Innovation on dairy cattle farms in Norway

A case study of farm-level innovation as part of a greater system of innovation

Natalia Pineguina

Master's thesis in Innovation and Entrepreneurship

Centre for Entrepreneurship

The Faculty of Mathematics and Natural Sciences

UNIVERSITY OF OSLO

20.05.2016

Innovation on dairy cattle farms in Norway

- A case study of farm-level innovation as part of a greater system of innovation

Natalia Pineguina

Master's thesis in Innovation and Entrepreneurship

Centre for Entrepreneurship

The Faculty of Mathematics and Natural Sciences

UNIVERSITY OF OSLO

20.05.2016

Figure 1: Title page*:* A cowshed in South Trøndelag, Norway (Photo: Natalia Pineguina)

2016

Innovation on dairy cattle farms in Norway: a case study of farm-level innovation as part of a greater system of innovation

Natalia Pineguina

http://www.duo.uio.no/

Trykk: Reprosentralen, Universitetet i Oslo

Abstract

This thesis investigates how Norwegian farmers innovate on dairy cattle farms, while they receive advice from Tine's advisory services. A combination of aspects that are subjects of exploration involve types of ideas and innovations that occur on farms, sources of new ideas, how ideas develop, actors involved in the innovation process, obstacles and drivers to innovation on farms.

The combination of chosen aspects has not been previously explored in the literature on innovation in (Norwegian) agriculture, and the conducted research fills this gap. The research contributes to existing literature by focusing on the systems of innovation perspective, but on micro-level and thus experiences and practices of farmers as individuals, which has received less attention compared to national, regional and sector level. The research contributes also to a greater understanding of the innovation processes on farm-level and further development of Tine's advisory services, and create an important basis for future research.

The research was carried out as a case study in Trøndelag, Norway, and focused on dairy cattle farmers that produce milk for and receive advice from the dairy cooperative Tine. Through two qualitative interviews with a farmer and his advisor from Tine and a qualitative survey responded by 57 dairy cattle farmers, the findings show that there are many creative and innovative farmers, and types of ideas and innovations on farms go beyond technology. New ideas come from interaction with different advisors and social networks, the government and not least, farmers themselves. Development of ideas happen closely with advisors from Tine. Actors involved in the innovation processes, besides Tine, involve other advisors, family, neighbours, local authorities and funding-related actors. Obstacles to innovation are preserved buildings, routines in the cowshed and economy, while drivers to innovation involve funding, governmental regulations, Tine's advisory services and farmers themselves.

In order for farmers to have a greater capacity to innovate and successfully adapt to current and future changes, they need to receive more attention and support from the rest of actors in the Norwegian agricultural system of innovation.

Keywords: agriculture, dairy cattle farming, innovation, Norway, system of innovation, Trøndelag.

Acknowledgements

There is a range of people I want to thank for contributing to this research project.

First of all, I would like to express my deep appreciation to Tor Borgar Hansen, one of my research supervisors, for valuable guidance, constructive feedback and consistent support throughout this research.

I would like to express my deep gratitude to Anders Mørch, my other research supervisor, for valuable recommendations and encouragement, and for willingness to generously give his time and assistance throughout this research project.

I wish to thank Hani Murad, my former lecturer at University of Oslo, for his initiative to introduce me to Anders Mørch in the first place. Without his assistance, this thesis would not be focusing on the same subject and I would not have gotten the amazing opportunity to take part in a larger research project through Anders Mørch and learn from experienced researchers.

I would like to thank Egil Petter Stræte and Gunn-Turid Kvam, researchers from Norwegian Centre for Rural Research, for including me in the research project Competent Farmer. Moreover, my appreciation is given to other researchers involved in the Competent Farmer project that provided assistance for this research. I wish also to thank Bjørn Gunnar Hansen, researcher from Tine, for providing research participants for this study, as part of Competent Farmer project.

I would also like to express my very great appreciation to the local project group from Department of Education at University of Oslo, as part of the Competent Farmer project. I am very thankful for the academic environment with useful discussions through several phases of this research.

I am very grateful for all research participants that took part in this research and provided valuable data. Special thanks is given to the dairy cattle farmer and the building advisor in South Trøndelag for their hospitality and useful data.

Finally, I would like to give a special thanks to my dearest family for being always patient and supporting throughout this important journey of my life.

Contents

Figures

All figures are own creation.

1 Introduction

This thesis investigates innovation in Norwegian agriculture on dairy cattle farm level. Innovation has been a topic of global interest for decades across economies and industries, and governments and scientists view innovation as a main driver for economic development, company growth and sustainability (Fagerberg, 2009; Tidd & Bessant, 2013). However, research on innovation have gotten less attention in the context of agriculture, compared to other industries.

There are several reasons why innovation in the (Norwegian) agriculture should be studied. The global population is constantly growing, and all of us are dependent on a sustainable agriculture. We are dependent on that agriculture provides us with food, fibres and raw materials. There have been (and still are) many discussions about climate changes and how important it is to prepare for and be able to adapt to the environmental changes. Agriculture is one of the industries most fragile to climate change, because it is directly related to livestock, crops and soil. Hence, in order for farmers to adapt to any climate changes and continue to deliver good to the population, based on a stable production without significant complications, farmers need to be innovative. The ability to adapt to environmental changes is an important aspect of successful firms, and ability to adapt is associated with innovation. Those who innovate are often those who are better equipped to have a greater ability to adapt to changes. Not least, study of innovation in agriculture may help to find potential for improvements in present innovation processes, knowledge transfer, advisory services available for farmers, farming productivity and development of farms.

In order to determine current innovation status in agriculture, assure that farmers have a good ability to adapt to changes and to find potential for any improvements, there is a need to know how farmers actually innovate. Surprisingly, there is limited existing research on the topic in Norway. Hence, the conducted research aims to get an insight into the innovation processes on dairy cattle farms in Norway.

1.1 Research question, study questions and study propositions

The research question in focus is: How do Norwegian farmers innovate on dairy cattle farms while receiving advice from Tine's advisory services?

This thesis defines innovation based on Joseph Schumpeter's definition: " 'new combinations' of existing resources" (Fagerberg, 2009, p.4). The thesis views *new* combinations as new to each farm, than new to Norway or new on global basis, and relate innovation on farms to creation, adaption and use of innovations.

Norwegian farmers have for many years received (and still receive) advice on their farming from various advisory services available in Norway. One of the advisory services that dairy cattle farmers are closely involved with is provided by Tine (TINE, 2016a). Tine is one of the two leading dairy companies in Norway, and Norwegian dairy cattle farmers that produce milk for Tine have automatically access to Tine's advisory service for any subjects in dairy farming. All dairy cattle farmers that produce for Tine get an own key advisor, who is their main contact person in Tine. When a farmer need more specialized advice, the key advisor advices the farmer to other advisors that are specialized in specific subjects. Main subjects of specialization include: feeding, economy, strategy, milk quality, health and animal welfare, operation techniques and milk equipment (TINE, 2016*b*).

Due to the close relation between dairy cattle farmers and Tine's advisory services, the research question considers Tine's advisory services as an important part of the investigation of farmers' innovation process.

Furthermore, the research applies the system of innovation perspective on micro-level, and focuses on farms as part of the greater innovation system in Norway. The innovation system perspective views innovation as an outcome of interaction and knowledge transfer between different organizations, research institutions, government and, not least, individuals (World Bank, 2007), compared to the macroeconomic perspective, where innovation is an outcome of a linear process from research to implementation through Research and Development (R&D) (EU SCAR, 2013).

The conducted research applies innovation system perspective on micro-level with focus on farmers as individuals in the system to get an insight into the process of innovation from their

perspective. Farmers' experiences and practices contribute to the whole system of innovation, and it is important to consider farmers as individuals in the system on micro-level, besides the links between organizations and other actors in the whole system on macro-level.

The research objectives in this thesis are:

1) to identify sources of innovation on farm-level,
2) to learn how innovative ideas develop on farm-level
3) to identify obstacles and drivers to innovative ideas on farm-level.

In order to answer the research question and attain research objectives, six study questions have been developed, which cover six important aspects of innovation processes. The study questions are:

1) What types of ideas and innovations occur on farms?
2) Where do new ideas come from?
3) How do new ideas develop?
4) Who are the actors involved in the innovation process?
5) What are the obstacles to innovation on farms?
6) What are the drivers to innovation on farms?

The research has not defined any study propositions due to focus on the innovation process on dairy cattle farms and related aspects of the process as the *subject of exploration* (Yin, 2009). The subject has not been previously explored in its entirety in existing research in Norway, and it has only been partly investigated in other countries (See chapter 2, Literature review). Moreover, study propositions were not applied in order to not restrict findings to specific propositions, but rather to gather new insights about the innovation process based on findings that have not been previously studied. Hence, the study questions are the components that direct attention to aspects of examination within the research scope in this thesis.

1.2 Research project Competent Farmer

The conducted research is related to a larger research project called Competent Farmer (Norsk senter for bygdeforskning, 2015). Competent Farmer project is a collaboration between research partners Norwegian Centre for Rural Research (responsible for the project), Norwegian Institute of Bioeconomy Research, University of Oslo, Norwegian University of

Science and Technology and Trøndelag Research and Development Institute. The aim of the Competent Farmer project is to improve farmers' competence by more efficient interaction between farmer, advisory services and research (Norsk senter for bygdeforskning, 2015). The involved partners, who are also research cases for the project, are Tine, Nortura, Norsk landbruksrådgiving, Felleskjøpet Agri and Midt-norsk samarbeidsråd for landbruket (Norsk senter for bygdeforskning, 2015). This research relates to the Competent Farmer project through shared case study of Tine, involving partly shared data collection and partly shared analysis with fellow researchers. Research findings in this thesis contribute directly to the Competent Farmer project.

1.3 Thesis structure

Chapter 2 reviews existing literature on innovation in agriculture through three sub-topics that build upon each other: innovation, innovation in agriculture and innovation in Norwegian agriculture respectively. The chapter summarizes existing theories and research on innovation in agriculture, forms a framework for the conducted research and views the conducted research in a larger scientific perspective.

Chapter 3 presents and justifies methodological aspects of the conducted research, involving a set of approaches, methods and procedures used. The chapter also reflects upon the quality of conducted research and its ethical aspects.

Chapter 4 presents and analyses results from the conducted research based on ten categories attained through collected interview and survey data: 1) small ideas and innovations, 2) big ideas and innovations, 3) development of ideas through interaction with advisors, 4) information seeking and learning through advisory services, 5) information seeking and learning through social networks, 6) individual information seeking and learning, 7) preserved buildings and innovation, 8) routines in the cowshed, 9) economy and funding and 10) government regulations.

Chapter 5 discusses results and analysis from Chapter 4 in light of existing literature and research on innovation in agriculture that is reviewed in Chapter 2 (Literature review). The chapter is structured by the six study questions in focus that are answered: 1) types of ideas and innovations present on farms, 2) sources of new ideas, 3) development of new ideas, 4) actors

involved in the innovation process, 5) obstacles to innovation on farms and 6) drivers to innovation on farms.

In chapter 6, the conducted research is summarized and concluded, and implications for further research are presented.

2 Literature review

This chapter reviews existing literature on innovation in agriculture. Sources of the literature include journal articles, textbooks, reports, theses, papers and webpages. The review is structured by three main topics that are reviewed separately, but which build upon each other: 1) innovation, 2) innovation in agriculture and 3) innovation in Norwegian agriculture. Literature on innovation reflects upon innovation as a concept, followed by types of innovation and the systems of innovation perspective. Literature on innovation in agriculture involves agricultural systems of innovation on macro-level, systems of innovation on micro-level and innovation in agriculture besides the systems perspective, which involves single aspects of or factors related to innovation. Finally, literature on innovation in Norwegian agriculture is reviewed, involving systems of innovation perspective and research on innovation besides the systems perspective. In the end, the review is summarized, and conducted research is discussed in light of the existing literature.

2.1 Innovation

A great amount of literature exists about innovation due to its broad nature and relevance across industries. Innovation is often associated with invention (Fagerberg, 2009; Tidd & Bessant, 2013). According to Fagerberg (2009, p.3), "invention is the first occurrence of an idea for a new product or process, while innovation is the first attempt to carry it out into practice".

Innovation is also often associated with the social scientist Joseph Schumpeter, who explored innovation in economic and social change (Fagerberg, 2009). Schumpeter defined innovation as " 'new combinations' of existing resources" (Fagerberg, 2009, p.4). Besides Schumpeter, many scientists have over time developed their own definitions of innovation. However, according to Tidd and Bessant (2013), the aspect that is present across the definitions is "the need to complete the development and exploitation aspects of new knowledge, not just its invention" (p.18). In other words, new knowledge has to extend beyond the ideation phase and need to be carried out in practice to become an innovation.

Joseph Schumpeter argued that economic development needed to be seen as "a process of qualitative change, driven by innovation, taking place in historical time" (Fagerberg, 2009, p.4). In other words, innovation drives economic development, and innovation is a process that

develop over time, and is not a simple act (Tidd & Bessant, 2013). Innovation plays an important role across industries. As argued by Tidd and Bessant (2013), in addition to a wide range of scientists, in order to succeed in the competitive and changing environment, emerging problems have to be solved with innovative solutions. Innovation is important for long-term economic growth (Fagerberg, 2009), and it is present in all aspects that characterize successful companies (Tidd & Bessant, 2013). Tidd and Bessant (2013, p.7) describe the role of innovation according to three aspects: 1) innovation is consistently found to be the most important characteristic associated with success, 2) innovative enterprises typically achieve stronger growth or are more successful than those that do not innovate, and 3) enterprises that gain market share and increasing profitability are those that are innovative.

2.1.1 Types of innovation

There are many types of innovation explored in the literature. Joseph Schumpeter divided innovation into five different types: new products, new production methods, new supply sources, new markets (disruptive innovation) and new ways to organize a business (Fagerberg, 2009). New products and new production methods were later categorized into product and process innovation. Product and process innovations were also classified into two types, based on innovation's impact: incremental innovation (involving an existing product with better performance; small incremental changes) or radical innovation (involving creation of new types of goods, non-existent in the current market; big revolutionary changes) (Fagerberg, 2009; Henderson & Clark, 1990).

According to Henderson and Clark (1990), the classification of innovation into radical and incremental innovation was incomplete. Hence, they developed a framework that extended incremental and radical innovation with modular innovation (involving replaced components in an existing product) and architectural innovation (involving changed design of the whole product or service) (Henderson & Clark, 1990). Similarly, Schilling (2010) further explored patterns of innovation, and added two new types related to knowledge: competence-enhancing (involving building upon a firm's existing knowledge) and competence-destroying (involving building upon knowledge outside the firm).

Organisation for Economic Co-operation and Development (OECD) divides innovation differently into four types, where product and process innovation is further extended with organizational and marketing innovation (OECD, 2015). Organizational innovation is defined

as “a new organisational method in business practices, workplace organisation or external relations” (OECD, 2015), while marketing innovation is defined as “a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing” (OECD, 2015).

Not least, innovation can be classified into user-driven innovation (Franke, 2013), which is innovation developed by users themselves for their own use, instead of profiting from it through selling the innovation. User-driven innovation is developed to make things “easier, more practical, or safer” (Franke, 2013, p.1). User-driven innovations, created by individuals, is not a new phenomenon, but it has been theoretically underestimated and only recently started to be theoretically explored and found as a frequent and important concept (Franke, 2013).

2.1.2 Systems of innovation perspective

Firms do not innovate in isolation, but based on interaction with its environment (i.e. customers, suppliers and competitors) (Fagerberg, 2009), and mobilisation of existing knowledge in the environment is what triggers innovation (EU SCAR, 2013). Innovation is seen as a social process and “more bottom-up or interactive than top-down from science to implementation“ (EU SCAR, 2013, p.17). The interaction-based aspect of innovation relates to a perspective called systems of innovation (World Bank, 2007; Edquist, 2009; EU SCAR, 2013), which is a contrast to the macroeconomic approach to innovation and innovation policy involving a linear process, rather than systemic (EU SCAR, 2013). World Bank (2007) defines systems of innovation as:

> “[…] *a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into social and economic use, together with the institutions and policies that affect their behavior and performance. The innovation systems concept embraces not only the science suppliers but also the totality and interaction of actors involved in innovation.*” (p.XIV).

Systems of innovation consist of many different actors, – not only on organizational and institutional levels, but also of individuals (i.e. the individual level). Innovation is a result of knowledge transfer and knowledge used in new ways through links and interaction between the different actors in the system (EU SCAR, 2013). Edquist (2009) defines systems of innovation as innovation process determinants, which are “all important economic, social, political, organizational institutional, and other factors that influence the development, diffusion, and use

of innovations" (p.182). In the macroeconomic perspective on innovation, on the contrary, innovation is seen as a linear process from research to implementation through R&D (EU SCAR, 2013).

The concept systems of innovation was developed through observation of strong innovation aspects in countries and industries during 1970s and 1980s (World Bank, 2007). The economist Christopher Freeman (1987) was the first to introduce the concept national systems of innovation, which was later closely studied by Bengt-Åke Lundvall (1992) and Richard Nelson (1993). Since the launch of the innovation systems concept, it has been studied both as a concept and approach (Lundvall, 1992; Nelson, 1993; Edquist, 2009). However, it has previously been mainly used to explain patterns of innovation in developing countries and in the industrial sector (World Bank, 2007), focusing on national, regional and sectoral level (Edquist, 2009).

2.2 Innovation in agriculture

Existing literature on innovation in agriculture involves studies with main focus on topics such as innovation system perspective and its usefulness, use of the perspective to understand innovation capacity, innovation systems in the context of food supply insecurity and climate change, innovation in the context of advisory services, farmer-driven innovation, roles and functions of actors in the system and, not least, different innovation strategies. The studies are reviewed in the following sub-chapters.

2.2.1 Agricultural systems of innovation

As previously explained, innovation systems concept is not new in various industries, but has only recently started to be applied as a concept to studies of innovation in agriculture (World Bank, 2007), with focus on nations, regions and sectors. According to World Bank (2007), the concept proves to be useful to understand how agriculture can make a better use of new knowledge. World Bank (2007) has carried out a research with the aim to assess usefulness of the innovation system concept related to agricultural technology development. An analytical framework was developed and applied in eight case studies to analyse innovation capacity in India, Bangladesh, Ghana and Colombia. The framework consisted of four aspects: 1) key actors and their roles, 2) attitudes and practices, 3) patterns of interaction, and 4) the enabling environment for innovation such as policies and infrastructure (World Bank, 2007). The

analysis resulted in four key findings. First, no linkages were found for creation of dynamic innovation systems. Second, the main aspects that may hinder innovation are attitudes and practices of actors involved. Strong innovation incentives are not sufficient alone to develop new patterns of interaction and collaboration. Third, weak (or lack of) interaction between actors may hinder important knowledge transfer for innovation. Lastly, challenges in agriculture are evolutionary, continuous and always in the process of change (World Bank, 2007).

European Union's Standing Committee on Agricultural Research (EU SCAR) (2013) has also carried out research on innovation systems. They focus on Agricultural Knowledge and Innovation Systems (AKIS) and analyse AKIS in European countries with the aim to increase innovation, including knowledge, experience and practice transfer between actors. They provide recommendations on how rural development programmes can be linked effectively to research activities towards year 2020 (EU SCAR, 2013). EU SCAR (2013) suggests that innovation can be stimulated by national and regional governments through implementation of multi-actor operational groups who: 1) give incentives for research, development and innovation, 2) encourage knowledge transfer and adoption of innovation, 3) support activities of involved actors (such as facilitators and innovation brokers) to implement innovations, 4) value farmer's input and knowledge, 5) support development of cross-border interaction and 6) invest in incomplete AKIS sub-systems for further development.

Brooks and Loevinsohn (2011) focus also on innovation systems in agriculture, and more specifically, on how the systems can be shaped to be responsive to food supply insecurity and climate change. It is pointed out that innovation occurs from "the actions of and interactions between agents, so the boundaries of innovation systems are not prescribed but evolve over time" (Brooks & Loevinsohn, 2011, p.186). Moreover, innovation systems can be characterized in terms of scale, such as national and international, in terms of inclusiveness, such as included and excluded actors, and in terms of interaction levels and knowledge flows between various actors (Brooks & Loevinsohn, 2011).

Brooks and Loevinsohn (2011) carried out a research involving three case studies in South Asia, Southwest Asia and Sub Saharan Africa, and identified difference in evolvement of the three studied innovation systems. There are four elements that researchers argue are key features of systems of innovation that are most likely to develop a sustainable agriculture with food supply security and strong response to change and uncertainty: 1) capitalization on agricultural multi-

functionality - seeing innovation in agriculture from a wider perspective and how it influences the economy, 2) facilitation of access to diversity - diversity is critical to knowledge transfer and hence innovation, 3) bottom-up capacity building - the farmers are the ones who constantly adapt to changing circumstances, and 4) maintenance of continuous effort and attention - innovation requires continuous trial and assessment to learn from mistakes and develop new knowledge (Brooks and Loevinsohn, 2011). Furthermore, the researchers argue that in big environmental changes, the incremental innovation alone is not efficient enough to adapt to changes. Instead, it will force more rapid changes in the system through involvement of radical innovation (Brooks and Loevinsohn, 2011).

Another research on systems of innovation is carried out by Knickel et.al. (2009), who explore innovation processes in agriculture, where there is a gap between the need for change and farmers' willingness to adjust and not sufficient enough capacities of innovation agencies and advisory services to support such changes. Knickel et.al. (2009) explores a conceptual framework that focuses on innovation processes as a result of collaboration between actors involved in the network, where information is shared and learning is occurs.

The researchers pointed out four aspects of the gap in innovation support systems: 1) the need to realign agricultural and societal goals, 2) the misunderstanding of innovation as a linear process, 3) the (related) segmentation of present agricultural knowledge systems and 4) the outdated orientation of many institutions, administrations and extension services in support of rural innovation (Knickel et.al., p.135). First, when diversity is identified between farmers' and society's interests, innovation policies should be explored regarding how they respond to both farmers' and societal interests. Second, innovation processes are still often seen as linear processes, than through the systemic perspective on innovation involving many actors in a network of information exchange and learning. Third, there is a challenging in segmentation of a present agricultural knowledge system, which involves actors that act upon shared knowledge in the system and generate innovation. The challenge concerns systems that are disconnected from the actual farming practices. Lastly, present innovation systems are outdated regarding their orientation. Innovation is needed to increase production and competitiveness in the markets, and also for development of other types of activities such as maintaining cultural landscapes and new services provision (Knickel et.al., 2009).

Furthermore, Knickel et.al. (2009) point out how innovation is related to farms:

> *"Innovation involves much more than just technology; more and more it relates to strategy, marketing, organization, management, and design. Farmers looking for alternatives to industrial agriculture don't necessarily apply 'new' technologies. Their novelties emerge as the outcome of 'different ways of thinking and different ways of doing things' "* (Knickel et.al., 2009, p.138).

Hence, innovation on farms is not only present in form of a technology, but involves also other types, which are from the farmers' perspective new ways of thinking and doing.

Knickel et.al. (2009) present three ways that can improve advisory services' and innovation agencies' capacity for support towards farmers. First of all, the systemic nature of innovation processes has to be recognized, where innovation occurs "when the network of production changes its way of *doing* things, so that innovation is mainly related to the resulting pattern of interaction between people, tools and natural resources" (Knickel et.al., 2009, p.140). Second, there has to be a focus on 'novelty production', besides technological innovation, involving continuous improvement of processes, products and other practices on the farms. Lastly, it is important to consider present information flows, learning and social interaction – these aspects are closely connected to innovation (Knickel et.al., 2009).

2.2.2 Systems of innovation on micro-level

As earlier pointed out, many studies have focused on innovation systems perspective on macro-level, involving a nation, region or sector (World Bank, 2007; Brooks & Loevinsohn, 2011; EU SCAR, 2013). However, very few studies have until now applied systems of innovation perspective on a micro-level and on a specific part of the system, such as individuals.

One study that focuses on innovation systems perspective on micro-level, and specifically on the experiences of the individuals, was carried out by McKenzie (2013), who explored the nature of farmer-driven innovation in Australia. McKenzie (2013) points out that innovation is not a new thing on farm-level, but is poorly understood as a concept by farmers and badly reviewed in policy approaches to innovation in agriculture. In order for systems of innovation to be improved regarding interaction and knowledge exchange for innovation, it is useful to understand how farmers innovate. Seven strategies were discovered that helped farmers to innovate: 1) observing signals from the landscape, 2) independent testing and trialling, 3) property redesign, 4) increasing system flexibility, 5) paying for independent advice, 6) participating in farmer groups, and 7) actively seeking information (McKenzie, 2013).

According to McKenzie (2013), innovation is not only a result of research and something involved with technology, but is also very much about solving small problems on farm-level, through creation of knowledge and interaction with other actors in systems of innovation (McKenzie, 2013). In order to achieve innovation and sustainability in agriculture, a new way of engagement with farmers is needed, including relevant information, creation of new opportunities on the farms, innovation process flexibility and feedback on the practices in order to learn from mistakes (McKenzie, 2013).

Another research study that focuses on micro-level of an innovation system was carried out by Hermans et.al. (2012). They explored roles and functions of actors in the innovation system in Netherlands that make innovation spread through the system both horizontally and vertically (Hermans et.al., 2012). The researchers presented three network functions that play an important role in co-creation and diffusion of knowledge: 1) learning and knowledge creation, 2) upscaling and institutional entrepreneurship, and 3) outscaling and innovation brokerage (Hermans et.al., 2012). Based on the study, the three functions were not evenly distributed in the system, and for each function type, there was detected a small group of actors that played the role as knowledge creators, institutional entrepreneurs and innovation brokers. The results showed that in order for innovation to spread, and make an impact on other innovation system levels, all three network roles have to be present (Hermans et.al., 2012).

Läpple et.al. (2014) carried out another research using systems of innovation on micro-level, by focusing on farmer-level innovation in Ireland with focus on innovation drivers and barriers. Innovation adoption, acquisition of knowledge and continuous innovation (i.e. renewed machinery) were used as innovation indicators in the study, and results showed different drivers and barriers to innovation, in addition to aspects that did not make any significant effects on innovation. First of all, it was found that innovation differed on various farming systems. Farming that involved cattle and sheep had a negative effect on innovation, as opposed to dairy farming, while farming with mixed livestock and dairy farming revealed no difference. The explanation of the differences was summarized as "the more technological opportunities a sector faces, the more likely a farmer is to adopt them" (Läpple et.al., 2014, p.6).

Regarding drivers of innovation, it was found that farm size, access to credit and marriage has a positive effect on innovation. Moreover, completed agricultural education is also positively related to innovation. It is specified that the explanation may be that farmers with agricultural education have an increased awareness about existing innovations and can better process new

information. Regarding barriers to innovation, it was found that farmer age had a negative effect on innovation. Findings showed that older farmers invest less in innovations due to a shorter time horizon, while younger farmers are more risk-takers. Aspects that did not have any significant effect on innovation were solvency, which is seen as a proxy to risk attitude, and number of households on the farm (Läpple et. al., 2014).

2.2.3 Innovation in agriculture besides system perspective

Besides the focus on innovation systems perspective, there are contributions to the literature about innovation strategies in agriculture. van der Veen (2010) is one of the researchers that focus on innovation strategy in the agricultural innovation processes. Her study concerned existing thinking and literature on how agricultural improvements and innovations arise, what their forms are and what actors are involved. van der Veen (2010) explored invention and adoption versus change and adaptation, which resulted in that farmers both adopt new technologies and inventions and adapt to existing innovations and changes.

According to van der Veen (2010), innovative farming is mostly concerned with increase of production and quality enhancement on the farms, and involves crops, animals, growth conditions, implements (i.e. machinery, equipment) and management practices. Findings suggest that it is easier to adopt simple innovations that require little capital and labour investment and that will result in returns in a short time frame, than adopting complex innovations that require heavy capital and labour and where returns are uncertain or will take long time to achieve (van der Veen, 2010).

The reasons for change in agriculture is related to both external factors, such as environmental change and population growth, and to internal factors, such as personal incentives for change, where internal factors are more significant than external (van der Veen, 2010). According to van der Veen (2010), it is often claimed that innovation is a top-down process, where the state coordinates and administrates significant changes. However, it is pointed out that there is much more focus on the bottom-up approach, involving user-driven innovation, because change is more often carried out in small incremental steps by individual farmers and small farmer communities (van der Veen, 2010).

2.3 Innovation in Norwegian agriculture

A limited amount of research exists on innovation in the Norwegian agriculture, as opposed to global literature on innovation in agriculture, especially related to systems of innovation perspective and with focus on micro-level of the system. Existing literature with innovation system perspective consists of studies that focus on topics such as organization of innovation in dairy industry, regional system of innovation in Norway compared to the system in Sweden, importance of innovation for agricultural development, and innovation as an adaption strategy to changes. Literature besides innovation system perspective involve topics such as part-time farming and entrepreneurial activities related to farmers' lifestyle and well-being, innovation diffusion and adoption of robotic milking systems, needs and challenges between farmers and advisory services, improvement of farming performance through interaction with advisors, and human and social capital in dairy farming and their influence on farmers' productivity. The studies are reviewed in the following sub-chapters.

2.3.1 Norwegian system of innovation

One contribution to the literature about system perspective on innovation in Norway is made by Stræte (2007), who focuses on how innovation is organized in the Norwegian diary industry. It is pointed out that a regional system perspective have little impact on innovation in the Norwegian dairy industry. Instead, a national system is present, and national system perspective is what the Norwegian dairy industry is oriented towards. Moreover, Tine is seen as an innovation driver and the most important actor in the national innovation system (Stræte, 2007).

Another contribution is made by Sæther (2010), who focuses on regional system of innovation perspective in Scandinavia. The research explores and compares agricultural extension services in Hedmark (Norway) and Värmland (Sweden), and how they respond to new knowledge demands in the case of a restructuring process in agriculture. Agricultural extension services are seen as an important component in innovation, and play an important role in product and process innovation implementation (Sæther, 2010).

The research showed that there is a model of extension services used in regionally networked system in Sweden that supports entrepreneurship and rural development. Norway, on the contrary, has extension services in the innovation system that promote a conventional agro-industrial model. The indication of new knowledge identified in Sweden was much clearer than

what was identified in Norway (Sæther, 2010). Results show that restructuring within an agriculture is a great challenge. When restructuring elements of an innovation system, extended knowledge base is a crucial component to consider. According to Sæther (2010), unique knowledge, which leads to innovation, emerges from interaction between equal partners, rather than from experts instructing farmers.

Kjølseth and Pettersen (2012) have investigated the importance of innovation for development in the Norwegian agriculture based on available literature and experiences of researchers and individuals that work on development of agriculture. They explored three aspects of innovative development in Norwegian agriculture: 1) an increase of productivity that indicate high innovation capacity, 2) increase of productivity and relation to innovation as a cause, and hence if there is a structure that represent a working system of innovation and 3) examples on technological, operational and product development-related progress that can document innovation (Kjølseth & Pettersen, 2012). Reflections show that present agriculture is less likely seen as an innovation system the same way as the oil industry, but the system involves the same roles, drivers and dynamics, including research institutions, suppliers of technology and equipment, advisory services, subject specialists, primary producers and customers. Hence, there is a network of different actors that have different types of knowledge and who share the knowledge between each other (Kjølseth & Pettersen, 2012).

According to Kjølseth and Pettersen (2012), the most important motivations for innovation are beneficial personal economy and operational necessity at the farms. Other drivers to innovation are access to new technology, levels of competition, customers, suppliers and knowledge exchange related to research institutions. Moreover, knowledge and knowledge exchange between actors is seen as an important factor closely related to innovation. Not least, project funding from Innovation Norway has contributed to innovation in projects on farms, and connection to and interaction with other actors in the network are important for agricultural productivity and innovation (Kjølseth & Pettersen, 2012). Innovation is a source to productivity increase in Norwegian agriculture, and innovation plays an important role in genetic progress of animals, breeding of plants, production capital, ecological production, changed farming organization, changed farming priorities and soil improvements (Kjølseth & Pettersen, 2012).

Another research that involves innovation systems perspective is carried out by Astad (2014). She focuses on innovation as an adaption strategy to changes in the Norwegian agricultural sector. The research explores, through a case study, the innovative capacity in the agricultural

industry of fruits and vegetables in Lærdal, Norway. The purpose of the research was to identify favourable factors for innovation in the agriculture to be able to adapt to challenges caused by changing conditions of production related to climate change. The research used the systems of innovation perspective to explore innovation capacity, and hence, viewed learning and knowledge transfer as crucial components related to innovation capacity in the studied setting (Astad, 2014). The main research findings from the case study showed that high innovation capacity depends on cooperation between different actors in the agriculture, rather than competition, and on knowledge transfer between internal and external actors. In order to explain the innovative capacity, both natural resources for innovation and social processes such as interaction and knowledge transfer are crucial (Astad, 2014).

2.3.2 Innovation in Norwegian agriculture besides system perspective

There are several contributions in the existing literature on innovation besides the system perspective. One contribution is made by Melberg (2003), who explored alternative strategies in small-scale farming involving part-time farming, pluriactivity and entrepreneurship. The aim of the research was to explore to what extent entrepreneurship is a result of structural changes and political means in the Norwegian agriculture, and to what extent new value creation is a viable lifestyle for farmers. Research results showed that additional entrepreneurial activities, besides traditional farming, is based on either a desire to increase income or to eventually switch to the new entrepreneurial activity (Melberg, 2003). Farmers' economy differs. Some farmers have good economy and are able to switch to new entrepreneurial activities in short time, while others use long time and are dependent on extra income besides farming activities. Moreover, governmental funding opportunities seem to play the role as a driver for creation and further development of the farms. Same role is also played by advisory services, family and support from individuals, both governmental and non-governmental. Not least, personal qualities, such as belief in an entrepreneurial idea and successful outcomes, are also drivers of entrepreneurial activities (Melberg, 2003).

It is concluded with that farmers that establish new entrepreneurial activities are motivated by a more interesting daily life on the farm, and well-being of farmers, which is an important aspect of the farming, is influenced by economy, working conditions and opportunities for personal development. New value creation through entrepreneurial activities is a marginal lifestyle in

the Norwegian agriculture, and farmers' desire includes better economy, increased well-being and life quality, as entrepreneurial drivers (Melberg, 2003).

Another contribution on innovation strategies is made by Hansen (2015), who explored innovation diffusion and specifically adoption of robotic milking systems on farms in Jæren, Norway. The research aimed to explore the farmers' motivation behind adoption of milking robots and outcomes of the adoption in farmers' lifestyle and farm management. The research show that the high adoption of robotic milking systems specifically in Jæren is due to human and social capital and socio-cultural aspects of the farming environment, where knowledge is exchanged and new technology is in focus due to close relations to farm machinery industry (Hansen, 2015). Farmers that successfully adopt and implement robotic milking system on their farms are motivated, pro-active and have ability to adapt to new technology specific to their needs. Farmers invest in robotic milking systems to get more flexibility in farming, to reduce their workload and to achieve a more modern lifestyle (Hansen, 2015). Outcomes of the robotic milking system involve both advantages and disadvantages on farms. Advantages involve less physical time needed for milking, less necessity for relief, more interesting farming and more fixed care of the cows. Disadvantages involve time needed to adapt to the new machine, necessity to be constantly available for inspection of the system and information overload from the system (Hansen, 2015).

Another research, carried out by Stræte (2014), focuses more on the advisory part related to the farmers. The recent research explored needs and challenges in the Norwegian agriculture regarding advisory services currently available for farmers. The study is based on a survey and interviews with Norwegian farmers from ten farms in Trøndelag, and focuses on what "forward-looking or professional farmer's needs are for advisory services in the future" (Stræte, 2014, p.10). As pointed out by Stræte (2014), the study involve uncertain representativeness, but it still give some qualitative insights of the current big picture of challenges on the farms.

One important insight is that almost half of the Norwegian farmers lack agricultural education, while another group has high level of agricultural knowledge and expertise and seeks to gain new knowledge both from the advisory service and through alternative channels (Stræte, 2014). The study indicates that farmers are generally satisfied with available advisory service. However, findings also showed lack of advisory subjects important to farmers (Stræte, 2014).

The study's findings involves challenges both regarding the present aspects of the farmers and the available advisory service provided to the farmers. First of all, there is lack in farmer's ability to make use of advisory services, because farmers lack basic level of agricultural competence and have weak ability to identify and access relevant advisory service. Second, the skills and capacity of the advisory services do not cover all the necessary topics needed in order to provide specialized expertise to farmers. Third, there is a lack in the innovative capability of the advisory services currently available, involving the need to develop new services in existing disciplines and productions, new fields and new forms of advisory service. Lastly, there is a challenge in the organization of advisory services. An indication in the study pointed out that there might be competition between advisors resulting in barriers between the advisors and poorer advisory service provided, and several farmers are interested in searching for advisory services from abroad (Stræte, 2014).

In order to find solutions to the identified challenges, several measures have been proposed by Stræte (2014) including: 1) continue to work with development of farmer's education and competence, 2) develop high level of advisory expertise, 3) Improve the advisory services and carry out regular evaluation of them, 4) improve advisory quality routines and improve procedures to avoid gaps in the advisor's competence, 5) strengthen the role of the farmer as an individual and as a manager, 6) test models and methodologies for a new and improved advisory service, 7) develop a stronger cooperation with Norwegian research institutes, 8) develop a stronger cooperation with international advisory service and 9) develop a stronger cooperation with educational institutions with focus on professional development.

Similarly, Hansen (2014) has carried out a research that explores how farmers' interaction in between them and interaction through Tine's advisory service, Tine Efficiency Analysis (TEA), can improve farming performance. Based on a both qualitative and quantitative study of 90 farmers in five dairy farming areas, results show that farmers, who receive advisory through Tine's advisory service, learn to improve their problem solving abilities, which improves their financial performance, and farmers become more pro-active, based on the knowledge they have (Hansen, 2014).

Furthermore, Hansen and Greve (2015) carried out a research of human and social capital in dairy farming in Norway through a quantitative and qualitative study of 90 farmers in Norway. The research focused on how human capital, involving knowledge and skills, and social capital, involving social relations, affect farmers' productivity. Results showed that education and

social capital positively relate to farming performance. When farmers that are passionate about dairy farming interact with each other, they learn a lot. Moreover, results show that interacted human and social capital increased farming performance only for farmers that had relevant agricultural education. When two individuals interact, involving interaction between human and social capital, the knowledge transfer depends on recipient's human capital – "the more you know, the more you will benefit from others' knowledge" (Hansen & Greve, 2015, p.158). The reason is that new knowledge need to interact with prior knowledge and thus, it makes learning easier. On the contrary, the study showed that lack of relevant agricultural knowlegde, large farmer network and required complex problem solving may decrease farming performance (Hansen & Greve, 2015).

2.4 Summary of literature review

The review shows that innovation is a broad concept that has been explored by a wide range of researchers. Innovation can be defined in many ways, but all definitions share one important aspect – development and exploitation of new knowledge that goes beyond invention and involves realization of an idea. There are many types of innovation, and innovation is related to two important perspectives in the literature: systems of innovation and the macroeconomic or linear approach to innovation.

Literature on innovation in agriculture involves focus on systems of innovation perspective and its usefulness, use of systems perspective to understand innovation capacity, innovation systems with relation to food supply insecurity and climate change, innovation in light of capacity of advisory services to support the changes, farmer-driven innovation, roles and functions of actors in the system, and not least innovation strategies, involving invention and adoption versus change and adaption. The systems of innovation concept is not new in the industries, but new to some extent in the agricultural sector. Hence, many studies have been focusing on exploring and using the systems of innovation perspective, while few other studies have focused rather on micro-level and individuals as part of the greater innovation system.

Literature on innovation in the Norwegian agriculture focuses also to some extent on systems of innovation perspective. Innovation on farm-level has been present for a long time, especially with a focus on technological innovation, but the innovation system concept has only recently started to be applied, and only on national, regional and sector levels. Main topics in focus in

the studies of innovation in Norwegian agriculture are: organization of innovation, importance of innovation for agricultural development, innovation as an adaption strategy to changes, part-time farming and entrepreneurial activities, adoption of robotic milking systems, farmers' interaction with advisors and not least, human and social capital related to farming productivity.

The study in this thesis is well suited to fill a gap in the existing literature on innovation in Norwegian agriculture, in addition to a global basis. There is a gap in how the Norwegian dairy cattle farmers innovate on farm level, while they receive advice from advisory services. Moreover, the conducted research contributes to the existing literature by focusing on the systems of innovation perspective, but on micro-level and hence experiences and practices on farms, which has received less attention in the literature as opposed to national, regional and sector-level focus involving a bigger picture. The understanding of the experiences and practices of individuals contribute to the whole system of innovation. The experiences of individuals are as important as the links between organizations in the whole network. If a system of innovation needs to be improved, the directly involved individuals, farmers, are one of the most important parts of the system that should be considered.

The conducted research focuses on exploring a combination of components directly related to innovation processes on farm-level, which include types of ideas and innovations on farms, sources of ideas and how ideas develop, actors that are involved in the process, drivers and obstacles to innovation on farms. The combination of the components in focus has not been previously explored in former Norwegian or international studies. Existing literature focuses mostly on single technological innovations or specific single factors related to innovation in agriculture, while conducted research aims to cover all related aspects and tries to explore innovation beyond technology to cover various interesting and important insights.

The focus on the combination of innovation components on farm-level contributes to a greater understanding of the innovation process on farm level and further development of Tine's advisory services, and create an important basis for future research.

3 Methodology

In order to find out how Norwegian farmers innovate on dairy cattle farms, while they receive advice from Tine's advisory services, a set of approaches, methods and techniques have been used. This chapter reviews the methodological aspects of the conducted research by first reflecting upon used research philosophy, approaches and design, followed by applied methods for data collection and methods for data analysis. Finally, the quality of the conducted research and ethical aspects are reflected upon.

3.1 Research philosophy and approach

The conducted research adapted a mix of the positivism and interpretivism philosophy (Wilson, 2010). From the positivist's perspective, there was made an attempt to carry out an empirical research with as objective results as possible and by looking in from the outside. The research intended having to some extent more quantifiable results. From the interpretivist's perspective, the research intended to include interaction with research participants in their context, not focus on generalization, and view of the world "as complex and open to interpretation", which might lead to subjectivity bias (Wilson, 2010, p.11).

The conducted research was carried out using an exploratory study through an inductive approach. The inductive approach is a "theory-building" process, which involves focusing on research observations and data findings before producing theory based on what has been investigated and relating findings to existing theory (Wilson, 2010). Inductive research was chosen because it allows a deeper and wider understanding of the research context when moving from data to theory and focusing on the observations and findings from the start. The conducted research wanted to gather new findings on the innovation process on farms without relying on aspects in the existing literature on the topic. The research context in the research was specific dairy cattle farms in the Norwegian agriculture, in which new ideas and innovations develop.

Exploratory research is related to inductive approach, and involves "a research problem where there is a lack of published research and a lack of knowledge about a given topic" (Wilson, 2010, p.103). The aim of this type of research is to explore a specific topic to get a greater insight in it (Wilson, 2010). The aim of the conducted research was to get an insight into the innovation process on dairy cattle farms in Norway. Hence, a greater understanding was needed

about the different aspects of the innovation process on farm-level, involving new ideas, their development, actors involved and related obstacles and drivers in the process. Moreover, based on the literature reviewed, there is a lack of research on the subject in focus.

3.2 Case study as research design

The chosen design for the research was a case study. Robert Yin (2009) defines a case as "[…] an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (p.18). The reason why a case study was chosen as research design was that the conducted research seeked to explore the several in-depth aspects of "how" dairy cattle farmers innovate.

Regarding case study design type, the conducted research focused on single case design (Wilson, 2010) with a study of dairy cattle farmers that produce for and receive advice from Tine. Regarding the unit of analysis, the conducted research involved multiple units of analysis, by focusing on the farmer's point of view and the advisor's point of view in the context studied.

The reason why Tine was chosen is related to the research project's connection to the larger research project Competent Farmer (Norsk senter for bygdeforskning, 2015) (See chapter 1). Tine, as one of the partner companies and research cases in the Competent Farmer project, was available and hence, chosen for the conducted research. Moreover, studying innovation on farms where farmers get advice through advisory service from Tine is of great interest, because Tine is one of the two leading dairy companies in Norway, and Tine is owned by over 10.000 dairy farmers (TINE, 2016a). Thus, how ideas develop through interaction with and in direct relation to the dairy cooperative Tine was not least a personal interest in the conducted research.

The conducted case study focused on a narrowed geographical area of dairy cattle farms in Norway, namely North and South Trøndelag, which cover Mid-Norway. The choice of Trøndelag is also related to the availability of informants that could be reached through the Competent Farmer project.

As explained in the introduction, the conducted research is related to the Competent Farmer project through the shared case study of Tine, partly shared data collection and partly shared analysis with fellow researchers. The details are further explained in the next chapters about methods for collecting data and methods for classifying and analysing data.

3.3 Sampling and methods for collecting data

In order to get an in-depth understanding of the field studied and answer the study questions, which involve "what", "where", "how" and "who" questions, the conducted case study was dependent on a qualitative approach through primary data collection. The primary data collection involved three types of tools – observation, interview and survey. The following sub-chapters reflect upon each tool used in the case study, including related sampling procedures.

3.3.1 Observation

Observation was the first tool used in the data collection. The purpose of the observation was to learn about regular advisory sessions between a farmer and his advisor from Tine. The observation was designed to understand the advisory process, its content and how it is carried out between the two participants. Moreover, the observation was used to understand the advisory context and its nature prior data collection, through conducted interviews and the survey. This is further explained in the next sections of this chapter.

One dairy cattle farmer and his building advisor from Trøndelag were chosen to be observed during one of their advisory sessions. The advisory session concerned plans to build a new cowshed on the farmer's farm. The sampling procedures for the observation was done through the Competent Farmer project, where Tine decided on and assigned informants that could be observed during one of their advisory sessions. It is unknown how the sampling was done and what the rationale behind the chosen advisor and farmer was. Such sampling could have been done in a random or non-random way. However, the person responsible for the sampling in Tine is an experienced researcher, which might have influenced the sampling in a positive way.

The advisory session was carried out virtually with the communication tools that usually are used in online advisory sessions between farmers and advisors. The communication platform used in observed advisory session was called *Same-Time* (IBM, 2016). It allows computer screen-sharing, but with regular telephone communication session for sound in parallel, which is connected to the *Same-Time* screen-sharing session. The farmer and advisor used the screen-sharing platform to plan and discuss drawings of the new cowshed that was going to be built.

The conducted observation was designed to be undisguised and non-participant (Wilson, 2010). The farmer and the advisor were aware that they were being observed, but two researchers (including myself) did not directly interact with the farmer and advisor during the observation,

besides in the beginning of the sessions and at the end. Moreover, the informants were not directly observed, but their communication (only voices) over the phone and virtual sharing of the advisor's computer screen with cowshed drawings that they discussed. The reason why an undisguised observation was chosen is that it is not possible to and there is no reasons to hide the observation in any way, and it would be quite unethical to do so (Wilson, 2010). The choice of a non-participant observation was to not interrupt the advisory session, and to observe an as natural advisory session as possible in the advisory's natural context.

The observed advisory session was both taped (communication) and recorded (computer screen activity), and later transcribed for later review of the original session. The transcription of the observation involved a certain notation to illustrate different aspects of the advisory session, such as thinking pauses and abruption of sentences during communication. This way, the transcript illustrated the original aspects of the communication observed.

3.3.2 Interviews

The second tool used in the data collection was interview. Interview was chosen to get an in-depth understanding of the farmer's attitudes, experiences and actions on his farm, and the advisor's attitudes, experiences and actions related to the farmer and his farm. Moreover, interview was chosen in order to get a direct conversation with informants, while having the opportunity to ask in-depth follow-up questions that could be answered immediately.

Two interviews were carried out in the conducted research – one with the dairy cattle farmer and another with the building advisor, who were both earlier observed. Hence, the same informants were first observed and then interviewed. The sampling of informants for the interview was the same as with the observation, decided by Tine, and the sampling procedure used is thus not known.

The two interviews were carried out in Trøndelag, involving face-to-face interviews in the informants' natural context. The dairy cattle farmer was interviewed on his farm, and the farm was explored after the interview session to get an insight into the farmer's working environment. The building advisor was interviewed at his office, where the workplace was also explored. Informants were interviewed face-to-face in their natural contexts to mirror their responses to the context and to understand the environment they work in. Moreover, the

interview also allowed both verbal and non-verbal communication examination (Wilson, 2010), which obviously strengthened gathered data and its interpretation.

Furthermore, both interviews were semi-structured, which involved a combination of structured and unstructured questions. The interviews followed the interview guides and prepared questions, but at the same allowed follow-up questions, explanation requests, elaboration on certain points and questions about other related aspects of the topic in focus that originally were not planned to be asked. The semi-structured approach made it possible to both get answers on defined questions and get the possibility to explore the studied topic in-depth without limiting answers and without missing interesting insights. Such aspects are hard to achieve when carrying out either a structured or an unstructured interview.

As previously mentioned in the section about observation, the interviews were designed partly based on the observation and understanding derived from it, in order to better understand and elaborate on the advisory context and how farmer and advisor interact. Otherwise, two interview guides were created involving different topics of interest for the conducted research. Both interview guides were developed through several rounds by three participants in the Competent Farmer project on behalf of University of Oslo, including myself. The two other participants were researchers from the Department of Education at the University of Oslo.

The interview with the farmer was designed to learn about his farm, how he operates in it, his experience with the building advisor and their advisory sessions, the farmer's perspective upon the advisory session that was previously observed, alternative channels for advisory and information seeking, use of ICT on the farm, and not least the farmer's experience and practice related to innovation. The interview guide used during the interview with the farmer can be reviewed in *Appendix A*. The interview with the advisor was designed to learn about him and his role as an advisor, his experience with the farmer interviewed, the advisor's perspective on alternative channels that are used for advisory and information seeking at farms, use of ICT, and the advisor's perspective on and experiences with innovation on farms. Hence, the interview was designed to learn about not only advisor's experience with the interviewed farmer, but also to learn about his experience with other farmers that he has advised. The interview guide used during the interview with the advisor can be reviewed in *Appendix B*.

Participants that were present at the both interviews, besides the farmer and advisor in their each interview, were the same who developed the interview guides, including myself. One of

three participants asked questions during the interviews, while the rest took notes, and all three participants asked follow-up questions. Both interviews were recorded and later transcribed in their entirety to not miss any information and to get accurate data for review and analysis. The interview transcripts involved a certain notation to illustrate different aspects of the interviews, such as thinking pauses, abruption of sentences, sounds and additional explanations of the context during the interview. Hence, the transcripts illustrated the original aspects of the conducted interviews.

3.3.3 Survey

The third tool used in the data collection was a survey. The survey intended to complement the data gathered in the interviews and explore the same aspects that were learned about through interviews, but on other dairy cattle farms. Hence, a qualitative survey was chosen. There were made two attempts to carry out a survey in the research, and they are both reviewed in the following.

The first attempt to carry out a survey was not successful. Two parallel surveys were designed to involve perspectives of both farmers and their advisors. The sampling method used was non-random, and the sampling technique was quota sampling (Wilson, 2010), which involves choosing informants based on pre-determined characteristics.

The plan was to send one survey to 45 advisors, including both key advisors (main advisors) and building advisors from Tine. 45 advisors were chosen because it is the total amount of key advisors and building advisors in Mid-Norway, which consist of a few counties in addition to Trøndelag, which was in focus in the observation and the interviews. The choice of key advisors was that they are regularly in contact with farmers, before farmers are further advised by other advisors, who are specialized in different subjects related to farming (i.e. feeding, building, health and economy). Moreover, almost all key advisors from Tine have specialization in many other subjects. Thus, by choosing key advisors, there was a possibility to get stronger data related to the different farms. However, no key advisors are specialized in building advisory, and hence, this was the reason why all building advisors were chosen, in addition to all key advisors in the planned survey. Furthermore, the other survey was planned to be sent to 45 dairy cattle farmers – the same number of farmers as advisors. Each advisor was supposed to pick one farmer to answer the survey. The sampling technique that was planned to be done by each

advisor would not be known, and could have involved random as much as non-random sampling method.

The survey for advisors was designed based on the interview guide and the findings derived from the interview with the building advisor. Moreover, the survey was designed to get the advisors' perspectives on both the related farmer that they were going to choose for farmer-survey and perspectives on their experiences with other farmers that were not going to get the survey. Similarly, the survey for farmers was designed based on the interview guide and the findings derived from the interview with the dairy cattle farmer.

A request was sent to TINE to get permission to send out the surveys, as part of the Competent Farmer project. However, the request was declined due to the high amount of advisors requested to participate as informants and limited time available as part of TINE's project involvement.

The second attempt to carry out a survey went successfully, and was conducted outside the Competent Farmer project with help from one of my supervisors. Since the advisors from Tine were not available for the conducted research, the focus was narrowed down to only dairy cattle farmers in North and South Trøndelag. With the help from my supervisor, a list of all dairy cattle farms in Trøndelag was acquired.

The sampling method used for the survey to dairy cattle farmers was non-random, using the convenience sampling technique (Wilson, 2010). The farmers that were approached to answer the survey were chosen based on available e-mail addresses. By excluding the dairy cattle farmer already interviewed prior the survey, there were 3144 active dairy cattle farms in total in both South and North Trøndelag. Out of the total amount of dairy cattle farms, only 336 active e-mail addresses were available, to which the survey request was sent.

However, it was not known how many of the 3144 farms in total and the approached 336 farms produced for and received advisory from Tine. Thus, the first question in the survey asked the farmers about the connection to Tine and sent farmers to the end of the survey if they did not produce for Tine. This way, the final responses included only dairy cattle farms connected to Tine. The total amount of dairy cattle farmers connected to Tine that answered the survey was 57, which involved 16,9% response rate. It was calculated that by contacting 336 farms, with 95% of confidence level and with belief in that at least 50% are producers for and receive advice from Tine, the margin of error would be 5.05.

The tool used to create the survey was Google Forms. The reason behind the choice was lack of availability of other simple and free survey programs that supported needed features for the survey design. The conducted survey questions can be reviewed in *Appendix C*.

3.4 Methods for classifying and analysing data

Several methods were used to classify and analyse data collected. This chapter reviews the methods used for data analysis from observation, interviews and the survey separately in the following sub-chapter.

3.4.1 Observation analysis

The data gathered from the conducted observation of the virtual advisory session between a dairy cattle farmer and his building advisor was indirectly relevant and not directly used as part of the data analysis. As earlier mentioned, the purpose of the observation was to get an insight into the advisory process, its content and how it is usually carried out. The conducted observation was playing rather an informative role prior the conducted interviews and the qualitative survey.

3.4.2 Interview analysis

The analysis approach used to analyse interview data was inductive (Wilson, 2010), meaning that themes, categories and patterns were developed from the gathered data, and not predetermined prior the analysis from the literature. However, even though the conducted study used an inductive approach in the analysis, it must be mentioned that the practice involved to some extent abductive aspects (Dubois & Gadde, 2002), including an inductive approach with deductive instances in mind. The reason is that it is difficult to carry out a research without having thoughts about existing theories, research, expectations and interests, even though they are not directly applied in the inductive analysis.

As previously mentioned, the interviews were recorded and transcribed to make sure no data was missing and to be able to review the data in its original form, making the raw data as less subjective as possible prior analysis. The used coding approach was emergent coding (Wilson, 2010), which is related to inductive analysis approach and involves themes, categories and patterns that emerge from the data through examination of it. The reason behind the choice of

emergent coding was to let the data speak for itself, in order to not miss any emergent or unforeseen codes and insights.

Moreover, the conducted research used open coding (Wilson, 2010) related to labelling and categorization of the data. Open coding was chosen to freely label and categorize the gathered data that was interesting with regards to study questions in focus. The two interview transcripts were coded by first selecting and highlighting interesting sections of the data that were directly relevant to the conducted research. Thereafter, the data was classified into themes, which were explored and compared prior interpretation of the grouped data. The coding of both interviews was reviewed in several rounds with three other participants in the Competent Farmer project.

The chosen qualitative approach for data interpretation and analysis of interviews was narrative analysis (Wilson, 2010). Narrative analysis is "the study of stories or a chronological series of events" (Wilson, 2010, p.264). Narrative analysis can be divided into two types: personal narrative, which is when personal experience of a situation is studied, and life story narrative, which is when a personal experience over a number of years is studied (Wilson, 2010). The conducted research applied narrative analysis, because it was the best fit to what was studied – farmer's and advisor's experience with new ideas and innovations on farm-level. Both personal and life story narrative was used in the analysis. Personal narrative was important regarding informants' experience and practice in particular situations related to innovation process and aspects involved, while life story narrative was important regarding experience and practice related to the innovation process over time.

3.4.3 Survey analysis

The analysis methods used to analyse the qualitative survey data was very similar to interviews. The approach used was inductive, with emergent type of coding (Wilson, 2010) that involved themes, categories and patterns that developed from the gathered data, rather than from literature. The reason behind the choice is the same as with interview analysis – to let the data decide in order to not miss any interesting insights.

The survey analysis also involved open coding, similarly to interview analysis (Wilson, 2010), where labelling and categorization of the data was made freely based on interesting and relevant responses. The survey data was highlighted and reviewed both per respondent's answers to different questions and across respondents to find relations and patterns. Thereafter, the data

was classified into final themes. Since the survey questions were based on data from interviews, the final themes overlapped, leaving the survey data strongly related to data from the interview analysis. The coding and analysis of the survey was also reviewed through several rounds, but was not a part of the review rounds with researchers from the Competent Farmer project. The used interpretation and analysis approach was the same as with interviews – narrative (Wilson, 2010). Since the survey was qualitative and based on interview data, an attempt was made to get as much stories and examples as possible. The type of narrative used for survey analysis was also both personal and story narrative. The reason behind the choice was to examine both personal experiences of different situations related to the aspects of innovation process on the farms and to examine experiences on the farms over time regarding innovative operations.

Regarding the software used for coding and classification, the survey data was carried out partly in Microsoft Excel, where survey responses were stored and highlighted, and partly in Microsoft Word regarding classification of the data into themes prior interpretation. The used software was chosen due to lack of a free and simple software for qualitative survey data analysis.

3.5 Quality of conducted research

This section reviews the quality of the conducted research by reflecting upon its reliability and validity in turn. The reflections are shortly summarized in the end of the chapter.

3.5.1 Reliability

Reliability of a research concerns the stability and consistency of results, in addition to repeatability, which involves being able to arrive at the same results if a certain study was repeated (Wilson, 2010). According to Wilson (2010), there are three main types of reliability: inter-judgemental reliability, testing and retesting reliability and parallel forms of reliability.

Inter-judgemental reliability determines "the extent to which individuals with the required skills and/or authority agree in their assessment decisions" (Wilson, 2010, p.116). Inter-judgemental reliability is present on several stages of the conducted research. Interview guides used in the research were reviewed and assessed through several rounds by four participants related to the Competent Farmer project (a researcher, research assistant, another master student and myself). Moreover, two more researchers from the Competent Farmer project contributed with an

additional review of the guides. The survey questions were also reviewed by both of my thesis supervisors. Data selection and categorization, as part of the analysis, was also reviewed and evaluated through several rounds by the same four participants related to the Competent Farmer project. The review and evaluation focused on how data is interpreted and how it fits defined themes.

Testing and retesting reliability concerns "measurement of the same reliability test on more than one occasion" (Wilson, 2010, p.116), and involves testing and retesting gathered data over a period of time with the same participants. The conducted research did not involve testing and retesting reliability due to short research time, availability of participants and extensive primary data collection.

Parallel forms of reliability is explained as "a method of measuring reliability that uses two different types of assessment tool" (Wilson, 2010, p.117), where the two response sets are later evaluated based on the consistency. This type of reliability was neither present in the conducted research, due to short research time, availability of participants and extensive primary data collection.

There are three principles that help to deal with reliability: using multiple sources of evidence, creating a case study database and maintaining a chain of evidence (Wilson, 2010). Conducted research used multiple sources of evidence to improve reliability. The two conducted interviews involved two sources of evidence, namely farmer's and his advisor's perspective. Moreover, the conducted survey involved additional sources, other farmers, that not only presented additional insights, but did also play the role of making the interview data more representative.

Reliability was further improved through creation of a so-called case study database. As earlier mentioned, conducted observation and interviews were recorded, transcribed and stored, and the survey responses were also stored in the original form. This way, all data gathered was organized in one place and can, in principle, be assessed in its original form, without being limited to the data interpretation and analysis carried out in this thesis.

The conducted research also partly improved its reliability by maintaining a chain of evidence involving two external observers – two thesis supervisors. Besides the main thesis supervisor, another supervisor was closely involved in the research evidence, as part of the Competent Farmer project, and followed the evidence from initial research questions through analysis to conclusions derived. The maintenance of the chain of evidence was carried out partly, because

not all research steps were observed directly. An example is interpretation of survey data that was accomplished outside Competent Farmer project.

3.5.2 Validity

Validity is concerned with whether or not a research measures what it intends to measure (Wilson, 2010). According to Wilson (2010), there are two main types of validity: internal and external. Internal validity can be further divided into content and construct validity, where content validity involves two more sub-types – face validity and sampling validity.

Face validity (internal, content validity) focuses on "the extent to which an instrument measures what it is supposed to measure" (Wilson, 2010, p.119). Face validity was supported in the conducted research regarding interview guides and survey questions. As earlier mentioned, interview guides and survey questions were reviewed and evaluated by both thesis supervisors, in addition to other few contributors involved in the Competent Farmer project.

Sampling validity (internal, content validity) is concerned with "that your measure includes all areas within the nature of your study" (Wilson, 2010). The conducted research supported sampling validity by involving various aspects that are directly related to innovation on farm-level. Besides exploring the types of new ideas and innovation, aspects in focus were sources of innovation, development process, actors involved, potential drivers and potential obstacles to innovation. Hence, the conducted research tried to involve several aspects related to exploration of how farmers innovate.

Construct validity focuses on validation of the research construct which is "valid to the extent that it measures what it is supposed to measure" (Wilson, 2010). The construct validity is supported in the conducted research by involving data triangulation. The data triangulation is not optimally present, but at least to some extent. As earlier mentioned, two separate interviews were conducted with one farmer and his advisor, who were initially observed during their advisory session, and a survey with 57 farmers was conducted. The data triangulation could have been more optimal if the original survey plan had worked out, involving an additional survey with farmers' advisors to also involve their perspectives on the same topic.

Furthermore, even more optimal construct validity would have been present if several pairs of farmers and their advisors could have been interviewed, instead of exploring their perspectives through a survey. The reason is that interviews would have involved more discussion,

explanation and justification of responses, in addition to a better understanding of the various innovation aspects, than what a qualitative survey potentially allows.

External validity is related to generalization of findings to a wider population (Wilson, 2010). The conducted case study did not initially intend to create a generalization to a wider population. However, at the same time, there was an attempt to get somewhat more representative findings by conducting a qualitative survey in addition to the two conducted interviews with a farmer and his advisor.

3.5.3 Summary of research quality

As Wilson (2010) points out, "[…] for a test to be reliable, it also needs to be valid" (p.116). In other words, reliability and validity are closely related and have to be present to achieve high research quality. The quality of the conducted research can be summarized with that it supports both reliability and validity to some extent, and risks of bias are to a degree reduced, such as through data triangulation and involvement of two thesis supervisors and other researchers related to Competent Farmer project through various research steps. However, the overall research quality is not optimal. Research results cannot be generalized to a wider population, but represent experiences and practices of one part of the population that is not least important.

3.6 Ethical reflections

The conducted research considered ethical aspects throughout the research. All individual participants in the conducted study were informed about the nature of the research and implications of taking part. Interview and observation participants were fully briefed about the conducted research and Competent Farmer project both through and besides a consent form that was signed prior data collection. Survey respondents were briefed through e-mail together with the survey request. Anonymity has been in focus from the beginning of the research, and all participants have been protected throughout the research regarding personal data. All participation in the study has been voluntary.

The conducted research has been reported to Norwegian Centre for Research Data (NSD) regarding research and privacy. Approved NSD form and information note about the research project can be reviewed in *Appendix D* and *Appendix E* respectively.

4 Results and analysis

This chapter presents and analyses results from two interviews and a survey conducted with informants from North and South Trøndelag in Norway. The interview results are based on data gathered from one dairy cattle farmer and his building advisor in South Trøndelag. Interview data presented covers often two perspectives on one topic – the farmer's and the advisor's. Moreover, the interview data explains interviewees' experiences related to each other and their experiences related to other farmers and other advisors they interact with. The survey results are based on data gathered from 57 dairy cattle farmers, involving 35 farmers from North Trøndelag and 22 farmers from South Trøndelag. Most of the survey respondents are between 30 and 50 years old, and have operated at their current farms mostly 3 to 10 years or over 20 years. Moreover, 32 respondents operate alone on their farm, 21 respondents operate together with family members and 4 respondents operate in cooperation with other farmers.

Both interviews and the survey were conducted in Norwegian, and respondents' quotes presented in this chapter have been translated to English. Interview extracts have been numbered starting at "Extract 1", and quotes from the survey respondents in this chapter are marked with identification numbers, such as "[1]: …" up to 57 (total amount respondents in the survey), in order to distinguish responses per farmer.

Results and analysis are structured based on ten categories that emerged from the collected data across interviews and the survey (See Section 3.4), and involve: 1) small ideas and innovations, 2) big ideas and innovations, 3) development of ideas through interaction with advisors, 4) information seeking and learning through advisory services, 5) information seeking and learning through social networks, 6) individual information seeking and learning, 7) preserved buildings and innovation, 8) routines in the cowshed, 9) economy and funding and 10) government regulations. Each category is reviewed separately.

4.1 Small ideas and innovations

According to the interview with the advisor, many farmers are creative and have many fun ideas, and many small ideas and experiments on the farms are initiated by the farmers themselves. The advisor explains how several farmers experimented in the cowshed against received advice from the advisor:

"*We have several who have implemented milking robots in old cowsheds with booths. How do we manage that? (.2) Ehm(..) I have told … that this is a very bad solution. But he [a farmer] makes it work (.3) So I have some examples with those who have ehm(..) implemented a milking robot and simply unleashed cows.*[…]" (Extract 1)

According to the advisor, farmers are also quite innovative in the sense that they have to find smart solutions that do not cost a lot of money. He tells how one farmer built low-cost concentrated feed silos by himself:

"*They come up with all kinds of things. Ehm(..) there was one who(..), he could not afford new concentrated feed silos, but he bought two oil containers from an offshore company that went bankrupt(..) Ehm, so he welded them to concentrated feed silos. Put on feets and raised it up.* […] *Ehm(..) because they have a welding machine, and they have some ideas about how it is supposed to work. And(..) while it can be innovative, in re-use and use something that costs a thousand Norwegian kroner.* […] *Instead of ehm(..) 120.000 that it would cost for two silos.*[…]" (Extract 2)

Farmers seem to be creative also in the sense that they use resources available on the farm. The advisor explains how farmers build their cowsheds:

"[…] *I have a number of farmers that build whole cowsheds almost by own forest and everything.* […] *Cut everything themselves. Use many years to cut timber.* […] *And then they build walls and roof and the whole package. use enormously long time.* […] *They are very good at this the farmers. It is incredible what they can manage out of so little.((laughs))*" (Extract 3)

The dairy cattle farmer interviewed has forestry work on his farm, and he explains that forestry is something he does occasionally, instead of doing nothing. He states: *"I do that occasionally because I do not use it for myself now. Now I have soil heater, so I do not use any wood (.2) so I sell the wood* […] *You do not have any hourly payment for it, it is just instead of lying on the couch, so you can as well produce wood.* […]". (Extract 4)

Furthermore, the farmer explains that he uses some of the wood to get organic material in the soil on his farm: "[…] *they are processed and sent to wood cargo and paper factories as well yes. It resulted in a lot of lumber out of it. The stubs I milled them and mixed into the soil to get some organic also.*" (Extract 5)

The survey, responded by 57 farmers, also revealed interesting insights. Thirty respondents state that they have applied new knowledge and learning in their farming. One example involves intensification and experimentation [1]: *"Intensified the operation, trying more difficult varieties and species"*. Another example involves farming strategy [40]: *"Simplification of*

working methodology". There is also focus on modernization and use of new tools in farming, especially related to new machinery and harvesting: [4]: *"Bigger machines"*, [15]: *"Renewed machines* […]", [18]: *"Modernized parts of the cowshed"*, [22]: *"Significant rationalization and efficiency improvement of the machinery"*, [12]: *"No big changes. Some building-related modifications and rationalization regarding harvesting of feed"*, [36]: *"New equipment for harvesting of grass"*.

Results show that a range of farmers implement small improvements and experimentation on their farms related to different aspects of their farming.

4.2 Big ideas and innovations

According to both dairy cattle farmer and the building advisor interviewed, there is a range of big changes on the farms. The farmer interviewed is in the process of building a new cowshed on his farm, and has built a new landscape on his farm. He explains the changes: *"I have taken initiative to build a new cowshed here* […] *Based on the resources I have here now. The way it is now [..] it was before Christmas I created 120 acres of land. This only I think is (.) I am proud that I managed it. Made a new landscape."* (Extract 6)

Furthermore, in addition to a new landscape and a building, there will be implemented a robotic milking system in the cowshed. The farmer explains that robotic milking might increase the productivity: *"They say that if you change from manual milking to a robotic milking system, the productivity amount of milk increases probably with 20 percent. This is because a robot takes the milk from a cow when she wants* […]*"* (Extract 7)

The farmer further reflects upon the expected changes ahead on his farm related to new knowledge and learning: *"*[…] *it is difficult to imagine how the production, it will be a significant difference compared to how I operate now, both related to planting, agronomic aspects and production in the cowshed, and it will not be to recognize, so the knowledge increase is important* […]" (Extract 8)

The advisor interviewed also reflects upon the implementation of automatic milking system on the farmer's farm related to the implementation of loose housing from his perspective: *"It is interesting regarding [the farmer]. Who goes from ordinary cowshed with booths (.2) to fully automatic milking robot ehm(..) and full package [i.e. loose housing]. So there is a lot of innovation in the picture.* […] *And around the production."* (Extract 9)

According to the survey responses, 19 farms have implemented a robotic milking system at their farm, while 38 do not have a milking robot in the cowshed.

The interview with the advisor also revealed an innovative idea that the interviewed farmer had, but which did not work out in the end:

"We have been into ehm(..) energy. […] *He [the farmer] has a big forest property. He has access to a lot of wood.*[…] *and we are then into what is called biofuel. Ehm(..) wood heating construction. Ehm(..) to warm houses, the cowshed, maybe other single properties also. So we had a process of investigating the opportunities with it.* […] *The reason it did not work out was that his farm is near a quite big sawmill (.2) and they have already wood heating..((laughs)). So there was a quite strong competitor in the neighbourhood* […] (Extract 10)

There seem to be big ideas on farms, which if acted upon will be costly. However, in this case, the farmer considered to act upon the idea and clearly investigated the opportunity. Unfortunately the idea could not be pursued on due to a strong competitive actor nearby.

The conducted survey gave also interesting insights into big changes on other farms in Trøndelag. 19 farmers specifically informed about that they have increased their production involving milking quota, amount of animals on the farm or farm size. Farmers that increased their milking quota had a significant increase. Some statements involve: [2]: "*From 112000 in quota to 430000* […]", [14]: "*Doubled milk production*", [15]: "*Increased the quota with 100 tons*", [18]: "*Increased milk quota with 70% without significant increase of number of cows*", [21]: "*Bought milk quota and increased milk production with almost 50%*", [22]: "[…] *Significant increase in milk production*", [50]: "*Extended production from 80000 litres of milk to 130000 litres* […]", [56]: "*Extended production x5*", [57]: "*Increased production. Increase > 100%*".

Some of the farmers that increased amount of animals on the farm state: [11]: "*Extended the cowshed from 32 cows to 60 cows*", [27]: "*Grew from 14 yearly cows to 25 yearly cows. Plan an increase to 40 yearly cows in 2017*". Increase in the amount of animals is almost double as much as many farmers had initially.

Another interesting insight from the survey about big changes involved that many farmers have had changes in their production of products or started to produce new products. New types of products that farmers have started to produce involve: [8]: "[…] *Sale of rare potato variety*", [7]: "*Chicken house*", [13]: "*Produce ice cream and beer*", [14]: "[…] *Wood heating construction – heating of houses – warm water in the operational house*", [17][22]: "*Grain*

production", [19]: "[…]*Started with sheep. Started with apple production. Started beer production*", [24]: "*Started with dairy products*", [28]: "*New types of grain*", [30]: "*Sheep, wool/leather* […] *new concentrated feed* […]", [37]: "*Started grain production*", [40]: "*Started with farm food like sale of meat, dairy products and beer*", [56]: "*Wood heating construction*".

Moreover, six farmers informed in the survey about that they changed their production from regular to ecological type, and one farmer tells that he is considering to pursue on a new idea: [5]: "*We have thoughts about building a cheese factory*".

Some farmers informed in the survey about that they have built a brand new cowshed on the farm, while other farmers have modified existing cowsheds. Modification of existing cowsheds include: [6]: "*Reconstruction of existing buildings*", [20]: "[…] *extended the cowshed for loose housing*", [31]: "*Built upon the cowshed and silos*", [38]: "*Extended the current cowshed with a new section for young animals*", [44]: "*Reconstructed the whole operational building* […]. *Extended with a [milking] robot*", [50]: "*Reconstruction from booths to loose housing*".

Big ideas and innovations vary to some extent across the different farms. There are many changes on the farms, and farmers seems to be quite creative regarding innovation on farms.

4.3 Development of ideas through interaction with advisors

The interviews with the farmer and the advisor revealed an interesting insight into how innovative ideas develop between them. As previously explained, the farmer interviewed is in the process of building a new cowshed, and the advisor tells the story about how it all began:

"[…] *He [the farmer] wanted help because (..) it was talk about quitting as a dairy cattle farmer* […] *the cowshed was too old* […] *So he wanted help. So I thought about the case and we started the building process.* […] *So we will start the physical building process of a new cowshed in the spring.*" (Extract 11)

Moreover, the advisor points out that various ideas develop differently from farm to farm. An example with another farmer involves a technique that the advisor uses when he tries to convince him to consider one idea instead of another:

"[…] *I had a quite challenging discussion with one about how to build a type of cowshed, without feed bunk* […] *and I did not like the idea, because it constrains further cowshed extension later. (..) But he was stubborn about that it should cost a lot. And then it was for me*

to try to juggle the solution, that I had in my head (..) over to him, without directly saying it. So you have to kind of hint. You have to say yees(..) and kind of put the words in his mouth […] *Think if you do this like this and this(..) Yees(..) Well, if I think twice(..) and then I got him kind of to support a new idea. After a couple of hours.*" (Extract 12)

Furthermore, according to the advisor, the discussion of building ideas begin 50% from the farmers and 50% from himself across cases he has experienced.

Regarding the experience of the interviewed farmer and development of the idea about building a new cowshed, the farmer has worked closely with the building advisor through the planning process. The farmer explains that he already had an idea about what he wanted to build, and according to the farmer, the advisor made the plan and draw a cowshed based on farmer's guidelines through many advisory sessions. Such guidelines are specified by the farmer: "[…] *I wanted a modern cowshed that could be operated by one person and was economic enough for the operation related to the current state of the farm. Besides from this you could say he [the advisor] formed the substance that I proposed in the cowshed solution."* (Extract 13)

However, the farmer makes clear that during the building plan sessions with the advisor, small changes were made to the building drawing when they saw that things were missing or after discussions about what would be a better solution regarding different aspects of the building.

Development of ideas happen closely between the farmers and advisors. The details are properly discussed, and both parts seem to be quite active in the development.

4.4 Information seeking and learning through advisory services

Farmers often seek new information and learning through Tine's advisory service. The farmer interviewed explains that he asks for advice in situations where he is going to do something unusual on the farm, because his knowledge alone is not enough in those cases: *"*[…] *where I am going to do something besides the ordinary like building a new cowshed. Then my competence is not sufficient, so then I need guidance."* (Extract 14)

Similarly, survey respondents often ask for advice when they experience problems on their farm. Some responses include general help needed, while other include problems regarding specific cases: [47]: "*when problems appear and I don't have good enough knowledge about it*", [11]: "*In cases of problems*", [46]: "*If I need help*", [50]: "*Strategic choices or in case of*

concrete problems", [12]: "*[Animal] Health problems*", [54]: "*Questions about feed, breeding, economy*", [10]: "*Regarding extension of buildings. Challenges with daily operation*", [16]: "*Since I am new in the agricultural context, there are questions about a lot of things*", [32]: "*in cases of problems with milk sampling*".

Moreover, a range of survey respondents seem to ask for advice regarding big decisions on the farm. Responses involve: [8]: "*I ask for advice when concrete problems arise, or in cases where I stand in front of a crossroad with big economic or structural consequences*.", [3]: "*When base- decisions have to be concluded – extension/closure*", [36]: "*In cases of big investments. Problems in the cowshed.*", [22]: "*Building investments*", [27]: "*In planning of building constructions, loose housing and robotic milking.* […]", [34]: "*In cases of building extensions or important strategical and economic decisions*".

The most popular topic that survey respondents ask advice about is animal feeding, which was mentioned by 20 farmers. Other topics that farmers ask advice about include breeding, milk production, development and improvement of farming and the farm, operation strategies, economy, purchase and sale of animals, health, and not least future opportunities on the farm involving future-oriented planning and further development.

Regarding the initiative to get advice, the farmer interviewed explains that the initiative to get advice in relation to a new cowshed came from a project in Tine. He explains: "[…] *The initiative regarding the advisory service in current case was initiated by Tine because they had a project for a couple of years ago something like 'future-oriented farmer' or something that kicked me and made me call the advisory service in this regard.*" (Extract 15)

Other farmers, based on survey results, have different opinions regarding the initiative for advisory. 41 dairy cattle farmers feel that they are the ones who take most initiative for advisory, while 16 farmers feel that advisors are the ones who take most initiative.

Survey respondents were asked whether they have been in contact with other advisors besides advisors from Tine. Results show that 40 farmers have been in contact with advisors besides Tine regarding their farm, while 17 have not. The most common advisory actor besides Tine is Norsk Landbruksrådgiving, which 17 farmers inform about in the survey. Other actors that farmers have received advice from include Felleskjøpet, Forsøksringen, Landbrukstjenester, Nortura, Allskog, local authorities on environment and agriculture, advisors from banks, animal doctor, coach and slaughterhouse. The most popular advisory topics related to received advice

besides Tine include building advisory, economy, accounting and advisory on planting. Other topics are animal feeding, breeding, animal health, fertilizer planning, plant production, investments in agriculture and environment and cultivation of soil.

Farmers seek for new information and learning through both Tine's advisory service and advisors from other institutions. The initiative for advice on behalf of farmers seems to be related mostly to experienced problems, lack of specific knowledge and when big decisions are to be made.

4.5 Information seeking and learning through social networks

Another channel for information seeking and learning is social networks. One example is so-called 'robot-milking circles', where farmers gather to discuss robotic milking systems and related issues. However, advisors are also often present at the gatherings. The advisor interviewed tell about the gatherings with involvement of advisors: "[…] *they try to make these milking robot circles. Ehm(..)and they are specifically about animal feeding. Because the milking robot is very much about feeding. Ehm(..) so feed advisors join the gatherings often* […]" (Extract 16)

According to the building advisor, Facebook is another channel used by farmers as a communication platform in between them. The advisor himself is not active on Facebook, but other advisors, such as feeding advisors, are more active on Facebook and available for farmer's questions. An example of a Facebook-group is about robotic milking machines, where farmers discuss them and follow-up on each other's use. The farmer interviewed, however, is not a member of any Facebook-groups.

The survey with farmers revealed that 18 farmers use Facebook-groups to get additional advice, and social media in general is commonly used by 20 farmers to get new knowledge and inspiration for their own farming.

According to the advisor interviewed, all farmers are also members of producing cooperatives that exist in each municipality in Norway. Such producing cooperatives use to invite advisors to the gatherings. The advisor explains:

"[…] all these municipalities have (..) all milk producers have their producing cooperative, that gather maybe once in a month and talk about cowsheds and feeding and such things, and the cooperatives use to hire us [advisors] to have such representations of what we work with. Or talk about what is currently new now [in agriculture]. " (Extract 17)

Similarly, the farmer interviewed tells about a usual gathering in his producing cooperative: *"The milk producers have a team in Soknedal producing cooperative and we have something that is called "cow coffee" once in a month or every second month where we gather and discuss* […]" (Extract 18)

Producing cooperatives is a channel mentioned by 2 farmers in the survey. However, 32 farmers informed about that they attend to village gatherings to get additional advice, and 28 farmers specifically responded that village gatherings are used to gather new knowledge and inspiration for their operation on the farm.

Moreover, according to the advisor, neighbourhood talk is one of the most active channels for information seeking and learning. The advisor explains the process: *"Producers in between. One mentions that something has happened, and the other starts to ask questions about it. Yes. And then they have a common understanding of what is good or bad [farming-related]."* (Extract 19)

According to the survey, neighbourhood talk is a common channel used by farmers. 40 farmers say that they use their neighbour as an alternative channel for advice regarding their farm, and 33 farmers say that their neighbour is also used for new knowledge gathering and for farming inspiration.

Social networks play an important part among farmers. The networks are used to seek new information and learning, get additional advice and gather inspiration for own farming. Some social networks are digital, while others involve face-to-face gatherings. Advisors take often part in some of the networks.

4.6 Individual information seeking and learning

Information seeking and learning appears also on individual basis, besides advisory service and social networks. The farmer interviewed uses to read physical magazines, which he is subscribed to, in order to continuously get new information. He explains: *"*[…] *I am a fan of*

something tangible, so magazines for example. That agriculture magazine Norsk landbruk og bedre gårdsdrift and those are a great resource." (Extract 20).

The farmer interviewed uses Internet for information seeking as well, but paper-based formats is what he prefer mostly. The farmer explains that a lot of the literature he reads is for possible future use, and several journals are found through Tine's website : "[…] *it is maybe likewise that I read the literature in advance, so maybe two years later, oh yes I have read that, so I can find back to it in cases I need to* […] *Tine has journals online. Various research that is published, so I think this is fine.*" (Extract 21)

Hence, the farmer seems to read much about things that might be relevant in the future, and is not necessarily an issue before he starts to read about it. He confirms: *"Yes, I feel it is much this way yes"*. (Extract 22). Moreover, the farmer is continuously interested to learn more. He states: *"I am always interested to learn new things, so I gladly do it"* (Extract 23).

Based on the survey results with dairy cattle farmers, 4 farmers responded that their information gathering is mostly re-active, meaning that they gather new information to solve a specific problem after the problem has appeared, while 11 farmers responded that their information gathering is mostly pro-active, meaning that they gather new information for possible future use, before problems appear. Moreover, 42 farmers responded that they gather new information actively in both ways. The division of farmers between pro-active and reactive information gathering may be understood as that farmers try to prepare for or prevent future challenges that can appear.

Regarding other used channels for individual information seeking and learning, some survey respondents pointed out Internet/websites, Pinterest and YouTube. Regarding channels used specifically for individual knowledge gathering and inspiration for the farming, 35 respondents mentioned web search, while almost everyone mentioned magazines or journals.

Seeking for new information and learning seem to happen not least individually, where many farmers gather new information pro-actively for future use, besides re-actively. Agricultural magazines and journals seem to be a great source for inspiration for almost all respondents, besides simple web search.

4.7 Preserved buildings and innovation

An interesting insight from the interviews with the farmer and advisor is regarding preserved buildings on the farm. More specially, it is not even only buildings, but the whole farm yard that is often preserved. As earlier explained, the farmer is in a process of building a new cowshed besides the current one, because the current is preserved. The farmer explains the difficulty of having preserved buildings:

"[…] *earlier, people thought that it was the buildings themselves that were preserved* […] *But it is not like this anymore. It is the farm yard.* […] *So everything you see from Rørosveien now is preserved, so I have to build the new cowshed in a way that will not view it from the other way* […] *Yes it is difficult.*" (Extract 24)

The farmer cannot modify the architecture of the existing preserved cowshed, and the cowshed is used up as a livestock space. The farmer explains that since it cannot be used as a cowshed any more, he has to figure out how to use it further, such as for example renting it out, because as long as it is placed on the farm, it is an expense. Not least, it is the farmer who is responsible for maintenance of the preserved building on the farm. However, the farmer informs about that it is possible to apply for specific funded projects related to livestock in preserved buildings:*"[…] I can apply for special projects if there is something for the animals regarding ordinary maintenance because it is preserved. Such as the roof* […] *it is very bad [old]*[…] *so directorate for cultural heritage can probably come with some kroner* […] *but yet there is a large own fee.*" (Extract 25)

Furthermore, the positioning and the look of the new cowshed depends on the preserved buildings, since the whole farm yard is preserved. The farmer explains the challenge: *"*[…] *there are a lot of difficulties regarding the positioning* […] *it is planned to have a grey colour [on the new cowshed], because it cannot be red because it cannot compete with existing buildings here.*" (Extract 26)

According to the farmer, preserved buildings and old history have both advantages and disadvantages with relation to innovation and changes on the farm:

"[...] *if you view innovation regarding agricultural development, it is a big challenge. It is hopeless to achieve good innovation and development of the farm like it is there, but at the same time if you view it from a different perspective such as development of the farm as a working place, it may give other opportunities such as for example with green care and such*

things in preserved building structure. […] *So it is how one chooses to view it.*[…] *Very nice living space, but economic and regarding agricultural development it is a big challenge.*" (Extract 27)

The survey results showed that most of the respondents' farms are quite old. Most of the farms are a couple of hundred years old, while others are several hundred years old and even up to a couple of thousand years old. However, only 6 farmers, that answered the survey, have preserved buildings on their farm. Such buildings are both cowsheds and other types of buildings. None of the 6 respondents mentioned directly any challenges regarding having a preserved building on their farm. It does not necessarily mean that there are no challenges in having a preserved building on the farm, but it might mean that it is not one of the biggest challenges related to innovation and changes on the farms.

4.8 Routines in the cowshed

There are special routines in the cowshed on the farms. The advisor interviewed describes how the robotic milking system works in the cowshed:

"[…] *The cow decides when she wants to be milked* […] *So she stand in front of the box and wonders if she should go inside or not. [The incentive to go inside is] concentrated feed.* […] *They get a little piece of sugar in there* […] *And afterwards, there are no problems […] when they have been there before"* (Extract 28).

However, cows are very much based on routines. The advisor tells a story about what happened when routines in a cowshed were changed:

"They [cows] are very based on routines […] *I have experiences a case where we had to turn around the milking robot (.2) so one had to go inside the box with the robot from another side. Total chaos. Nobody [cows] understood anything ((Laughs)) No. Had to start to teach them again. They could not understand."* (Extract 29)

According to the advisor, it is very costly to change the routines in the cowshed, especially related to implementation of robotic milking system and loose housing:

"If you change a routine in a cowshed(..) they [cows] will be confused. And the weird thing is that it is the behaviour you loose money on. So you cannot change anything. You have to leave it as it is […]So when you go from booths to loose housing and milking robots, you think oh this is a huge improvement, but often in this situation, you have to expect behaviour challenges and have to kind of build them up again" (Extract 30)

Furthermore, similar challenges occur when a farmer increases the number of cows. The advisor explains the hierarchy related challenges:

"[…] *often in a situation, you add another animal flock* […] *and they are going to decide who is the strongest. So they have a fight the first week. Yes.* […] *The hierarchy have to be decided. So there is a lot of fight in there.* […] *When the pattern is decided, it is decided. Some are lowest, other highest. If one dies, another takes the place, and after a while a new one comes.*" (Extract 31)

Hence, routines in a cowshed is a challenge with relation to changes in the farm, and the challenge involves both the environment on the farm among cows, confusion and monetary aspects. The survey with farmers did not inform about the routines in the cowshed and the challenges, but it does not mean that the challenges are not present on their farm as well.

4.9 Economy and funding

Economy is also a great challenge in farming. According to the advisor interviewed, the capacity to innovate on the farms is restricted by economic issues. He explains:

"Restricted in kroner and ører (.3) I mean, you know, agriculture is restricted when it comes to investment in capital. (..) they [farmers] do not have good affordance.[…] *It is certain, if you are going to invest in something innovative on the farm, you need capital, and farmers do not have it in these regard.* […] *everything cost money. (.2) So this is what often stops the farmer. He cannot afford it.*" (Extract 32)

The farmer interviewed also views the economy in the farming as a challenge:

"[…] *It is somewhat difficult. I mean, as long as you don't have too many loans, it is not bad being a farmer, men when you start to take loans and keep up with the time it is bad economy. It happens now when I am taking the step and start to invest so the margins are small (.2) because now I am going to triple the production when I am done with the new cowshed, and then it is almost possible to get the same salary that I have today, so it is like, you plan 30 years forward in time and it is not possible to get one extra krone."* (Extract 33)

According to the conducted survey, 23 farmers view their economy as a challenge regarding changes on the farm. When asked what challenges farmers experience during changes on the farm, many farmers included economy in their response: [3]: "*The most difficult thing is uncertainty in future economy*", [8]: "*Challenges in change is that investments come before return, and with it the company is under pressure in a period of time*.", [10]: "*To keep the budget related to building extensions, improve profitability in the daily operation.*", [34]: "*Heavy workload and uncertainty of economy.*", [41]: "*Little economic freedom*", [42]: "*Economic: uncertainty with future conditions*", [47]: "*To have enough economy to finalize initiatives*", [48]: "*Bigger and bigger debt*", [50]: "*Liquidity, it takes long time from cost*

increase to the income regarding extended production". Moreover, according to the survey, even more farmers – 34 individuals – state that they view economy as a factor that directly hinders development of new ideas.

According to the interview with the farmer, it is possible to get subsidies, but it is not much. He states: "*Yes, but it is so little when the projects are big.* […] *Innovation Norway gives 1 million in direct support, but the project now has passed 10 million. It is only 10 percent.*"(Extract 34)

Survey respondents were also asked about funding for projects on their farms, and results show that 39 farmers have applied for or already received funding, while 18 farmers state that they have not applied for or received any funding for projects at their farms. Projects that farmers want(ed) to get funded are mostly related to buildings on the farm, cowshed modifications and implementation of robotic milking systems. Funding institutions that farmers have applied to or received funding from include mostly Innovation Norway, which was mentioned by 20 farmers, but also local banks and local authorities. One farmer, who has not applied for or received any funding state the challenge he experiences with funding: [5]: "*Because it is nonsense. And the costs with operation plans and other things get unnecessarily expensive*".

Economy is clearly a challenging factor related to changes on the farms, and many farmers have applied for and received funding for big projects on their farms, even though several farmers view the funding as limited.

4.10 Government regulations

The interviews with the farmer and advisor involved interesting reflections about the role of government regulations in the context of changes on the farms. The advisor interviewed tells about the changed milk quota increase in context of governmental regulations:

" […] *when Listhaug was minister of agriculture (..) she changed the regulation for how much milk you could produce as one producer.* […] *the rules were that as single producer, you could produce max 450 tons milk (..) in a year. That was the quota you had, max quota. But then Sylvi ((minister of agriculture)) came into the picture, and changes the rules (..) she changed it to 900 tons*" (Extract 35)

According to the advisor, the changed quota made farmers think bigger:

"[…] *it made farmers think different. Bigger. And when farmers start to think bigger, we see less value in the [existing] buildings.* […] *they become simply too small. And it is certain, the*

more cows you have the more young animals you have. Bigger recruitment you have, and it is also related (..) to the production base that is called house. Yes (.2) […]" (Extract 36)

Regarding the changed milk production quota from the perspective of the farmer interviewed, he explains: "*[…] when I bought here there was 71 tons in milking quota, but now I have 196 tons* […] *now I have to triple almost the production per booth space compared to what was previously.*" (Extract 37). When asked why he says he has to do it, he explains: *"Well, it is the production capacity I have, and you would like to make it up to it (.2) the capacity (.1) the limit you have*" (Extract 38). However, when asked whether or not this has to do with getting best profit out of it, he says: "*Yes*".

Furthermore, a new regulation states that all cowsheds have to implement loose housing of cows, and many farmers are thus in the process of implementing it. The advisor informs: *"Yes, we are in the process of changing this now. This is why my planning list is so long::[…] I mean, all cows are going over to loose housing in 2024*" (Extract 39).

According to the survey, several farmers point out that government is one of the factors that contribute to appearance of new thinking and new ideas on farm-level. When asked what the drivers are to new thinking and ideas, several farmers involved government regulations in their response: [9]: "*Increase of the quota*", [27][45][49]: "*New requirements. For example Løsdriftskravet 2024 [Loose housing]*", [27]: "*New ideas come from the society around us, like agricultural policies[…]*", [54]: "*Future scenario for behaviour in the market for our products and political decisions*".

Governmental regulations clearly have an impact on the farms. Besides regulation changes that have to be implemented by all farmers, such as loose housing, the outcome is that farmers think bigger and act accordingly, such as with increased milking quota that is not a requirement.

5 Discussion

This chapter reflects upon previously presented results and analysis in light of existing literature and other researchers' findings on the same topic, both Norwegian and on global basis. This chapter is structured based on the six aspects from the study questions, which are directly related to the research question: 1) types of ideas and innovations present on farms, 2) sources of new ideas, 3) development of new ideas, 4) actors involved in the innovation process, 5) obstacles to innovation on farms and 6) drivers to innovation on farms. Each aspect is discussed separately in the following sub-chapters.

5.1 Types of ideas and innovations present on farms

Findings from the conducted research show that there are many different new ideas and innovations present on Norwegian farms. Many farmers are quite creative and motivated to improve their farming processes and further develop their farm (Section 4.1 & 4.2). Most of the new ideas are already realized into innovations, while few are still ideas and potential new innovations (prototypes). Some ideas and innovations are small and cost little, while others are big and costly.

Ideas expressed by farmers and innovation in use on farms in the conducted study can be categorized based on product and process innovations. Product innovations, which are related to additional entrepreneurial activity besides dairy farming, involve rare potato varieties, chickens, ice cream, beer, grain, sheep, apple production, wool and leather, new types of concentrated feed, new milk types, sale of farm food including meat and dairy products, forestry and wood heating constructions for biofuel. In addition, one farmer has an idea about starting with cheese production (Section 4.2).

Technological product innovations are also present among findings in the conducted study. There are robotic milking systems, bigger or renewed machines and other tools and equipment. Many farmers modernize their farms by implementing new machinery in the production process, which often also results in increase in number of cows and amount of milk production quota (Section 4.1 & 4.2). Findings about technological innovations are partly in line with the

study carried out by Hansen (2015), who investigated innovation diffusion and high adoption of robot milking systems on farms in Norway.

Regarding process innovation, farmers improve their farming through simplification of working methods, rationalization and intensification of production (Section 4.1). Farmers experiment based on new knowledge and learning. Process aspects are closely related to technological product innovations and the new machinery that contribute to new production methods. These aspects are in line with Läpple et.al. (2014) and their research in Ireland, where innovation involved innovation adoption, acquisition of knowledge and continuous innovation, such as renewed machinery. It is also in line with research carried out in Australia by McKenzie (2013), where farmers carried out independent testing and trialling on their farms, and thus, learned from the experimentation in order to improve farming and solve problems.

Moreover, there are ideas on smart solutions that farmers try to realize for less costs, such as self-made low-cost concentrated feed silos that one farmer built (Section 4.1). Other ideas involve using resources available on the farm to reduce costs, such as building own cowsheds out of forest on the farm (Section 4.1). There are also building related modifications on the farms. Some build brand new cowsheds, while others modify existing ones. Farmers further develop their farm, expand farming area and create new landscape (Section 4.2). According to McKenzie (2013) and research in Australia, farmers also redesign their farms. This is partly in line with modifications of the farms found in conducted research, but which are not directly related to redesign based on experimentation, which was found in research carried out by McKenzie (2013).

According to Knickel et.al (2009), innovation in the context of farming goes beyond technology and involves strategy, marketing, organization, management and design. Results from the conducted research shows exactly the aspects beyond technological innovation, such as strategic and operational including processes and products. Moreover, according to van der Veen (2010), farmers are both adopting new technologies and inventions and adapting to existing innovations and changes. Findings in the conducted research show both adoption of new technologies and inventions on farms (i.e. concentrated feed silos and ideas about starting with cheese production, which is new to the farm) and adaption of existing innovations and changes (i.e. implementation of milking robots on the farm).

Findings in the conducted research are also partly in line with research done by van der Veen (2010) regarding that innovative farming is mostly concerned with increase of production and quality enhancement. Moreover, similarities are found based on that innovative farming involves crops, animals, growing conditions, implements (i.e. machinery, equipment) and management practices.

5.2 Sources of new ideas

There are a range of sources of new ideas on farm-level. Even though it is hard to know where exactly ideas come from, there are still sources that contribute to various extents (Section 4.4, 4.5, 4.6 & 4.10). They include first of all, farmers themselves, involving farmer-driven experimentation and ideation, which is related to user-driven innovation concept (Franke, 2013). There is a lot of individual information seeking, learning and inspiration present, and related sources involve physical magazines and journals that many farmers subscribe to, Internet and web search, which almost all farmers use, and Pinterest and YouTube, which was mentioned by one farmer (Section 4.6). Based on results, few farmers state that they seek information re-actively (to solve a problem), and more farmers state that they seek new information pro-actively (for probable future use); while most of the farmers state that they seek information both ways (Section 4.6). This means that farmers seek information more pro-actively to get inspired and to be prepared, than re-actively to solve appeared problems. The findings are similar to research findings in Australia, carried out by McKenzie (2013), where farmers were very much dependent on themselves and individual, pro-active information seeking.

Tine's advisory service and other advisory services available to farmers is another source of new ideas (Section 4.4). All farmers in the conducted research receive advice at least from Tine's advisors, where all kinds of ideas are discussed and further developed. As confirmed by Hansen (2014), farmers that receive advice through Tine's advisory service learn to improve their problem solving abilities, which further improved their financial performance. He further states that farmers become more pro-active, based on the knowledge they have and acquire (Hansen, 2014).

Third source of new ideas is government and governmental regulations (Section 4.10). Farmers are not only required to think different and make changes on the farms, but regulations inspire

farmers to think bigger based on opportunities that derive from regulations (Section 4.10). There is lack of existing research that outlines same findings about the governmental regulations as a source to new ideas on farm-level.

Furthermore, social networks is also a source of new ideas used to seek new information, learning and inspiration both digitally and face-to-face (Section 4.5). Among social networks sources are robotic milking circles between farmers, where advisor often are present, Facebook groups of farmers, where some advisors also are available, producing cooperatives in each municipality in Norway, who also use to invite advisors, village gatherings between farmers and neighbourhood talk used to gather information, share advice and get inspiration (Section 4.5). According to McKenzie (2013), farmers in Australia use their social networks as sources as well, involving participation in farmer groups.

As pointed out by World Bank (2007), the environment plays an important role regarding innovation, and this is visible through the sources of new ideas present on farm-level (Section 4.4, 4.5, 4.6 & 4.10). Moreover, according to Astad (2014), innovation is a social process involving interaction and learning between several actors, and depends highly on knowledge transfer between both internal and external actors in the network, which is line with findings in the conducted research.

5.3 Development of new ideas

Results in the conducted research show interesting insights about how ideas develop through interaction with advisors from Tine's advisory service (Section 4.3 & 4.4). When farmers build a new cowshed, farmers and advisors meet to plan and discuss changes. They have close contact and have several advisory sessions both on the farm and through virtual technology in order to finalize the planning, drawings and discussions. Farmers seem to have an idea of what they want to build, and take contact with advisors to discuss the ideas and further develop them.

Quite often, farmers contact advisors when they are going to do something unusual on their farm (i.e. building a new cowshed), because they lack relevant knowledge, or when big decisions are to be made, that have significant economic or structural outcomes. Experienced problems that farmers need help with is also often a motivation for seeking advice from advisors (Section 4.4).

According to the advisor interviewed, he uses a specific technique in development of ideas in his advisory sessions - he puts new or changed ideas in the farmer's mouth, in order to get the farmer to think reflect upon aspects of new ideas or change his mind about ideas that are not good from advisor's perspective (Section 4.3). Hence, it seems like the advisor tries to make the farmers think themselves and propose new ideas themselves, even though many proposals originally seem to come from the advisor.

Existing literature lacks research contribution on how ideas develop, not only between farmers and advisors, but also involving farmers in general. Thus, there is no research that can either support or deny findings from the conducted research.

5.4 Actors involved in the innovation process

Findings in the conducted study inform about many different actors involved in the innovation processes on farm-level (See chapter 4), and they are expressed in *Figure 2*.

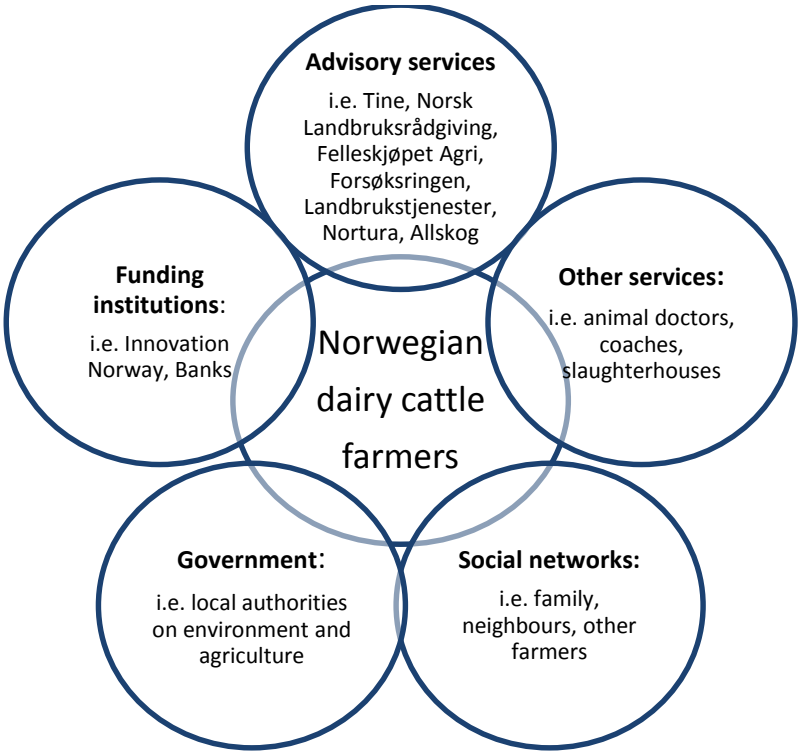

Figure 2: *Actors involved in the innovation processes on farms*

Besides Tine's advisory service, many farmers are in contact with advisors from Norsk Landbruksrådgiving, Felleskjøpet Agri, Forsøksringen, Landbrukstjenester, Nortura and Allskog. Most popular topics for advice are related to building, economy, accounting and advice

about plants. Moreover, farmers are also in contact with local authorities on environment and agriculture, advisors from banks, animal doctors, coaches and slaughterhouses (Section 4.4). Innovation Norway is another actor actively involved in the process regarding funding (Section 4.9), in addition to the government (Section 4.10). Most of the projects that farmers apply funding for seem to be related to buildings on the farms. As earlier mentioned regarding sources of new ideas, actors in farmers' social networks take also part in the innovation process, and include family, neighbors and other farmers (Section 4.5).

Partly similar actors can be found based on reflections by Kjølseth and Pettersen (2012), where actors involved in the whole network are research institutions, suppliers of technology and equipment, advisory services, subject specialists, primary producers and customers. The various actors have different types of knowledge that are shared between them (Kjølseth & Pettersen, 2012). Moreover, Stræte (2014) also confirms advisory services and alternative channels as involved actors that groups of farmers seek to new knowledge from during the process.

The findings are again partly in line with the research in Australia by McKenzie (2013), where advisors and other farmers take part in the innovation process on farm-level. Moreover, as pointed out by McKenzie (2013), innovation is not only a result of research, but also a result based on creation of knowledge and exchange of knowledge through interaction with other actors in farmers' networks. As stated by Fagerberg (2009), firms (which involve farms that are owned by the farmers) do not innovate in isolation, but based on interaction with the environment. This is strongly supported in the conducted research.

5.5 Obstacles to innovation on farms

Results from the conducting research show that preserved buildings on the farms may hinder innovation, even though only few farmers informed about preserved buildings on their farm and only one farmer elaborated on the challenges of having preserved buildings (Section 4.7). Preserved buildings may be an obstacle to innovation, because the architecture of the building cannot be modified. If the preserved building is a cowshed and it is used up as a livestock, there is a challenge. The farmer is also the one responsible for maintaining the preserved buildings on the farm. However, it is possible to get funding for livestock specific projects, but not much.

Any modifications to the farm have to fit the preserved building (i.e. building colours, place of new buildings) (Section 4.7).

Routines in the cowshed is another obstacle to innovation on the farm (Section 4.8). Cows are based on routines, and if something changes in the cowshed, cows need time to adapt to the new changes, which makes confusion among cows and affect farming, productivity and economy. Moreover, if amount of the cows are increased, it may also make some challenges, because there is a hierarchy among cows. The cowshed can be damaged, because cows will most certainly fight. Hence, routines in a cowshed seem to be a challenge with relation to changes on the farms, and the challenge involves both the environment on the farm among cows, longer adaption to changes and monetary aspects (Section 4.8).

An obstacle to innovation on farm-level is also economy, for most of the farmers in the conducted research (Section 4.9). As pointed out by the advisor interviewed, the capacity to innovate is very much restricted by economic issues, and economical issues is what most often stops the farmer to pursue on big ideas and changes. However, many farmers have applied for and received funding for big projects on their farms, but it does not seem to be enough help, because it is still expensive to implement big innovations, even with the funding (Section 4.9).

The findings on economic issues are in line with the study made by van der Veen (2010), who states that it is easier to adopt simple innovations that require little capital and labour investment, than adopting complex innovations that require heavy capital and labour. Famers in the conducted study innovate both big and small (Section 4.1 & 4.2), but economy is an obstacle.

Unlike the findings in the conducted research, according to World Bank (2007), main aspects that may hinder innovation are attitudes and practices of actors involved in the process and weak or lack of interaction between actors, which may hinder important knowledge transfer for innovation. It does not necessarily mean that these are not obstacles to innovation on Norwegian farms, but it may be that it is not what research informants clearly reflect upon and consider as a hinder to innovation from their perspective.

Moreover, according to Läpple et.al. (2014), it was found that farmer age had a negative effect on innovation, because older farmers invest less in innovations due to a shorter time horizon, while younger farmers are more risk-takers. Conducted research findings do not involve direct

study of farmer age related to innovation, and it is hence unknown whether age is an obstacle to innovation on Norwegian farms.

Stræte (2014), in his research on needs and challenges between farmers and advisors point out that some aspects of advisory service seem to be challenging from farmers' perspective. Some of the challenges involve skills and capacity of advisory that do not cover all topics needed to provide specialized expertise to farmers, and an indication point at competition between advisors that result in barriers, which make farmers seek for advice through other channels. Results in the conducted research did not involve significantly negative aspects of advisory services and advisory was not viewed as an obstacle to innovation – rather a driver (Section 4.4). Reason for this could be that advisory services do not hinder innovation for informants in the study or that it is not significant enough to play an important role from the farmers' perspective.

5.6 Drivers to innovation on farms

Based on the results from conducted research, good economy is clearly one of the factors that drive innovation activities on the farms. Bad capital is often what stops farmers from pursuing with new ideas and innovations, because of the costs (Section 4.9). Similar findings are pointed out by Kjølseth and Pettersen (2012), where one of the most important motivations for innovation is assumed to be beneficial personal economy. Similarly, according to Läpple et. al. (2014), access to credit had a positive effect on innovation in their research.

Funding seems also to be a driver to some extent (Section 4.9). Many farmers search for and receive funding to fund big projects on the farms. However, as pointed out by several farmers, even though projects are big, the funding is still limited and makes it costly anyways, but it helps to some extent (Section 4.9). Kjølseth and Pettersen (2012) confirm that project funding, mostly from Innovation Norway, has contributed to innovation through funding of big projects on farms.

Governmental regulations seem also to be the drivers to innovation, according to farmers (Section 4.10). Governmental regulations are drivers especially to building activities, modification of buildings and milk quota increase on farms. Besides regulation changes that have to be implemented by all farmers, such as loose housing, many farmers seem to think bigger and act accordingly. Thus, government have an impact on the farms, both direct and

indirect (Section 4.10). These findings are in line with Melberg (2003), who state that governmental funding opportunities seem to play the role as a driver for creation and further development of farms.

Involvement in Tine's advisory service and advisory outside Tine is another factor that drive innovation on farms. This is shown especially regarding big decisions, problems and lack of specific knowledge on farms that make farmers approach advisors to make decisions and pursue on innovative ideas and big changes on the farms (Section 4.4). The same role seem to also be played by social networks to some extent, involving mostly other farmers, in addition to advisors, who are often involved in many of farmers' social networks (Section 4.5). The results are in line with Melberg (2003), where advisory, family and support from other individuals play the role as drivers to innovation. The results are also in line with Stræte (2007), where Tine is seen as an innovation driver and the most important actor in the national system of innovation in Norway. The findings are also in line with Kjølseth & Pettersen (2012), where it is stated that knowledge and knowledge exchange between actors is seen as an important factor closely related to innovation.

Not least, farmers themselves are drivers to innovation on their own farms. This is shown especially through individual information seeking and pro-active behaviour in addition to re-active (Section 4.6). Many farmers are creative and have new ideas, experiment and seem to be quite motivated in their own farming (Section 4.1, 4.2 & 4.6). This is in line with van der Veen et. al. (2010), where the reasons for change in agriculture are related not only to external factors, but also internal, such as personal incentives for change, which are more significant than external. The results about the farmers as drivers are also in line with Hansen (2015), where results showed that to successfully adopt and implement robotic milking systems, farmers need to be motivated, pro-active and have ability to adapt to new technology specific to their needs. Similar findings are informed by Melberg (2003), where personal qualities, such as belief in an entrepreneurial idea and belief in successful outcomes, are drivers of entrepreneurial activities. It is also pointed out that farmers that establish new entrepreneurial activities are motivated by a more interesting daily life on the farm (Melberg, 2003).

According to McKenzie (2013), there are seven strategies that help farmers in Australia to innovate on their farms: observing signals from the landscape, independent testing and trialling, property redesign, increasing system flexibility, paying for independent advice, participating in farmer groups and actively seeking information. Hence, the seven aspects seem to play the role

as drivers to innovation, where advisory, farmer groups and active information seeking is in line with results from conducted research regarding drivers to innovation (Section 4.4, 4.5 & 4.6).

Moreover, Läpple et. al. (2014) found also farm size, marriage and completed agricultural education to be drivers to innovation, which was not the case in the conducted study. Education, farm size and marriage were not directly studied in the conducted research regarding innovation drivers, and no farmers mentioned the aspects as direct drivers to innovation. It does not mean that the aspects do not affect farmers' innovation in Norway, but farmers do not express significant point of view of the aspects as direct drivers to innovation.

6 Conclusion

The aim of this research was to get an insight into the innovation processes on dairy cattle farms, as one part of the bigger system of innovation in Norway. The research question in focus was: How do Norwegian farmers innovate on dairy cattle farms while receiving advice from Tine's advisory services?

In order to answer the research question, six aspects of the process of innovation were in focus through six developed study questions:

1) What types of ideas and innovations occur on farms?
2) Where do new ideas come from?
3) How do new ideas develop?
4) Who are the actors involved in the innovation process?
5) What are the obstacles to innovation on farms?
6) What are the drivers to innovation on farms?

The six aspects are important components of the innovation processes that has to be explored in order to get the full picture of innovation processes on farm-level. The exploration of combination of the six components, from the innovation system perspective on micro-level, have not yet been studied in previous research in Norway and on global basis in the context of agriculture. Existing literature has only explored some of the aspects, such as focus on only obstacles and drivers to innovation or focus on specific innovation types (i.e. technological innovation), which does not give a full picture of innovation in agriculture.

According to the findings in the conducted research, there are many different ideas and innovation on Norwegian farms. Many farmers seem to be quite creative and experiment on their farm. Innovations on the farms include mostly product and process innovation and relate to production besides traditional dairy cattle farming (entrepreneurial activities) and the way they operate on the farm (i.e. new equipment, robotic milking system). Existing research on innovation in agriculture involve more focus on technological innovations, while farmers have ideas about and implement innovations beyond only technology.

New ideas and new thinking on farms come from interaction with advisors and individuals in their social networks involving family members, neighbours and other farmers. Farmers'

ideation and innovation is also based on their own initiative, through Internet searches, journals and magazines. Government plays also an important role by making many farmers think bigger and more creative through changes in regulations, besides requirements that farmers have to follow.

Development of new ideas is closely related to Tine's advisory services, which farmers are often in contact with regarding their daily farming. Farmers ask for advice mostly when they experience problems that they have little knowledge about and when they need to make big decisions that will make a significant economic or structural impact on the farm. Hence, advisors play an important role in the development of new ideas on the farms.

Innovation processes on the farms involve many different actors. Besides Tine's advisory services, farmers are directly in contact with other advisory services, family, neighbours and farmer in social networks, local authorities on environment and agriculture, funding-related actors, such as Innovation Norway and banks, and other services, such as animal doctors, coaches and slaughterhouses.

There are several obstacles to innovation on farm-level. Preserved buildings hinder reconstruction and modifications of the farm and are costly to maintain. Routines in the cowshed limit modifications and changes of the cowshed, and any changes have an impact on animal environment, longer adaption to new routines and monetary aspects of the farming. Bad economy and little funding is a factor that most often stops the farmer from pursuing on big ideas and make big changes on the farm.

There are several drivers to innovation on farm-level. Good economy make farmers pursue on big ideas and changes. Available funding from Innovation Norway and local banks contributes to some extent to farmers' economy and to realizations of big innovative projects on farms. Governmental regulations drives innovation on farm through not only requirements that farmers have to follow, but also through changes in regulations that make farmers think bigger, such as increase of milk quota. Tine's advisory service directly contributes to innovation on farms by being a close partner in farmers' ideation and decision making. Not least, farmers are also drivers of their innovation on farms through their creativity, pro-active behaviour and farming motivation.

This research has explored and gathered important insights about Norwegian farmers' processes of innovation on farm-level. However, some findings are quite detailed, while others are more general. Some are supported by many informants, while other are supported by few. Finally, some findings are in line with findings from similar previous research, while others have not been explored in existing literature on innovation in (Norwegian) agriculture.

Existing literature could benefit from more research on innovation in agriculture, especially on farm-level as part of a great system of innovation. This research has focused on the qualitative aspects of innovation processes on farms, but the literature could benefit from a more quantitative research in Norway on the same aspects to establish a more representative understanding of innovation processes, farmers' experiences and practices and what aspects are more significant than others. Moreover, similar qualitative research can be carried out in other parts of Norway to establish an understanding of geographical similarities or differences in aspects that take part in farmers' innovation processes. Not least, existing literature could benefit from research that zoom into each of the aspects studied in this research. This way, an even more detailed understanding can be established about the different aspects, which can contribute to the overall understanding of innovation on farm-level and give more detailed implications for improvements both on farm-level and in the overall system of innovation.

To conclude, Norwegian farmers seem to be quite creative and innovative, but they experience a range of challenges in their daily operations related to changes on the farms. In order for farmers to have a greater capacity to innovate and successfully adapt to current and future changes, they need to receive more support. There should be a greater focus on farmers and aspects of their innovation processes. Farmers are not least important in the agricultural system of innovation in Norway, and agricultural actors in the agricultural system of innovation in Norway should focus more on farmers. Innovation system actors should find solutions that allow bigger changes on farms and give farmers more opportunities to innovate, by reducing the challenges and obstacles to successful innovation processes. After all, we are all dependent on a sustainable agriculture.

References

Astad M. S. (2014). *Innovasjon som tilpasningsstrategi til endring i jordbruket. Et case-studium av innovativ kapasitet i grøntnæringen i Lærdal* (Master's thesis, University of Bergen, Norway) Retrieved from: https://bora.uib.no/handle/1956/8313

Brooks, S. & Loevinsohn, M. (2011). *Shaping agricultural innovation systems responsive to food insecurity and climate change.* Natural Resources Forum, Vol.35(3), p.185-200. Retrieved from: http://onlinelibrary.wiley.com/doi/10.1111/j.1477-8947.2011.01396.x/abstract

Dubois, A. & Gadde, L.-E. (2002). *Systematic combining: an abductive approach to case research.* Journal of Business Research, Vol.55 (7) p.553-560. Retrieved from: http://www.sciencedirect.com/science/article/pii/S0148296300001958

Edquist, C. (2009). *Systems of innovation: Perspectives and Challenges*. Fagerberg, J. & Mowery, D. C. (Eds.) *The Oxford Handbook of Innovation*. Oxford University Press. Retrieved from:http://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199286805.001.0001/oxfordhb-9780199286805-e-7

EU SCAR (2013). *Agricultural knowledge and innovation systems towards 2020 – an orientation paper on linking innovation and research*, Brussels.

Fagerberg, J. (2009). *Innovation: A Guide to the Literature*. Fagerberg, J. & Mowery, D. C. (Eds.) *The Oxford Handbook of Innovation*. Oxford University Press. Retrieved from: http://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199286805.001.0001/oxfordhb-9780199286805-e-1

Franke, N. (2013). *User-driven Innovation*. Dodgson, M., Gann, D.M. & Phillips, N. (Eds.) *The Oxford Handbook of Innovation Management.* Oxford University Press. Retrieved from: http://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199694945.001.0001/oxfordhb-9780199694945-e-036

Freeman, C. (1987). *Technology policy and economic performance: lessons from Japan*. Pinter Publishers.

Hansen, B. G. (2014). *Financial extension that challenges farmers' thinking in discussion clubs helps farmers improve their problem solving abilities.* Agricultural Systems, Vol.132, 2015, p.85-92.
Retrieved from: http://www.sciencedirect.com/science/article/pii/S0308521X14001310

Hansen, B. G. (2015). *Robotic milking-farmer experiences and adoption rate in Jæren, Norway*. Journal of Rural Studies, Vol.41, 2015, p.109-117.
Retrieved from: http://www.sciencedirect.com/science/article/pii/S0743016715300164

Hansen, B. G. & Greve, A. (2015). *The role of human and social capital in dairy farming.* Rural Society, Vol.24(2), p.154-176.
Retrieved from: http://www.tandfonline.com/doi/abs/10.1080/10371656.2015.1060718

Henderson, R. M., & Clark, K. B. (1990). *Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms*. Administrative Science Quarterly, Vol.31(1), p.9-30. Retrieved from: http://www.jstor.org/stable/2393549?sid=primo&origin=crossref&seq=1#page_scan_tab_contents

Hermans, F., Stuiver, M, Beers, P.J. & Kok, K. (2012). *The distribution of roles for upscaling and outscaling innovations in agricultural innovation systems*. Agricultural Systems, Vol.115, 2013, p.117-128.
Retrieved from: http://www.sciencedirect.com/science/article/pii/S0308521X12001436

IBM (2016). *IBM Sametime. Features*. Retrieved from: http://www-03.ibm.com/software/products/en/ibmsame

Kjølseth, T., & Pettersen, I. (2012). *Innovasjon i landbruket*. Norsk institutt for landbruksøkonomisk forskning.
Retrieved from: http://nilf.no/publikasjoner/Notater/2012/innovasjon_i_landbruket

Knickel, K., Brunori, G., Rand, S. & Proost, J. (2009). *Towards a Better Conceptual Framework for Innovation Processes in Agriculture and Rural Development: From Linear Models to Systemic Approaches*. The Journal of Agricultural Education and Extension,Vol 15(2), p.131-146.
Retrieved from: http://www.tandfonline.com/doi/abs/10.1080/13892240902909064

Lundvall, B.-Å. (1992). (Ed.) *National systems of innovation: towards a theory of innovation and interactive learning*. Pinter Publishers.

Läpple, D., Renwick, A. & Thorne, F. (2014). *Measuring and understanding the drivers of agricultural innovation: Evidence from Ireland*. Food Policy, Vol.51, 2015, p.1-8.
Retrieved from: http://www.sciencedirect.com/science/article/pii/S0306919214001948

Melberg, K. (2003). *Alternative strategier i norsk landbruk – ny verdiskapning som livsstil på gård?*. Tidsskrift for samfunnsforskning, Vol.44(2), p. 203-233. Universitetsforlaget.
Retrived from: http://www.samfunnsforskning.no/Publikasjoner/Tidsskrifter/Tidsskrift-for-Samfunnsforskning/Tidligere-utgivelser/2003

McKenzie, F. (2013). *Farmer-driven Innovation in New South Wales, Australia*. Australian Geographer, Vol.44(1), p. 81-95.
Retrieved from: http://www.tandfonline.com/doi/abs/10.1080/00049182.2013.765349

Nelson, R. R. (1993). (Ed.) *National innovation systems: a comparative analysis*. Oxford University Press.

Norsk senter for bygdeforskning (2015). *Om Kompetent bonde*. Retrieved from: http://kompetentbonde.no/om-kompetent-bonde/

OECD (2015). *Innovation strategy: Defining innovation.*
Retrieved from: http://www.oecd.org/site/innovationstrategy/defininginnovation.htm

Schilling, M. A. (2010). *Strategic management of technological innovation*. (3rd ed.) McGraw-Hill/Irwin.

Stræte, E. P. (2007). *A system perspective on innovation in the Norwegian dairy industry*. Norsk Geografisk Tidsskrift - Norwegian Journal of Geography. Vol.61(1), p.25-33. Retrieved from: http://www.tandfonline.com/doi/full/10.1080/00291950601174125

Stræte, E. P. (2014). *Rådgiving til bonden - et innspill om behov og utfordringer*. Norsk senter for bygdeforskning, Universitetssenteret Dragvoll, Trondheim.

Sæther, B. (2010). *Agricultural extension services and rural innovation in inner Scandinavia*. Norwegian Journal of Geography. Vol.64(1), p.1-8.
Retrieved from: http://www.tandfonline.com/doi/abs/10.1080/00291950903557647

Tidd, J., & Bessant, J. (2013). *Managing innovation – Integrating technological, market and organizational change.* (5th ed.) Wiley.

TINE (2016*a*). *Om TINE*. Retrieved from: http://www.tine.no/om-tine

TINE (2016*b*). *TINE Rådgiving*. Retrieved from: http://www.tine.no/presserom/om-tine-gruppa/tine-r%C3%A5dgiving

van der Veen, M. (2010). *Agricultural innovation: invention and adoption or change and adaptation?*. World Archaeology, Vol.42(1), p.1-12. Retrieved from: http://www.tandfonline.com/doi/abs/10.1080/00438240903429649#.VyeLgutf204

Wilson, J. (2010). *Essentials of business research: A guide to doing your research project*. SAGE Publications Ltd.

World Bank (2007). *Enhancing agricultural innovation: How to go beyond the strengthening of research systems*. Agriculture and rural development series, Washington, D.C, The World Bank. Retrieved from: http://elibrary.worldbank.org/doi/abs/10.1596/978-0-8213-6741-4

Yin, R. K. (2009). *Case study research: design and methods* (4th ed.) SAGE Publications Inc.

Appendix

Appendix A: Farmer interview guide (semi-structured)

Intervjuguide Bonde

Spørsmål til intervjuguide (semi-strukturert intervju):

- ***Forhold ved produsent & gårdsbruket***
  - Navn:
  - Alder:
  - Familie:
  - Størrelse: Årsverk/antall dyr/areal
  - Økonomi i drifta: Hva synes du om økonomien?
  - Hvor lenge har du drevet denne gården:
  - Odel eller kjøp:
  - Utdanning/bakgrunn:
  - Hvorfor ønsket du å satser på gårdsdrift og geiter:
  - Andre produksjoner på gården:

- ***Konkret om rådgiver***
  - Hvor mange møter har du hatt med rådgiveren (ca.)?
  - Hvor lenge har du kjent /jobbet med rådgiveren?
  - Hvilke andre rådgivere bruker du? I Tine ; utenom?
  - Hvordan skiller denne rådgiveren (KH) seg fra andre rådgivere du har hatt?
  - I hvilke situasjoner ber du om veiledning?
  - Hvem tar initiativet til veiledning? du; veileder; på andre måter?
  - Hvordan har du opplevd møtene med rådgiveren (kommunikasjon etc.)?
  - Kunne du tenkt deg at rådgiver formidlet kunnskapen på en annen måte?
  - Utfordrer rådgiver deg? Positiv/negativ effekt?
  - Føler du at du og rådgiver har felles interesser av samarbeidet?
  - Har du tillit til rådgiver, forklar?

- ***Samtalen/møtet (Interaksjon og kommunikasjon)***
  - Hvordan forberedte du deg til møtet?
  - Hva ønsket du å få ut av dette konkrete møtet?
  - Hvis du ønsket et bekreftelse på tidligere antagelser du hadde, hvor viktig var det for deg å få en endelig bekreftelse på det du antok på forhånd?
  - Hvordan forløp møtet seg? (Strukturert/planer videre/ansvarsfordeling?)
  - Synes du at rådgiver var godt forberedt? Hvis nei, hvorfor ikke. Hvis Ja, på hvilken måte?
  - I hvilken grad følte du at du hadde innvirkning på selve veiledningsprosessen? (hvem satte agendaen?)

- Hvilket utbytte hadde du av veiledningen (for eksempel lærte du noe nytt; eller anvendte det du ble fortalt i etterkant av møtet)
- Ble dine forventninger til møtet innfridd? Fikk du diskutert det du ønsket å ta opp, og er du fornøyd med veiledningen/rådgivningen du fikk?
- Hva bidro du med i samtalen? Når du ser tilbake, kunne du ha gjort noe annerledes under møtene?
- Ble du motivert av å snakke med veileder, beskriv?
- Har møtet ført til noen konkrete endringer i drifta?
    - For eksempel vil du følge opp finansieringsplanene (budsjett, osv) dere ble enige om? Hvis nei, hvorfor ikke?
- Var noe av det veileder snakket om vanskelig å forstå? Gi eksempler
- Var det noe som du ikke kunne ta opp der og da eller som du for eksempel tenkte på i etterkant?
- Var dere uenige om noe under møtet? Hvis ja, ble det løst? på hvilken måte? Hvis ikke, har det vært noe uenighet mellom deg og veileder etter møtet?

- ***Rådgivingsprosessen / eksempler***
    - Her leter vi etter 2-3 historier (konkrete hendelser) som du kan fortelle om, som du husker spesielt godt, på ”godt” og ”vondt”
    - Gi et eksempel (ikke nødvendigvis bare for dette møtet) der du følte at veiledningen var vellykket
    - Gi et eksempel (ikke nødvendigvis bare dette møtet) der du følte at veiledningen ikke var vellykket

- ***Alternative kanaler for rådgiving***
    - Bruker du alternative kanaler for rådgivning?
        - I så fall, hvilke? (i.e. nabobonden, bygdemøter, web, annet)
    - Hvordan skaffer du deg fagligkunnskap til bruk i den daglige i drifta?
        - Navnet på relevante fagblad; søkemotorer; internettsteder, osv.
        - Finner du det du søker etter
        - Hvilke kriterier bruke du for å vite at du har nok informasjon?
        - Hvor ofte gjør du slike søk?

- ***Det sosiale nettverket du er en del av***
    - Nøste opp det sosiale nettverket omkring bonden, i konsentriske sikler fra nære relasjoner til mer perifere, og be dem (eller oss) tegne en skisse av en slikt sosiale nettverk
    - Rådgiverens plass i dette nettverket, nært eller fjernere

- ***IKT***
    - Hva slags IKT bruker du på gården og hvordan?
    - Andre virtuelt forum enn Same-time (IBM), for fjernrådgivning
    - Kune du være interessert i å lære om andre typer verktøy til bruk i gårdsdriften eller i kommunikasjon med rådgiver og andre som du benytter for å få nødvendig informasjon
    - Er avstand et problem for veiledningen?

- Hva synes du om fjernrådgivning sammenlignet med gårdsbesøket, tatt i betrakting hyppigheten på møtene

- ***Innovasjon***
  - I hvilken grad ser du på deg selv som en innovativ bonde? Hvorfor?
  - Hvor kommer nye ideer fra med hensyn til gården og gårdsdriften?
  - Hva slags type ideer gjelder det? (i.e. om produkter, redskaper, prosesser, kunnskap)
  - Gi noen spesifikke eksempler?
  - Eksempler på innovasjon på gården initiert av deg selv?
  - Eksempler på innovasjon på gården initiert av rådgiveren?
  - Hva er de største endringene som har vært på gården det siste året?
  - Hvor høy innovasjonskapasitet anser du at gården har (basert på all driften hittil)? Hvorfor?

Appendix B: Advisor interview guide (semi-structured)

Spørsmål til intervjuguide (semi-strukturert intervju)

- **Om rådgiver**
  - Navn
  - Alder
  - Utdanning / erfaring fra gårdsarbeid
  - Hvor lenge jobbet som rådgiver i Tine
  - Hvor mange bønder har du rådgitt (ca. tall)
  - Fortell litt om hvordan Tine rådgiving lokalt jobber?

- **Rådgiveren**
  - Hvordan blir man en rådgiver? Hva kreves av utdanning. I hvilken grad kjenner rådgiveren bondeyrket?
  - Hvordan utvikler du deg faglig som rådgiver?
  - Er det noe du savner med den utdanning og bakgrunnen du har?
  - Hva er spesielt utfordrende med rådgiverrollen? (For eksempel kjemi, kanaler for rådgiving, rådgiverbesøk, rådgiver rollen, alternative kanaler å få info på?)
  - Hvordan oppfatter du din rolle som veileder?
  - Hva er viktig for å skape en god relasjon med bonden?

- **Kjennskap til bonde fra før**
  - Kjenner personen fra før, i så fall på hvilken basis, hvordan osv.?
  - Hvorfor ville bonde benytte seg av denne rådgivertjenesten?
  - Hvordan vil du beskrive bonden? Engasjert/motivert/stemningsleie, osv.
  - Føler du at bonden er aktiv i andre nettverk, dvs. får informasjon fra andre kanaler?
  - Føler du at bonden er aktiv i bruk av IKT for å skaffe seg kunnskap?
  - Skiller denne bonden seg fra andre bønder du har jobbet med?

- **Rådgivningsprosessen**
  - Fortell om en gang du følte at du lykkes med veiledningen
  - Fortell om en gang du følte at du ikke lykkes med veiledningen
  - I hvilke situasjoner etterspør bonden veiledning?
  - I hvilke situasjoner synes du bonden har behov for veiledning? Og hva gjør du da?
  - Hvordan synes du rådgivningen fungerer i dag?
  - Hva er det som er utfordrende med rådgivningen?
  - Hvordan blir din innsats i rådgiverrollen vurdert, i så fall hvordan?
  - Hva slags tilbakemelding kunne du ha ønsket deg fra leder/distriktssjef/bonden?
  - Er du med i et nettverk av andre rådgivere?
  - Hvilke kanaler benyttes til interaksjonen i disse nettverkene?
  - Benytter du noen ganger fjernrådgivning til gruppeveiledning? I så fall hvordan foregår gruppeveiledning?
  - Drøfte konsekvensene av geografisk avstand mellom bonde og rådgiver?

- **Fjernrådgivning**
  - Hvordan vurdere du hvor godt du har lykkes med veiledningen? Hvilke kriterier benyttes da. Er du selv fornøyd?
  - Hvordan synes du kommunikasjonen med bonden er? Forstår dere hverandres språk godt nok?
  - Hvordan samarbeider dere før og etter møtet?
  - Teknologi?
  - Hva gjør du for å motivere bonden til handlinger eller endringer?
  - Kurs, møter, konferanser osv.?

- **Alternative kanaler for rådgivning**
  - Hvilke alternative kanaler brukes utenom rådgiving og hvorfor? (I.e. nabobonden, lokalsamfunnet, web.)
  - Hvor effektive er alternative kanaler?
  - Hvor mye kunnskap gir alternative kanaler?
  - Hvor viktig er rådgiver i forhold til slike alternativer (i prosent?)

- **IKT**
  - Hvilke IKT verktøy bruker du og hvordan? Annet enn same-time!
  - Kunne du være interessert i å lære om andre typer verktøy?
  - Vi gir noen eksempler på Push og pull teknologi for å diskutere muligheter og begrensninger for bonde og rådgiver relasjonen?
  - E-rådgiving: Finnes det dokumentasjon/guidelines/Q&A/manualer i rådgivingsprosessen? (Som brukes; gis til bonden; er tilgjengelig generelt)

- **Samarbeid med andre rådgivningsaktører eller andre**
  - Har du et eksempel på samarbeid med andre?
  - Hvem samarbeidet du med? Flere?
  - Hvem tok initiativ?

- **Innovasjon**
  - Hva slags typer innovasjon har du sett på gården til bonden mens du har vært hans rådgiver? (i.e. produkter og redskap, ideer og kunnskap, eller prosess/drift)
    - Gi noen spesifikke eksempler?
  - Hvordan organiseres rådgivingen for innovasjon på gården?
  - Eksempler på tilfeller der bonden har vært innovativ på gården ut fra eget initiativ?
  - Eksempler på tilfeller der bonden har vært innovativ på gården ut fra rådgivingen?
  - I hvilken grad ser du på bonden som innovativ? Hvorfor?
  - Hvor kommer nye ideer fra med hensyn til gårdsdriften?
  - Hvor høy innovasjonskapasitet anser du at gården har (basert på all den tiden du har brukt som rådgiver for bonden)

Appendix C: Web survey questions to farmers (qualitative)

This is a print version of the web survey that shows the survey questions and the structure. The distributed web version of the survey involved a specific design and was stuctured by sub-topics per page to make the survey user-friendly for respondents.

Innovasjon på norske gårder

Velkommen til spørreundersøkelse om innovasjon på norske gårder.

Spørreundersøkelsen er delt inn i 6 ulike temadeler:
1) Relasjon til TINE
2) Forhold ved produsent og gård
3) TINEs rådgivingstjeneste
4) Alternative kanaler for veiledning
5) Innovasjon og nye ideer om gårdsdriften
6) Eventuelle oppfølgingsspørsmål

Det tar ca. 15 minutter å gjennomføre spørreundersøkelsen, og alle innsendte svar blir anonymisert. Innsendte svar som skal publiseres gjennom masteroppgaven vil ikke være mulig å knytte opp mot enkeltpersoner.

Takk for at du tar denne spørreundersøkelsen. Din tilbakemelding teller!

*Må fylles ut

Relasjon til TINE

1.
Er du produsent for TINE? *
Markér bare én oval.

- ◯ Ja
- ◯ Nei *Stopp å fylle ut dette skjemaet.*

Forhold ved produsent og gård

2.
Alder *
Markér bare én oval.

- ◯ Under 25
- ◯ 25 - 30
- ◯ 31 - 40
- ◯ 41 - 50
- ◯ Over 50

3.

Hva slags type utdannelse har du? *

Merk av for alt som passer

- [ ] Landbruk
- [ ] Jordbruk
- [ ] Skogbruk
- [ ] Teknologisk
- [ ] Andre: .....

4.

I hvilket fylke driver du gård? *

Markér bare én oval.

- ◯ Nord-Trøndelag
- ◯ Sør-Trøndelag
- ◯ Andre: .....

5.

Hvor lenge har du drevet gården? *

Markér bare én oval.

- ◯ Under 3 år
- ◯ 3 - 10 år
- ◯ 11 - 15 år
- ◯ 16 - 20 år
- ◯ Over 20 år

6.

Driver du gården alene eller sammen med andre? *

Markér bare én oval.

- ◯ Alene
- ◯ Med familiemedlemmer
- ◯ I samvirke med andre bønder
- ◯ Andre: .....

7.

Hvor gammel er gården? (antall år) *

.....

8.

Hvor stor er gården? (areal) *

.....

9. **Er det noen bygg på gården som er vernet? ***
Markér bare én oval.

- ◯ Nei
- ◯ Ja

10. **Hvis ja på forrige spørsmål, hvilke typer bygg er vernet? (i.e. fjøset)**

.....

11. **Hva slags dyr er det på gården? ***
Merk av for alt som passer

- ☐ Geiter
- ☐ Kyr
- ☐ Andre: .....

12. **Hvor mange dyr er det på gården? ***
Hvis flere typer dyr er involvert, oppgi antallet per type dyr (i.e. antall - type dyr)

.....

13. **Hva produseres på gården? ***
Merk av for alt som passer

- ☐ Melk
- ☐ Kjøtt
- ☐ Korn
- ☐ Ved
- ☐ Andre: .....

14. **Har du en melkerobot på gården? ***
Markér bare én oval.

- ◯ Ja
- ◯ Nei

TINEs rådgivingstjeneste

15. **Hvor mange rådgivere fra TINE har du vært i kontakt med siden du startet gårdsdriften? (Ca.) ***

.....

16. **Hvilke typer rådgivere har du vært i kontakt med siden du startet gårdsdriften? ***

Merk av for alt som passer

- ☐ Nøkkelrådgiver
- ☐ Bygningsrådgiver
- ☐ Fôringsrådgiver
- ☐ Budsjettrådgiver
- ☐ Helserådgiver
- ☐ Lean rådgiver
- ☐ Rådgiver for strategi og veivalg
- ☐ Rådgiver for driftsplanlegging
- ☐ Rådgiver for besetningsstyringssystemer og melkerobot
- ☐ Andre: .....

17. **Hvor mange rådgivere fra TINE er du i kontakt med på nåværende tidspunkt? ***

.....

18. **Hva slags typer rådgivere er du i kontakt med på nåværende tidspunkt? ***

Merk av for alt som passer

- ☐ Nøkkelrådgiver
- ☐ Bygningsrådgiver
- ☐ Fôringsrådgiver
- ☐ Budsjettrådgiver
- ☐ Helserådgiver
- ☐ Lean rådgiver
- ☐ Rådgiver for strategi og veivalg
- ☐ Rådgiver for driftsplanlegging
- ☐ Rådgiver for besetningsstyringssystemer og melkerobot
- ☐ Andre: .....

19. **I hvilke konkrete situasjoner etterspør du veiledning fra rådgivere? ***

.....

.....

.....

.....

.....

20.

Hvem tar størst initiativ til veiledning? *

Markér bare én oval.

- ◯ Jeg
- ◯ Rådgiver
- ◯ Andre: .....

21.

Hvordan blir du utfordret av rådgiver i veiledningen? *

.....

.....

.....

.....

.....

Alternative kanaler for veiledning

22.

Har du vært i kontakt med andre rådgivere utenom TINE? *

Markér bare én oval.

- ◯ Ja
- ◯ Nei

23.

Hvis ja på forrige spørsmål, hva slags type rådgiver var det og fra hvilken institusjon?

(i.e. type rådgiver - institusjon)

.....

.....

.....

.....

.....

24.

Hvilke andre kanaler bruker du for å få veiledning? *

Merk av for alt som passer

- ☐ Nabobonden
- ☐ Bygdemøter
- ☐ Facebook-grupper
- ☐ Andre: .....

25.

Hvilke andre kanaler bruker du for å få ny kunnskap og inspirasjon til gårdsdriften? *

Merk av for alt som passer

- [ ] Fagblader
- [ ] Web-søk
- [ ] Sosiale medier
- [ ] Nabobonden
- [ ] Bygdemøter
- [ ] Andre: .....

26.

Hvilken type kunnskapsinnhenting bruker du mest? *

Markér bare én oval.

- ◯ Pro-aktiv: henter inn ny kunnskap for eventuell fremtidig bruk
- ◯ Re-aktiv: henter inn ny kunnskap for å løse et problem
- ◯ Begge deler

Innovasjon og nye ideer om gårdsdriften

27.

Hva slags typer innovasjon har du hatt på gården fra du startet med driften? *

Merk av for alt som passer

- [ ] Produksjon av nye produkter på gården
- [ ] Bruk av nye redskaper på gården
- [ ] Nye driftsprosesser integrert på gården
- [ ] Bruk av ny kunnskap/læring på gården
- [ ] Andre: .....

28.

Spesifiser eksempelvis de ulike innovasjonene du har hatt på gården *

(i.e. type innovasjon - eksempel) (F.eks.: "Nytt produkt - begynt å produsere flis og har et flisfyringsanlegg på gården."

.....

.....

.....

.....

.....

29. **Hvilke store endringer har blitt gjort på gården fra du startet med gårdsdriften? ***

30. **Hvilke utfordringer opplever du under endringer på gården? ***

31. **Hvilke type aktører tar del i ulike endringer på gården? Utdyp gjerne med eksempler. ***

32. **Hvor kommer nye ideer fra relatert til melkproduksjon og gårdsdriften? Utdyp gjerne med eksempler på ideer. ***

33. **Hva hindrer videreutvikling av nye ideer og hvordan? ***

34. **Hva støtter videreutvikling av nye ideer og hvordan? ***

35. **Hva setter i gang nytenkning om gårdsdriften? Utdyp gjerne med eksempler. ***

36. **Har du søkt om eller fått noe form for finansiering til prosjekter på gården? (F.eks. fra Innovasjon Norge) ***

Markér bare én oval.

- ◯ Ja
- ◯ Nei

37. **Hvis ja på forrige spørsmål, hva slags finansiering har du søkt om eller fått og fra hvilken institusjon?**

(i.e. type finansiering/prosjekt - institusjon)

38. **I hvilken grad ser du på deg selv som en innovativ bonde? Utdyp gjerne med eksempler. ***

Eventuelle oppfølgingsspørsmål

39. **Er det mulig å kontakte deg for eventuelle oppfølgingsspørsmål basert på svar fra denne spørreundersøkelsen? ***

Markér bare én oval.

- ◯ Ja
- ◯ Nei

40. **Hvis ja, hvilket telefonnr eller e-post adresse kan du bli kontaktet på?**

.....

.....

.....

.....

.....

Appendix D: Approved NSD form

This NSD form includes the initial research question, which has been changed during the study. Collected data and personal information concerns have not been changed during the study.

Norsk samfunnsvitenskapelig datatjeneste AS
NORWEGIAN SOCIAL SCIENCE DATA SERVICES

Harald Hårfagres gate 29
N-5007 Bergen
Norway
Tel: +47-55 58 21 17
Fax: +47-55 58 96 50
nsd@nsd.uib.no
www.nsd.uib.no
Org.nr: 985 321 884

Anders Mørch
Institutt for pedagogikk Universitetet i Oslo
Postboks 1092 Blindern
0317 OSLO

Vår dato: 09.03.2016 Vår ref: 46400 / 3 / HJP Deres dato: Deres ref:

TILBAKEMELDING PÅ MELDING OM BEHANDLING AV PERSONOPPLYSNINGER

Vi viser til melding om behandling av personopplysninger, mottatt 04.01.2016. All nødvendig informasjon om prosjektet forelå i sin helhet 07.03.2016. Meldingen gjelder prosjektet:

46400	*Innovasjon i norsk jordbruk: hvordan rådgiving støtter innovasjon på bondegården og hvordan den kan bli forbedret for å øke innovasjonskapasiteten.*
Behandlingsansvarlig	*Universitetet i Oslo, ved institusjonens øverste leder*
Daglig ansvarlig	*Anders Mørch*
Student	*Natalia Pineguina*

Personvernombudet har vurdert prosjektet og finner at behandlingen av personopplysninger er meldepliktig i henhold til personopplysningsloven § 31. Behandlingen tilfredsstiller kravene i personopplysningsloven.

Personvernombudets vurdering forutsetter at prosjektet gjennomføres i tråd med opplysningene gitt i meldeskjemaet, korrespondanse med ombudet, ombudets kommentarer samt personopplysningsloven og helseregisterloven med forskrifter. Behandlingen av personopplysninger kan settes i gang.

Det gjøres oppmerksom på at det skal gis ny melding dersom behandlingen endres i forhold til de opplysninger som ligger til grunn for personvernombudets vurdering. Endringsmeldinger gis via et eget skjema, http://www.nsd.uib.no/personvern/meldeplikt/skjema.html. Det skal også gis melding etter tre år dersom prosjektet fortsatt pågår. Meldinger skal skje skriftlig til ombudet.

Personvernombudet har lagt ut opplysninger om prosjektet i en offentlig database, http://pvo.nsd.no/prosjekt.

Personvernombudet vil ved prosjektets avslutning, 01.06.2016, rette en henvendelse angående status for behandlingen av personopplysninger.

Vennlig hilsen

Katrine Utaaker Segadal

Hanne Johansen-Pekovic

Dokumentet er elektronisk produsert og godkjent ved NSDs rutiner for elektronisk godkjenning.

Avdelingskontorer / *District Offices*:
OSLO: NSD. Universitetet i Oslo, Postboks 1055 Blindern, 0316 Oslo. Tel: +47-22 85 52 11. nsd@uio.no
TRONDHEIM: NSD. Norges teknisk-naturvitenskapelige universitet, 7491 Trondheim. Tel: +47-73 59 19 07. kyrre.svarva@svt.ntnu.no
TROMSØ: NSD. SVF, Universitetet i Tromsø, 9037 Tromsø. Tel: +47-77 64 43 36. nsdmaa@sv.uit.no

Appendix E: Information note about the research project

This information note informs about the initial aim of the conducted research, which was changed during the study. All other aspects informed about in the note have not been changed.

Deltakelse i forskningsprosjekt

Forbedring av bøndenes kompetanse gjennom mer effektiv samhandling mellom bonde, veileder og forsker (KOMPETENT BONDE)

Bakgrunn og formål
Hovedmålet for prosjektet Kompetent Bonde er å forbedre metodene for å utvikle og styrke bøndenes kompetanse. Jeg, Natalia Pineguina, skriver masteroppgave i programmet Innovasjon og Entreprenørskap fra Universitetet i Oslo, og masteroppgaven er en del av Kompetent Bonde prosjektet. Masteroppgaven har som formål å undersøke hvordan rådgivingstjenesten mellom bonde og rådgiver bidrar til innovasjon på bondegården.

Kompetent Bonde prosjektet er et samarbeid mellom forskningsmiljøene Norsk senter for bygdeforskning (prosjektansvarlig), NIBIO, Universitetet i Oslo, NTNU og Trøndelag Forskning og Utvikling. Hovedfinansieringen kommer fra Forskningsmidlene for jordbruk og matindustri. Næringspartnere, som også bidrar med finansering i prosjektet: TINE, Nortura, Norsk landbruksrådgiving, Felleskjøpet Agri og Midt-norsk samarbeidsråd for landbruket (Grønn forskning). I tillegg bidrar fylkesmennene i Møre og Romsdal, Sør-Trøndelag og Nord-Trøndelag med finansiering.

Hva innebærer deltakelse i studien?
De rådgivingstjenestene som skal studeres nærmere er valgt ut fordi det er ønskelig å lære hva som fungerer bra, hva som kan fungere bedre og hvordan det eventuelt kan forbedres. For å besvare disse spørsmålene er det ønskelig å gjennomføre intervjuer med rådgivere og bønder og observere rådgivingssituasjoner. Det vil bli gjort lydopptak av intervjuene og under observasjonen av rådgivingssituasjonene, og det vil bli gjort notater både under intervju og observasjon. I tillegg, vil det bli gjort videoopptak under omvisningen på bondegården for å dokumentere konteksten.

Hva skjer med informasjonen om deg?
Alle personopplysninger vil bli behandlet konfidensielt, og det er kun forskerne i Kompetent Bonde prosjektet som vil ha tilgang til personopplysninger. Egil Petter Stræte er hovedansvarlig for Kompetent Bonde prosjektet, mens Anders Mørch er hovedansvarlig for Universitetet i Oslo sin del. Jeg, Natalia Pineguina, vil skrive masteroppgave ut fra datafunn i prosjektet, hvor Universitetet i Oslo er behandlingsansvarlig institusjon.

Det vil ikke bli brukt personnavn i min masteroppgave eller i andre publikasjoner fra prosjektet, og det vil ikke være mulig å identifisere individer i masteroppgaven eller i andre rapporter som skal skrives på vegne av Kompetent Bonde prosjektet. Bakgrunnsinformasjon som vil bli publisert både i masteroppgaven og i publikasjoner på vegne av Kompetent Bonde prosjektet innebærer type bonde (i.e.

melkprodusent), type rådgiver (i.e. bygningsrådgiver) og stedsnavn der bonden/rådgiveren holder til (i.e. Trøndelag).

Min masteroppgave skal avsluttes 1.juni 2016, og all datamateriale vil overføres til og inngå i prosjektet Kompetent Bonde med planlagt prosjektslutt 1.mai 2022. Skriftlig datamateriale vil da bli anonymisert. All lydopptak og videoopptak vil bli slettet.

Frivillig deltakelse
Det er frivillig å delta i studien, og du kan når som helst trekke ditt samtykke uten å oppgi noen grunn. Dersom du trekker deg, vil alle opplysninger om deg bli anonymisert.

Dersom du har spørsmål til Kompetent Bonde prosjektet, ta kontakt med prosjektleder Egil Petter Stræte (tlf: 416 38 118). For spørsmål om masteroppgaven, kontakt professor Anders Mørch som er hovedansvarlig for Universitetet i Oslo sin del i prosjektet (tlf: 480 21 736) eller meg, Natalia Pineguia, som skriver masteroppgaven ved Universitetet i Oslo (tlf: 454 55 409).

Studien er meldt til Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste AS.

Samtykke til deltakelse i studien

Jeg har mottatt informasjon om studien, og er villig til å delta.

_____

(Signert av prosjektdeltaker, dato, sted)