prior to the transition, the farmer was part of a joint venture with 4 other farmers, but he found himself not really agreeing with the intensive way of farming and began looking for alternative approaches. In 2013, the farm entered into an HLS agreement, which is coming to an end in about 2 years. We recruited the farmer because of the transition to plant about 6.5 hectares of edible woodland on arable land. This is supported by the local community, for example by volunteers planting trees. The farmer said that he wanted to let his land to a community-led agricultural scheme, because his family and children are not interested in continuing farming. He set up an EcoCentre on the farm, which aims to educate and inform people about what is happening in the working countryside, hosting about 60 school visits per year. The centre and part of the farm could also be used for care, but this is difficult to finance at the moment. The farm is a member of LEAF and is run as a joint venture with one other farmer, who does most of the arable work (80% of the farm), while the farmer focuses on his work with the community. The woodland should become a community resource, offering volunteers the chance to plant, tend and harvest the crop as well as have a say in how it should be used, or where it could be sold. The farmer also hopes to offer creative and practical courses, including art-based sessions and tree identification workshops.</p>	

Farm D

Size	Large (>300ha)
Tenure	Owned & rented
Manpower (FT/100ha)	1.6
Farm type as described by the farmer	Dairy with beef
Crops	2% for silage
Pasture & Grass	98%
Finished cattle	150
Dairy	500
Specific habitats	In-field trees, hedges (plenty)
Agreements	HLS
Farmer	Male, farms with his wife
Age	42
Education	BSc
Year in farming	19
Nuffield scholar	Yes
Transition to	Organic farming followed by agroforestry
Main triggers	Taking over the farm (before first transition) inspirational farmer, reflections on 3 D farming
Biggest problems	Electric fencing; trees not establishing; making it fit in with the rest of farming
Experiments/ESR stages	R: tree planting
<p>Farm D has been in the family since 1950 and the current farmer started a conversion to organic farming in 1998, achieving full organic status and selling organic milk in 2000. In 2003, the farmer did a Nuffield scholarship on the topic of farmer discussion groups. We recruited the farmer because of a more recent transition to agroforestry. His interest in trees and agroforestry started in 2012, following on from a visit to a "tree person". The planting of trees followed one year later, with support from a local college student, who did a project on the nutritional value of trees and planned what should be planted. The farmer also received advice from the Woodland Trust and they are also paying for the trees. Since then, the farmer has deepened his interest in farm woodland, for example by attending the Acres conference in the US. At the time of the interview, the farmer had recently taken over a second dairy farm.</p>	

Farm E

Size	Medium (150-300 ha)
Tenure	Rented
Manpower (FT/100ha)	1.5
Farm type as described by the farmer	Dairy
Crops	No data provided
Dairy	Cows and goats
Specific habitats	Old pastures, agroforestry project, orchard, hedges
Agreements	HLS
Farmer	Male, farms with his wife
Age	47
Education	HND
Year in farming	33
Nuffield scholar	Yes
Transition to	Organic farming
Main triggers	New tenancy, diversity is key, previous experience on other farms, getting into processing
Biggest problems	Access to finance; social enterprise grant; understanding of the landlord
Experiments/ESR stages	R: new livestock species
<p>The farmer and his wife took on the tenancy in 2015. The family had managed several organic farms as managers and as tenants before moving to the current farm. They brought a small herd of goatlings, as well as taking over the management of the dairy herd that was on the farm and starting a specialist dairy for ice cream production. Diversifying away from more traditional farming practices, they developed the idea of a goat dairy, selling the milk and other products locally and directly to the customer. There also is an agroforestry project and an orchard on the farm. The family considers it important that the farm provides public access and education around farming, enabling people to understand the farm environment and where their food comes from. In future, they hope to open a farm classroom and create a care farm, but when the interview was carried out, it was still early days of settling in.</p> <p>Farm E needed to get access to capital to invest into the business, but the farmer was able to reduce capital demand by renting cows from another dairy farmer rather than having to buy them. An application for a local enterprise support grant was experienced as being very time consuming; the outcome was not known at the time of interview.</p>	

Farm F

Size	Large (>300ha)
Tenure	Family owned
Manpower (FT/100ha)	0.48
Farm type as described by the farmer	Mainly cereals (with some horticulture)
Crops	76%
Pasture & Grass	12%
Horticulture	8% (some field scale vegetables and allotments)
Other crop	Miscanthus
Specific habitats	-
Agreements	'stewardship'
Farmer	Female
Age	42
Education	Experience, various courses
Year in farming	12
Nuffield scholar	No
Transition to	Integrated farming with stewardship, direct drilling
Main triggers	Taking over family business, more community engagement, wanting to engage with stewardship
Biggest problems	Staffing; self-belief (but everything has worked out); blackgrass
Experiments/ESR stages	E: N efficiency S: cover crops
<p>Farm F is a family estate that had been run as a business, with the owner not working on the farm. The current farmer took over the management of the farm in 2005, and one of the first decisions she made was to enter the farm into a 'stewardship' agreement (not specified), because she believed that this would be good for the farm. The application was successful in 2007.</p> <p>Apart from some non-farming diversification activities, the farmer has taken some fields out of cropping and overall reduced tillage across the whole farm, and presents it as a modern farm, aligning sustainability and food production as well as offering some opportunities for the local community to engage, for example through allotments.</p>	

Farm G

Size	Large (>300ha)
Tenure	Family owned
Manpower (FT/100ha)	0.5
Farm type as described by the farmer	Mixed
Crops	59%
Pasture & Grass	28%
Suckler cows	120
Woodland	7%
Specific habitats	Grass strips, wild bird seed
Agreements	Organic support
Farmer	Male
Age	50
Education	BSc
Year in farming	20+
Nuffield scholar	No
Transition to	Organic on parts of the farm; conservation agriculture
Main triggers	Taking over the farm Concerns about soil health Research into direct drilling More land became available
Biggest problems	Yields, accepting that it all looks messier; silage making (i.e. struggling against the norms of tidy 'good' farming)
Experiments/ESR stages	S: direct drilling; intercropping R: wider rotation
<p>Farm G is a family farm that the current farmer took over from his father. The farmer started to reevaluate the inputs that were used when the father stepped back a bit and the farmer could also take on some more land. A central topic during interview was future-proofing the farm.</p> <p>The farmer did research into direct drilling in the late 90s and unlike many others (<i>"most of them were abandoning it after a couple of years"</i>), this farm decided to persevere. In the words of the farmer: <i>"My ambition is to increase organic matter and micro/macro fauna. If you create the habitat for the wildlife, it will come"</i>. The farmer is convinced that this system has huge potential.</p> <p>Financial analysis also showed that the suckler cows on the farm were not really paying their way, but the farmer did want to keep them, so entered them into conversion to organic farming to improve profitability of that enterprise. Keeping livestock also has some environmental spin-offs for the farm. The arable enterprise remains conventional, but is following a full direct-drill approach with no ploughing. According to the farmer direct drilling is very tricky to begin with, and there was limited experience around to benefit from. He believes that soil organic matter has increased and that soil health has improved and also that there is more wildlife on the farm now. <i>"If you create the habitat for wildlife it will come"</i>.</p> <p>The farmer also experimented with companion cropping and intercropping, mixing oilseed rape (OSR) and cereals with various legumes, such as barley and beans, OSR and peas, vetch and OSR, barley and OSR, and was planning to grow peas and barley together in the coming season.</p>	

Farm H

Size	Large (>300ha)
Tenure	Owned & rented
Manpower (FT/100ha)	0.76
Farm type as described by the farmer	Mixed beef & sheep
Crops	5%
Pasture & Grass	96%
Suckler cows	160
Sheep	1500
Woodland	2%
Specific habitats	Hedges (6 km)
Agreements	HLS, organic support
Farmer	Male
Age	45
Education	HND
Year in farming	25
Nuffield scholar	No
Transition to	Organic farming
Main triggers	Taking on the farm Next-door farm became available
Biggest problem	Establishment of clover in the first year
Experiments/ESR stages	E: seed rates S: machinery, livestock genetics R: new livestock species
<p>The farmer came home to farm in 1994 and took over about 100 hectares as a tenant. The farmer was interested in doing things differently and had wanted to be organic, but felt constrained by the size of the farm. The family was able to buy the next-door farm in 2009, which allowed them to start the conversion to organic farming. A three-year period of intensively looking at any change followed. The farmer became a monitor farm in 2010, with particular focus on improving the genetics for their specific location and switched breeds to have animals that could finish on grass. According to the farmer, genetics/breeding, a focus on health, and feeding are all important for success. The conversion also required capital investment and new ideas to produce enough forage. The farm introduced lucerne, started some mixed cropping and undersowing, and introducing cattle as new livestock species in a mainly sheep-based system.</p> <p>The farm qualified for organic payments and the farmer reported that others looking at his figures are surprised that a farm that is doing so well, can be organic.</p> <p>As part of the transition, the farmer has "<i>learnt to love weeds - another form of forage!</i>"</p>	

Farm J

Size	Small (<150 ha)
Tenure	Family owned
Manpower (FT/100ha)	2.88
Farm type as described by the farmer	Livestock
Pasture & Grass	Mainly grass
Suckler	65
Woodland	14%
Specific habitats	Old pastures
Agreements	ELS
Farmer	Female
Age	51
Education	National Diploma
Year in farming	37
Nuffield scholar	No
Transition to	Pasture fed livestock
Main triggers	Taking over the farm Selling direct End of agreement Soil improvement Contact with PFLA Holistic management course
Biggest problem	Having to change the mindset
Experiments/ESR stages	S: livestock genetics R: new grazing management
<p>The farmer took over in 2009, after the death of the father, who previously had run a small relatively low-input dairy herd, later changing to beef production. The current farmer looked into finishing from grass. The farmer began selling directly to customers in 2013 as well as continuing to sell store cattle. She was told about various mineral deficiencies in the soil, but was not convinced about the solutions offered by sales reps. She eventually was put into contact with holistic grazing as another way to improve pastures.</p> <p>In the same year the Countryside Stewardship Scheme Agreement ended. The farmer did not see any reason to go back to using fertiliser, especially as fertiliser price had soared. In the same year, she also came across the Pasture Fed Livestock Association, when doing some research into how to improve pasture and soil. This was followed by attending the first course in Holistic Land Management in 2014, and introducing mob grazing techniques on the farm.</p>	

Farm K

Size	Small (<150 ha)
Tenure	Family owned
Manpower (FT/100ha)	2
Farm type as described by the farmer	Mixed dairy
Crops	45%
Pasture & Grass	65%
Sheep	160
Dairy	40
Other	9 pigs, mainly to control brambles and bracken
Woodland	13%
Specific habitats	Woodland in Glastir
Agreements	Glastir; applied but was turned down for organic
Farmer	Male
Age	31
Education	National Diploma
Year in farming	14
Nuffield scholar	No
Transition to	Organic farming
Main triggers	New business Getting new land Diversity is key Getting the soils right
Biggest problem	Lack of conversion funding; financing the herd; staff
Experiments/ESR stages	S: teat sealant R: new livestock enterprises
<p>The farmer left college in 2003 and began his farming career by renting 10 acres for 60 ewes with the aim to grow the flock and increase land area. In 2004, he bought 36 acres in an auction and was able to add on bits of land in various places, whilst selling lamb to a multiple retailer.</p> <p>This enabled him to buy the current farm in 2012, reducing his sheep flock and buying a dairy herd in 2014. The farmer describes the process as <i>“having worked up to this slowly”</i>. Developing the farm into a dairy farm has required a considerable amount of investment. He reports on a visit from somebody from the control body and regular contact with the neighbouring farmer, who is a real ambassador for organic farming and has been a big help as mentor. The farmer believes that getting the soils right is important to feed the farm. <i>“The soil is like the engine of the farm. If I don’t get my soil right, I can’t feed the farm”</i>. In 2016, he started a large-scale reseeding programme, in preparation for the organic conversion later in the same year. The farmer also moved to a 16 hour milking interval to cut costs. The farmer is now continuing the conversion to organic without grant support. The holding includes 6 hectares of woodland (in a Glastir scheme), where the farmer started coppicing and tree planting to produce and sell firewood and charcoal for tourist businesses in the neighbouring county.</p>	

Farm L

Size	Large (>300ha)
Tenure	Owner occupied
Manpower (FT/100ha)	0.24
Farm type as described by the farmer	Arable farm becoming mixed
Crops	37%
Pasture & Grass	61%
Suckler	Grazing
Woodland	3%
Specific habitats	Meadow, wide field margins, hedges
Other	Livery yard
Agreements	OELS
Farmer	Female
Age	54
Education	Experience
Year in farming	6
Nuffield scholar	Yes
Transition to	Organic farming
Main triggers	Taking on business with existing OELS agreement and seeing better margins Able to collaborate with neighbour to utilise leys Low yields Soil health
Biggest problems	Terrifying cash-flow; lack of grain storage
Experiments/ESR stages	S: compost teas R: ley into rotation/letting out grazing
<p>The farmer returned to her home country in 2004, after living and working in London, and spent time on the family farm. When the opportunity arose to take over a farm in 2011, she decided to try farming. The previous tenants had converted around 300ha to organic in 2009, which were in a five year OELS agreement with another two years to go. The farmer knew when taking over that the farm had been heavily worked and that the organic conversion was not fully planned, but she did not want to terminate the OELS agreement. For three years, the farm was part organic and part conventional. The first harvest in 2012 was in the farmer's words "<i>terrible</i>". In the following years, she observed that the margins on the organic land were better than the rest, and so decided to convert the whole farm in 2014. The was made easier through collaboration with a nearby organic farmer, who wanted land for dairy replacements, which opened up an opportunity to extend the leys to three years and get some financial return for the fertility-building part of the rotation.</p>	

Farm M

Size	Small (<150 ha)
Tenure	Owner occupied
Manpower (FT/100ha)	27.3
Farm type as described by the farmer	Horticulture
Horticulture	Blueberries, tree products
Livestock	Pigs kept in the summer; poultry
Specific habitats	The whole farm
Other	Unusual, not really fitting into any boxes
Agreements	Glastir organic, recent application was not successful
Farmer	Male
Age	40
Education	Experience
Year in farming	8
Nuffield scholar	No
Transition to	Agroforestry with organic
Main triggers	New business Loves trees, wanted to become a woodland gardener
Biggest problems	Lack of conversion funding; problems with tree establishment; weeds
Experiments/ESR stages	R: planting of different species of tree/shrub
<p>The farmer bought the land in 2003 as a clear-felled site with no infrastructure. At first he planted it with broadleaf woodland, which turned out to be difficult to establish, due to the climate. This made him think more about different crops. Instead of growing organic vegetables, he decided to plant blueberries, and has added various trees since then, aiming to have fruit and nut crops for sale.</p> <p><i>"It was only because the initial crop didn't do well, that we started thinking outside the box and chose blueberries".</i></p> <p>Conversion to organic started in 2010 with the aim to get organic certification for the blueberries, which are now sold locally. In 2011, the farmer built his own house on site and moved in. Trees are also used as windbreaks for shelter, and the farmer keeps pigs in the summer, to graze and dig up the ground, which helps with controlling gorse and heather. The farmer was in the Welsh organic scheme, but the latest application to Glastir organic has not been successful.</p>	

Farm N

Size	Large (>300ha)
Tenure	Owner occupied
Manpower (FT/100ha)	1.2
Farm type as described by the farmer	Mixed
Crops	45%
Pasture & Grass	55%
Suckler	280
Sheep	500
Woodland	8%
Specific habitats	60ha unproductive
Agreements	-
Farmer	Male
Age	42
Education	BSc
Year in farming	20
Nuffield scholar	Yes
Transition to	Organic farming
Main triggers	New business Engagement with soil improvement Availability of organic premiums Off the treadmill
Biggest problems	Disconnect with grants; problems of fitting in when doing things differently; leaping into marketing and developing a relationship with buyers
Experiments/ESR stages	E: N efficiency S: new cash crops R: mixed farming
<p>The process of buying the current farm started in 2005 with the purchase of separate parcels that were not farmed as one holding before. Since then more land has been added and a mixed farm with crops and beef and sheep enterprises was created.</p> <p>There was a need for investment into the infrastructure, such as grain stores, livestock sheds, fences, hedges, etc.</p> <p>In May 2016, 60% of the farm went into organic conversion, with the aim to convert the remaining land over time. One important reason was that there was no particular reward for using less N in conventional agriculture. The farm management was getting closer to organic, but they could only qualify to get a premium for doing what they were doing with organic conversion and certification.</p> <p>Farm N also experimented with diversification of different cash crops, such as introducing milling wheat and malting barley and building food production units to support small business that can use products from the farm.</p>	

Farm O

Size	Medium (150-300 ha)
Tenure	Owner occupied
Manpower (FT/100ha)	17.7
Farm type as described by the farmer	Mixed
Pasture & grass	80%
Free-range hens	135,000
Woodland	20%
Specific habitats	-
Agreements	-
Farmer	Male
Age	55
Education	BSc
Year in farming	28
Nuffield scholar	No
Transition to	Woodland eggs and organic farming
Main triggers	Seeing the market grow
Biggest problem	Arrangements with letting out grazing; attitude of mind; organic regulations
Experiments/ESR stages	E: early lambing; S: machinery; R: tree planting
<p>This family farm was taken over by the current farmer in 1989. To start with it consisted of about 30 hectares of beef and sheep. The first change was one of intensification to move to early lambing, and a year later 200 layers were introduced as the farmer's wife's enterprise. In 1997 the farm also planted trees and has since worked with various organisations on range enrichment for the layers through tree and hedge planting.</p> <p>In the next few years, the flock size of layers increased considerably, producing free-range eggs. After building their own pack-house the family was able to take on a contract with a supermarket, which gradually expanded in the next 10 years. In 2001, a small proportion of the business was converted to organic, because the farmer saw a growing demand for organic eggs.</p> <p>The farm now supplies several multiple retailers with woodland and organic eggs.</p>	

ANNEX 2: INTERVIEW GUIDE

General introduction

We are interested in learning more from farmers that have begun or completed a transition to a more agroecological way of farming, such as conservation agriculture, integrated farming, organic farming, regenerative agriculture or agroforestry. In particular, we are interested in the change process.

The study is funded by Scottish National Heritage (SNH), as a member of the Land Use Policy Group (LUPG) which brings together the statutory conservation, countryside and environment agencies in the UK including Natural England. It is carried out jointly by the Organic Research Centre and GWCT's Allerton Project. In our report we will include recommendation how farmers can be supported in such a transition.

We are carrying out about 15 interviews with farmers in the UK who have adopted a number of different agroecological approaches. The interview will last about 2 hours. We are here to learn about your views. Is there another person that has been key to this process? Everything you say will be treated in strictest confidence and we ask you to sign a consent form. (We are aiming to interview the key persons that were involved in the process).

Agroecology attempts to reconcile environmental, sustainability and production goals by emphasising the application of ecological concepts and principles to the design and management of agricultural systems. Agroecological principles include promoting recycling and optimising nutrient availability, ensuring favourable soil conditions, maximising species and genetic diversity and enhancing biological interactions and synergies to promote ecological processes and services.

Check list before interview:

- Postcode and directions how to find the meeting place
- Phone number of the farmer in case you are late
- Voice recorder, working?
- Spare battery or charged?
- Camera (or good phone camera)
- Printed copy of interview guide
- Printed copy of consent form (see end)
- Printed copy of information sources list
- Note paper
- Pen and spare

About the interview and person(s) – potentially over phone beforehand

Farm Name			
Date			<input type="checkbox"/> 1 st interview of the day <input type="checkbox"/> 2 nd interview <input type="checkbox"/> 3 rd interview
Interviewer			
Time of appointment:			
Formal interview	Start time	Finish time	
Length (hours, min)			
Location			
Time leaving the farm			
Comments			
Interview partners	Name	Position	Age
1 st interview partner			
2 nd interview partner			
3 rd interview partner			
	Agriculture Qualification	Years in farming	
1 st interview partner			
2 nd interview partner			
3 rd interview partner			

Can you tell us a bit about your farm?

Please fill in table about farm facts before and during the interview, but keep it informal

Farm Size:	
Manpower:	
Tenure:	
Farm Type:	
Rainfall:	
Altitude:	
Soil:	
Location	
Agroecological approach:	
Farm type	<input type="checkbox"/> Mainly Cereals (100% cereals) <input type="checkbox"/> Cereals + sheep; <input type="checkbox"/> Cereals + beef; Cereals + dairy) <input type="checkbox"/> Mainly livestock with some cereals <input type="checkbox"/> (Beef, Sheep, Pigs, Poultry) <input type="checkbox"/> Mixed <input type="checkbox"/> Dairy <input type="checkbox"/> LFA/lowland
Crop types and areas	
Pasture types (ages) and areas	
Livestock numbers & types	
Horticulture inc. potatoes	
Nature conservation areas & any ungrazed areas / set-aside	
Woodland	

Before you started, how would you describe your farm in relation to other farms

(good, average, a bit poor right now)

- Yield
- Profitability
- Environmental performance

Have you ever been involved in any benchmarking schemes?

The following sections are envisaged as a conversation. Each question should add as a reminder to prompt if certain things have not been covered.

Can you describe the main story of your farm and how it developed under your management?

“How has the farm changed/developed under your management?”

Further prompts:

- Time lines and connections? Did this happen before that etc.?
- When did you start thinking about the transition?
- When did you actually start the transition?
- What made you go this way?
- Can you relate your decision to change to any specific experience or event?
- Where did you find out more about it?
- Did you consider other options (e.g. mini-till, organic farming, agroforestry?)
- Did you get any help planning the changes? If so from whom?
- Did you change your mind? Why?
- Have there been any difficulties or setbacks?
- Have you ever considered giving up and going back to just being ‘normal’?
- If so, then what inspired you to keep going/trying?

If they do describe their desire to give up – it is worth describing how the transition to become more sustainable is MUCH more difficult than what we did in the 1960s and 1970s. What they are doing is harder and brave and risky – but they are brave pioneers. I would try hard to give them a boost.

What we do not need is to help them rehearse the arguments for giving up so that they do, actually, give up!!

Think about the levels of the farm, the farmer as a professional, the farmer as a person. On occasions you ask, “how did you feel about that” but use sparingly.

Which important decisions do you recall having to make?

“Take me through your ”

Make a list of the important decisions so can ask about advice/support for each of them.

What were the positive and negative experiences within this process?

- Arable crops, livestock, machinery?
- Inputs (external or internal), soil fertility, crop/animal protection measures, etc.
- Markets, supply chains, intermediaries, supermarket chains

Experiments your farm: How did you try things out? In what sense were these ‘experiments’? What did you learn?

What about investments? Where were any major investments you needed to make as part of this transition?

Further prompts : Who was involved in making the decisions?

- Did anyone try to dissuade you from making the transition? (i.e. the prophets of doom who said it would all go wrong)
 - Which of those decisions do you remember as being difficult?
 - Did you get advice? From whom? *Clarify this for each important decision?*
 - Did you look for specific support (financial but also in other ways)
 - Was it helpful to make the decision?
 - Why was it helpful/unhelpful?
 - How did you gain confidence that this was the right thing to do?
- Any other changes on the farm that were not directly related to the transition but that might have impacted on the process?

What problems did you encounter?

Take note of key problems as they are mentioned

Of those you mentioned (*read out from your notes*), **which was the biggest problem?**

Further prompts for possible

- What did you do to solve it
- Did you try to find any help to solve the problem?
- Where did you find help?
- **Was there a time when you wanted to give up and go back to 'normal'?**

How did transition impact on your relationship with other farmers and the local community

What about the staff?

Did any particular person have an important influence on your decision?

Did anybody try to discourage you?

What support did you receive?

How have other farmers and the local community influenced your decision?

How would you describe your relationship with the government agencies?

Which information sources did you use during the transition?

Please use the table below for some scoring whether sources were helpful/ not helpful using a simple Likert Scale from 1= least helpful to 5 = most helpful

	Before starting	During transition	helpful (1= least, 5 most helpful)				
			1	2	3	4	5
Farming magazines							
Books (note key titles)							
Other farmers							
Internet							
Social media							
Videos							
Projects/initiatives							
Farmer discussion groups & meetings							
National farmers' organisations							
Government agencies							
Farming forum							

Now we are nearly at the end, just a few things

How do you feel about the transition now?

Did it turn out as you expected?

Do you feel you have engaged with agroecological principles during your transition?

If you were to do it again, what would you do differently?

What are your aspirations for the near future? Are you hopeful about your farm's future?

What is your advice to other farmers considering a transition?

Anything we should have asked you?

THANK YOU VERY MUCH for your time.

“We will let you know when we have a draft report that can be shared with you if you are interested”.

Notes after the interview

Please complete these notes directly after the interview, once you have left the farm and can stop for a short moment of time. This way your memory will still be fresh.
Please be mindful when and how farmers move between three levels
Level 1: factual aspects of the farm and bits of behaviour (what actually happened). EASY
Level 2: more behavioural and some intentional aspects (why did I do this?) MORE DIFFICULT
Level 3: the deepest feelings (how did I FEEL about what happened? How did those around me react? Was there conflict? How did I cope?) VERY DIFFICULT, DEPENDING ON PERSONALITY – needs very careful and sensitive prompting.

Were there any distractions and interruptions?	
How was the atmosphere?	
How did you feel as the interviewer?	
Results	
Was there a central topic?	
What was most unexpected?	
Where there any topics the interview partners felt uneasy to talk about?	

ANNEX 3: Informed Consent Form

We are conducting research to gain insights into transition process from conventional to agroecological approaches, as perceived by UK farmers. The study is undertaken by Organic Research Centre in collaboration with the Allerton Project o GWCT on behalf of Scottish National Heritage, as a member of the Land Use Policy Group (LUPG) which brings together the statutory conservation, countryside and environment agencies in the UK including Natural England. The Lead Officer at SNH is Cécile Smith, Scottish Natural Heritage, cecile.smith@snh.gov.uk .

I/we agree to take part in the transition study for SNH, carried out by ORC/GWCT. The project has been explained in a satisfactory way.

I/we understand that agreeing to take part means that we are willing to be interviewed by the researcher, allow the interview to be audio recorded for internal use in the project and are willing to provide further clarification should that be required.

I/we understand that any information provided is confidential, and that no information will lead to the identification of individuals in the reports on the project. Comments may be quoted anonymously as part of the publications of the project.

I/we consent to the processing of personal information for the purposes of this research study. Such information will be treated as strictly confidential and handled in accordance with the UK Data Protection Act 1998.

I/we agree, that pictures taken during the meeting/interviews can be used for social media and project publication without additional consent.

Name

Signature _____

Date: _____
