Gender Differences in Climate-Friendly Investments in Norwegian Agriculture and the Effect of Norm-Nudging

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Abstract

The Norwegian Farmers Union and The Norwegian Farmers and Smallholder Union have signed an intentional agreement with the Norwegian government to reduce GHG emissions from the sector with 5 million tons of CO2-equivalents by 2030 (Norges Bondelag, 2020). Zahl-Thanem and Stræte (2022) find that the adaptation rate for some of the recommended climate-friendly practices is low. My research question asks whether there are gender differences in climate-friendly investments in Norwegian agriculture, and whether a norm nudge can affect the stated willingness to invest in climate-friendly practices. 923 Norwegian livestock farmers responded to my survey, which contained, one risk preference elicitation task, one time preference task, and I exposed a randomly selected treatment group to the norm-inducing nudge.

I run pairwise correlations between gender, investment patterns, and background characteristics to map the gender differences. I find a significant gender difference in association with climate-friendly investments. One of the main explanatory variables could be risk preferences. The difference in risk preferences appears to explain some of the differences in net income and agricultural area. I also find an association between gender and present bias. However, this result should be interpreted cautiously as a high cognitive load may have affected the results. The treatment test concludes no effect of the norm nudge, which is why I cannot give any definite policy recommendations. However, there seems to be structural differences between female and male-lead farms. Future research could investigate the effect of increased knowledge and capital for female lead farms.

I have used Stata 17.0 to analyze my data and Excel and PowerPoint to present them.

Keywords: Climate-friendly investments, agriculture, gender differences

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1. Introduction

Behavioral economics is a beautiful symbiosis between psychology and economics. This research field uses psychological insight to explain economic phenomena (Loewenstein, 2001). It is most useful when neither legal nor political reasoning can explain a market failure. One of these cases is greenhouse gas emission (GHG) in Norwegian agriculture. This thesis will answer the research question: Are there gender differences in climate-friendly investments in Norwegian agriculture, and can norm nudging affect the stated willingness to invest in these investments?

The Intergovernmental Panel on Climate Change states, "The agricultural sector worldwide is responsible for 14% of greenhouse gas emissions – 24% if one includes forestry" (IPCC, 2014). Reductions in GHG emissions from agriculture are therefore significant to meet the Paris Agreement goals (Richards, Wollenberg, & van Vuuren, 2018). The Paris Agreement has the overarching goal of keeping global warming below 2°C, which some would argue is already out of reach. As a double-edged sword, The World Bank argues that world hunger could be intensified due to agriculture's vulnerability to Climate Change (The World Bank, 2021). Reducing GHG emissions from the sector would, therefore, not only make the Paris Agreement more attainable, but it would also make food supply for the future more robust.

In 2020 the Norwegian Farmers Union and the Norwegian Farmer and Smallholder Union signed an intentional agreement with the government to reduce emissions from the sector with 5 million CO2-equivalents by 2030 (Norges Bondelag, 2020). The amount compares roughly to the annual emissions from the sector (Statistics Norway, 2022c). The agreement aims at reducing emissions through eight investment areas. All areas aim to reduce the CO2-equivalents on the farm by reducing the emission intensity of the food. The investments are climate-friendly practices that a farmer can adopt on the farm, which is why "practices" and "investments" are used interchangeably. CO2-equivalents weigh the relative "damage" of methane and nitrous oxide to CO2, including all climate gasses originating from the farm (Norges Bondelag, 2020). With a political will and a global need to reduce emissions from the sector one could argue that there are no political or legal reasons why farmers would not invest in these GHG-reducing practices.

Climplement, a research project by Ruralis (2023), investigates how farmers can invest in these climate-friendly practices. As a part of this research project Zahl-Thanem and Stræte (2022) report that the adaptation rate is low. They investigated 11 climate-friendly practices recommended by the Norwegian Farmers Union and found that about 8% of the respondents had invested in these practices, see **Figure 1**.

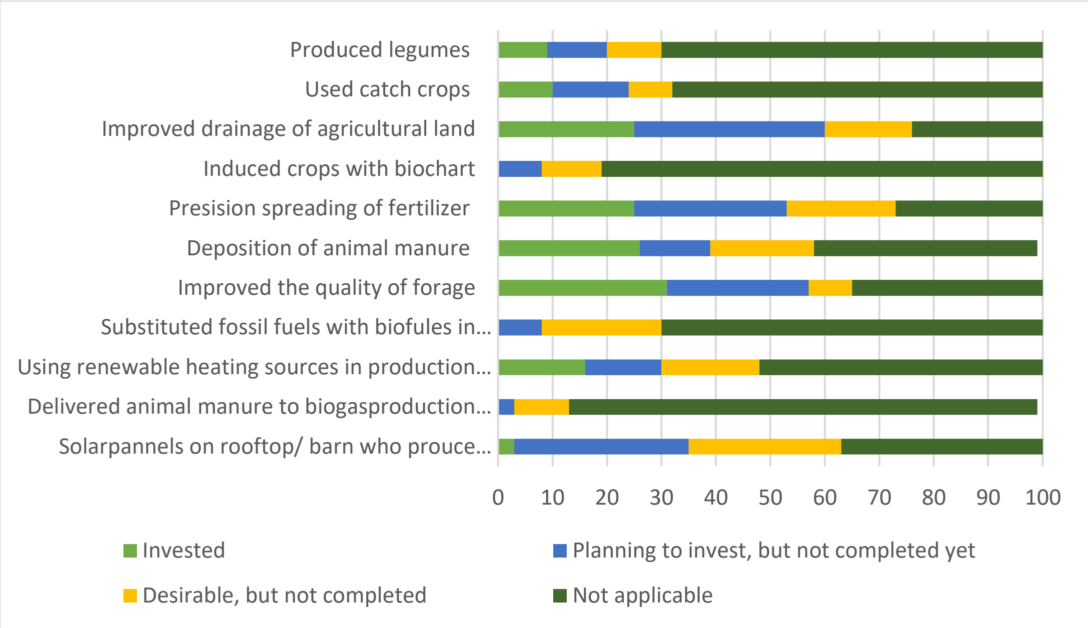

Figure 1 Uptake of climate-friendly investments in Norwegian agriculture (Zahl-Thanem & Stræte, 2022, p. 48)[1]

Figure 1 shows that the adaptation rate of climate-friendly practices by Norwegian farmers is low, notwithstanding that many farmers state that some investments are not applicable to their farms. Farmers have yet to invest in either biofuel in transportation, biochar-induced crops, or delivering animal manure to biogas production facilities. The reasons why the adaptation rate is low could be many, I will run pairwise correlations between the climate-friendly investments and background characteristics of farmers. Pairwise correlations estimate the degree to which two variables vary together, which can be utilized to map out some behavioral traits associated with investing in climate-friendly practices. The three main dimensions that will be investigated are gender, risk, and time preference. These differences in adaptation rates could be a good foundation for analyzing if there are any behavioral differences in climate-friendly farms as it provides a nuanced perspective of the heterogeneity in the sector.

[1] A reproduced and translated version of their Figure 30

Recognizing the importance of farmers' heterogeneity has been identified as a significant factor in increasing the adaptation rate. In recognizing their differences, it would be possible to aim policies at specific sub-groups of farmers with a lower adaptation rate. (Burton & Otte, 2022; Wreford, Ignaciuk, & Gruère, 2017). While the farmer population may have been more homogeneous in the early 2000's its composition is changing. Up until 2009, the firstborn male heir had the inheritance right to a family farm in Norway (Odelslova, 1975). This regulation meant that even if a girl were the first born in her family, she would not have any legal right to the farm. This could be seen as a barrier to entry for women into the agricultural sector, as most farms in Norway are family owned, and could explain some of the gender gap in the industry, see **Figure 2**.

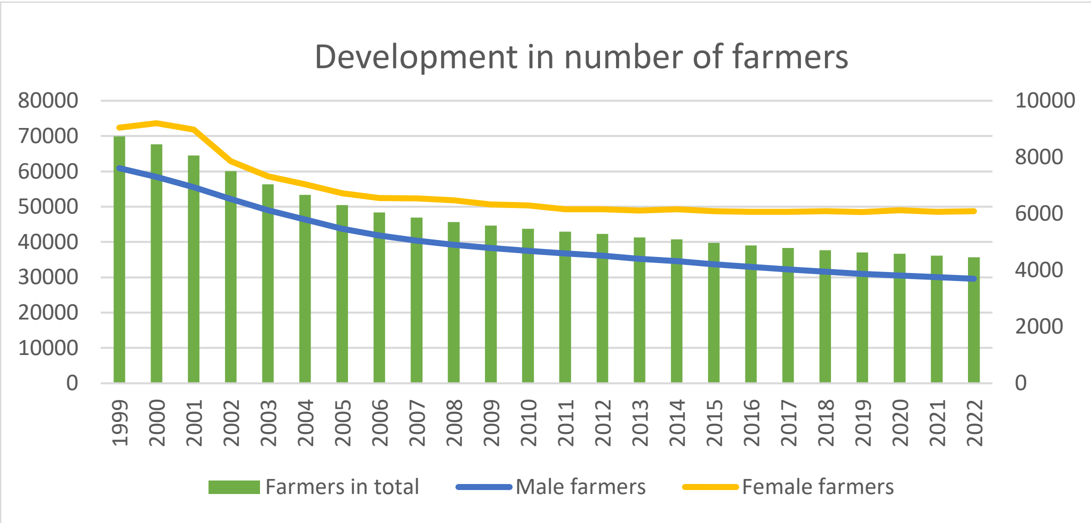

Figure 2 Number of farmers in Norway from 1999-2022 (Statistics Norway, 2022a). Left axis: Farmers in total, male farmers. Right axis: Female farmers

In this figure the number of farmers in total are on the left axis and female farmers are on the right axis. **Figure 2** shows that there has been a steady decline in the total number of farmers in general since 1999 (Statistics Norway, 2022a). It seems, however, that the number of female farmers has stabilized at around 6000, while the number of male farmers continues to decline. This stabilization could be a combination of female farmers staying in the sector for longer and more women taking over the farm from their predecessors, which could imply a change in the farming population's composition since the share of female lead farms increases. This change in composition could be relevant for policy makers as women may govern their farms quite differently to male farmers, either due to inherent differences or social conditioning. For example, men and women could be fundamentally different when making investment decisions.

The literature states that women tend to be more risk averse than men (Eckel & Grossman, 2008) and Flaten, Lien, Koesling, Valle, and Ebbesvik (2005) argue that those who invest in organic farming are less risk averse. I hypothesize that women are less likely to invest in climate-friendly practices due to their relatively higher risk aversion than men.

The policy framework could also consider humans' myopic decision-making. Climate change has been a known phenomenon for several decades. Gro Harlem Brundtland declared in 1987 that the world should safeguard the possibility frontier for future generations by ensuring sustainable development (The United Nations Seceratary-General & World Commission on Environment and Development, 1987). However, little seems to have been done. Weber (2017) argues that one of the leading causes of this lack of urgency could be that humans prioritize immediate benefits more than future costs. A present bias could explain why little action is taken, even though the Bruntland report is almost 40 years old. I hypothesize that farmers are no different. They prioritize making ends meet today rather than saving the world for tomorrow.

When constructing a new policy framework, regulators would usually like it to be cheap and predictably alter behavior. Nudges, minor changes in the choice architecture (Thaler & Sunstein, 2009), meet these criteria and could be an option. Kuhfuss et al. (2016) finds that providing French farmers with information about what other farmers intend to do can influence a farmer's decision to maintain an Agri-Environmental scheme. This is one of the reasons why I test whether the stated willingness to invest in climate-friendly practices could be affected by descriptive norms. Croson and Gneezy (2009) find that women are more sensitive toward social cues, so I will test whether men and women respond differently to this information. My thesis will, therefore, answer the following research question: What are the gender differences in investing in climate-friendly practices, and does norm nudging affect the willingness to invest differently for male and female farmers?

My thesis is structured as follows. First, I will briefly summarize the Climate Action Agreement between the Norwegian Farmers Union, The Norwegian Farmer and Smallholder Union, and the Norwegian government. This chapter will provide information on the framework for farmers to make climate-friendly investments. Chapter 3 presents the theoretical framework in which farmers make sustainable investment choices. This framework is built on a summary article by Dessart, Barreiro-Hurlé, and van Bavel (2019) while supplemented with literature on gender differences in investment behavior. Sustainability is a broad term encompassing many aspects; this thesis will be based on the broad literature, however, mainly analyzing GHG reduction initiatives. In Chapter 4, I present my experimental design. I have three behavioral tasks, one risk and one time preference elicitation task, and one descriptive norm nudge to test whether stated willingness to invest is malleable. The data from my survey and descriptive statistics are presented in Chapter 5. The results and analysis in Chapter 6 analyzes the gender differences, and the effect of the norm-nudge. I analyze the treatment effect of the nudge through a linear regression model. The thesis continues with a discussion of my results and recommendations for future research, before I conclude in Chapter 8.

2. Norwegian Agriculture and GHG Reduction

The emissions on a farm originate from both transportation and production. CO_2 from diesel is the most significant emission source regarding transportation, whereas methane is one of the most significant greenhouse gases in livestock production. To consider these nuances, the emissions from a farm need to be normalized into CO_2 equivalents. CO_2-equivalents scale the impact of methane, CO_2, and nitrous oxide to make the measures comparable (Norges Bondelag, 2020). The Norwegian Farmers Union and the Norwegian Farmer and Smallholder Union signed an intentional agreement with the government in 2020 to reduce emissions from the sector with 5 million CO_2 equivalents by 2030 (Norges Bondelag, 2020). The annual emissions from the sector are 4.6 million CO_2-equivalents (Statistics Norway, 2022c).

I have selected some of the recommended measures from this national agreement to analyze the stated willingness to invest in climate-friendly practices in Norwegian agriculture. As this is the most wide-ranging agreement the sector has agreed on, it is the best document to analyze. The thesis is limited to the emissions reduction aspect of sustainability. It will not consider other aspects, such as sustainable governance, economic sustainability, or social sustainability. So, I define them as climate-friendly and not sustainable practices. In this chapter, I will go through the framework these climate-friendly investments are operating within and what productions they apply to. This chapter is based on information from the action plan of The Norwegian Farmers Union.

The agreement aims at reducing emissions through eight investment areas: increased knowledge, sustainable feeding, fossil-fuel-free transportation, fossil fuel-free heating, better fertilizer and agronomic decisions, animal manure deliveries to biogas production facilities, carbon capture in agricultural land, and new agronomic technologies. Within these investment areas, there are several measures the farmer can choose. I focus on nine of the 11 investigated by Zahl-Thanem and Stræte (2022) illustrated in **Figure 1**. I exclude substituting fossil fuels in transportation for biofuel because they report that most farmers consider this to be "not applicable" because of the few operational facilities. Biochar is also excluded because few farmers report it to be accessible to them. The other nine investments are elaborated on in this chapter.

Methane gas is one of the most significant GHG in livestock production. Climate-friendly feeding aims to reduce methane in the digestion process of ruminant animals. This can be done either through additives or increased energy concentration in forage which decreases methane production. Piloting projects to reduce methane emissions through additives are forthcoming. However, it is not accessible to most farms yet. This is why increasing the energy concentration in forage is the most accessible practice. As forage is eaten by sheep, goats, cattle, and cows, this measure only applies to sheep, goats, cattle, and dairy farmers. Other productions, such as chicken and pig, use feed concentrate. By reducing the methane production in the digestive system of these animals, GHG emissions could decrease by 2.1-2.6 mill. tons CO2 equivalents (Norges Bondelag, 2020).

If animal manure is delivered to biogas production facilities, this will decrease greenhouse gas emissions in the agricultural and other sectors. Today there is only one facility *Greve Biogass* that receives animal manure, which is limited to the farmers in Vestfold County. So even though this measure applies to all livestock farmers, it will not be accessible. If more facilities start to receive animal manure for biogas production, the Norwegian Farmers Union estimates that it will reduce emissions by 280 thousand CO2 equivalents.

Catch crops and legumes are initiatives to increase carbon capture in agricultural land. Together with improved drainage, precision spreading of fertilizer and deposition of animal manure, and other carbon capture and storage initiatives, this investment area will decrease the emissions by 220 thousand tonnes of CO2 – equivalents. Catch crops and legume production are limited to farms with relatively flat agricultural land as they grow in fields. This means that only the Eastern lowlands in Norway could make these investments.

Making the heating on the farm fossil fuel free, either by biogas or solar panels, applies to all livestock farmers. According to The Norwegian Farmers Union, fossil fuel heating could reduce the CO2 emissions on the farm with a minimum of 190 thousand CO2 equivalents (Norges Bondelag, 2020). Most animals require heating to survive the cold Norwegian winter, which is why it applies to all livestock farmers.

Lastly, the Norwegian Farmers Union wants to increase the knowledge of climate-friendly investments on each farm, so they want to have a Certified Sustainability Advisor (CSA) on every farm. These advisors would guide the farmers in investment decisions and how to make the farm as carbon-neutral as possible. This is meant to be calculated through the Climate Calculator, which can estimate the CO2 emissions on the farm and what improvements the farmer can make to lower their emissions.

3. Previous Research

For this thesis, I have done literature studies into behavioral factors affecting farmers' decisions to invest in sustainable investments and gender differences in investment patterns. Only after understanding the investment choice is it relevant to test whether they are malleable. Dessart et al. (2019) provide an overview of relevant studies through a theoretical framework for understanding which factors are more proximal and distal to the investment choice. However, this framework is not through a gendered lens, so I supplement it with literature on gender differences in investment behavior. I assume that farmers are not systematically different from other humans, so I find it relevant to supplement with literature on gender differences in other sectors. 3.1 The behavioural framework of sustainable farming

3.1 The Behavioral Framework of Sustainable Farming

Dessart et al. (2019) assume that farmers' behavioral patterns are both distal and proximal to investments in sustainable practices. Behavioral "distal" factors are further away from the sustainability question and could be linked to other decisions. An example would be risk preferences because it does not only affect the willingness to invest in sustainable practices but also their insurance policy (Hellerstein, Higgins, & Horowitz, 2013). A less risk-tolerant farmer is more likely to have better coverage in their insurance policy to minimize the uncertainty of future income flow. Compared to a more risk-tolerant farmer who is more likely to accept uncertainty. Behavioral factors are considered "proximal" when closely related to the sustainability investment. An example of this would be the perception of costs and benefits associated with the investment. These dimensions can be illustrated in **Figure 3** (Dessart et al., 2019).

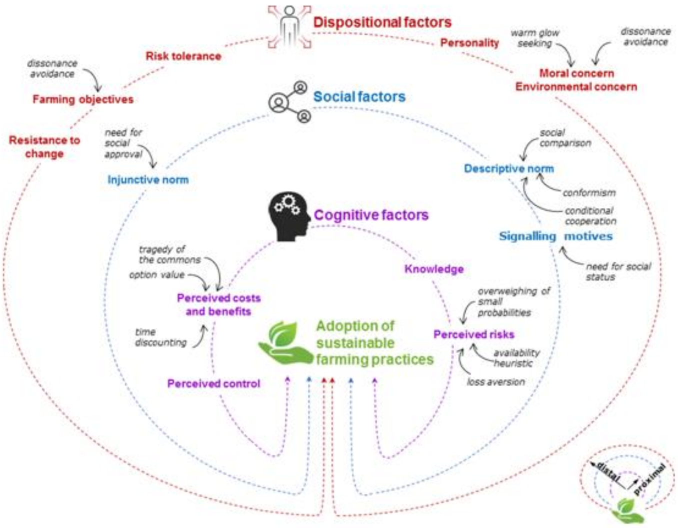

Figure 3 Dessart et al. (2019)'s integrated framework of behavioural factors affecting farmers' adoption of environmentally sustainable practices. Mechanisms and biases in italics. Within each cluster, behavioural factors are not necessarily situated at the same distance (proximal-distal) to the adoption of environmentally sustainable practices.

ithin the spectrum of distal and proximal behavioral factors, there are three main categories; cognitive, social, and dispositional. The dispositional factors describe the farmer's internal farmer's likelihood of behaving in a particular pattern. This will include risk preferences and openness to new experiences. Dessart et al. (2019) find these critical factors in farmers' investment choices. Within this category, women are more risk-averse than men (Croson & Gneezy, 2009; Eckel & Grossman, 2008), especially in financial settings (Charness & Gneezy, 2012). The second category, social preferences, refers to what extent people are affected by what their peers or society does. As a general conclusion, if other farmers in the area are investing in sustainable practices, it is more likely that others will follow (Kuhfuss et al., 2016). This effect is especially present for women as research shows that women are more aware of social questions than men (Croson & Gneezy, 2009). Lastly, Dessart et al. (2019) explore the cognitive characteristics of sustainable farmers. This category includes knowledge, perceived risk, control, and costs and benefits.

3.2 Dispositional Factors

Within the category of dispositional factors affecting the gender differences in farmers' investment in sustainable practices, risk preferences, and environmental concerns are the main research objectives.

3.2.1 Risk Preferences

Risk preferences are the producer's general predisposition toward assuming financial risk (Hoffmann, Post, & Pennings, 2013). Risk preferences have been extensively researched in behavioral economics as it relates to several aspects of an individual's life. In farming, risk preference determines the farmers' propensity for insurance policy (Hellerstein et al., 2013) and adaptation of sustainable practices. An insurance policy minimizes income loss due to unforeseen events, such as bad weather, so a more risk-averse person would be more likely to invest in better insurance (Hellerstein et al., 2013). Flaten et al. (2005) show that farmers investing in sustainable practices are less risk-averse than those who engage in conventional farming. The authors point to environmental concern as one of the drivers. Greater risk tolerance has also been found to increase the likelihood of early investment (Kallas, Serra, & Gil, 2010; Läpple & Van Rensburg, 2011). The early investors are usually young, have higher education, and are concerned with the state of the environment. Meissner, Gassmann, Faure, and Schleich (2022) find that risk aversion positively correlates with age and gender.

There is mixed evidence for whether there are gender differences in risk preferences. Some authors find that women tend to be more risk-averse than men (Charness & Gneezy, 2012; Croson & Gneezy, 2009; Eckel & Grossman, 2008; Hira & Loibl, 2008). While Meissner et al. (2022) find that most studies report men as more risk-tolerant than women, they also find a substantial amount of studies that report no gender differences. They also criticize journals for being more likely to publish a study that finds a gender difference, which could indicate that several studies found no gender difference. This could show the presence of gender differences in risk aversion. Most demographically representative studies find men to be more loss averse than women. However, the gender differences disappear when considering non-representative samples (Meissner et al., 2022). Men tend to be more patient than women when the number of observations is considered instead of the number of studies. However, when reporting their multinational representative study results, they find that men are less risk-averse than women (Meissner et al., 2022).

Croson and Gneezy (2009) believe there are three main reasons for the gender differences in risk aversion. First, women tend to take losses more to heart than men. This affects both their evaluation of outcomes and their evaluation of probabilities. If women are more emotionally affected by losses, they will to a greater extent, avoid them or believe it is less likely for them to win. The second reason why men are more risk-taking than women can be due to their overconfidence. Niederle and Vesterlund (2007) contribute to this line of study by finding that men are significantly overconfident about their relative performance in a task. Therefore, men's probability distribution could be distorted, making them more risk-taking than women. The last reason mentioned as to why women are more risk averse is because of their risk perception. Men generally think of risk as a challenge that needs to be undertaken, whereas women tend to see risk as a threat(Croson & Gneezy, 2009). That could explain why women shy away from risk wheras men dive into it.

3.2.3 Farming Objectives

While the individual has much to say in the investment decision, farming objectives can also be a part of the picture. *Farming objectives* are factors the farmer govern their farm by, including economic, production and cultural factors (Pannell et al., 2006). Pannell et al. (2006) find that farmers are more likely to invest in sustainable practices if it gives the farmer an advantage compared to more conservative methods. Meaning that if sustainable practices help them achieve their say production goals, it is more likely that they will invest (Dessart et al., 2019). Greiner, Patterson, and Miller (2009) find that sustainable practices negatively correlate with economic objectives. If the farmer is not concerned with economic objectives, they are more likely to invest in sustainable practices. However, Mills, Gaskell, Ingram, and Chaplin (2018) find that those who participate in an agri-environmental subsidies scheme are more likely to be motivated by economic incentives. The authors find that those who run environmentally friendly farms without participating in the subsidies scheme are more likely to be motivated by environmental and agronomic reasons. Weather conditions are usually a significant factor in investing in sustainable practices. There is, for example, hardly any point in investing in solar panels if there are 20 days of sun per year.

3.3 Social Factors

Social factors describe decision-making in interaction with others. These can be categorized into social norms and signaling motives (Dessart et al., 2019). *Signaling motives* are behavior that indicates to others what kind of person we are or want to be through signaling behavior. Läpple and Kelley (2015); Schmidtner et al. (2012) both find that proximity to other farmers who have adopted the same sustainable farming practices seems to influence their neighbors' decisions. This could be a sign of signaling behavior or because neighboring farmers can share information and experiences on the actual costs of investments and benefits. *Social norms* is a signal of what is accepted in society, and is generally defined by the sanctions that follow if broken (Lapinski & Rimal, 2005). These social factors could both be distal and proximal to the investment decisions.

Social norms are typically divided into descriptive norms and injunctive norms. *Injunctive norms* are defined by people's beliefs about what should be done (Lapinski & Rimal, 2005). Whereas if the social norm is based on what people actually do, Lapinski and Rimal (2005) define it as a *descriptive norm*. Descriptive norms could make farmers feel pressured to behave in a certain way and have been found to influence their investment decisions (Sok, Hogeveen, Elbers, & Lansink, 2016) which I will test in the norm nudge. Kuhfuss et al. (2016) find that descriptive norm nudges influence farmers' willingness to continue an agri-environmental scheme. The social pressure effect seems more significant for women (Croson & Gneezy, 2009).

In their meta-study of gender differences Croson and Gneezy (2009) argue that women are more sensitive to social cues than men. They build their argument on several studies of social preferences with different experimental designs. Social preferences are studied through ultimatum, dictator, trust, or public good games. The different games explain the four fields of social preferences: altruistic behavior, envy, inequality aversion, and reciprocity. In all the articles listed in their work, they find that within these four fields, one can find evidence for and against gender differences. They, therefore, argue that this inconsistency in evidence is due to women's sensitivity toward social cues. In the experimental design, these differences can be displayed as different payoffs, degree of anonymity, price of altruism, and the repetition of the game. The authors argue that the inconsistencies in the two studies they mention are due to the social context of the two studies. Mellström and Johannesson (2008) prove this to some extent in their research on crowding out the intrinsic motivation to donate blood. They give the treatment group monetary compensation for donating and find a gender difference between the treatment and control group. Women are, to a greater degree, crowded out of donating blood when paid to do so.

3.4 Cognitive Factors

How an investment choice is perceived and the background knowledge of the investment is foundational for the outcome. Dessart et al. (2019) therefore, consider it a proximal characteristic of a sustainable investment choice for farmers. Cognitive factors include perceived risk, costs, benefits, and whether they feel they are skilled enough to make the investment. As already established, men are more confident in their skills than women, which may feed into the farmer's feeling of having enough information about sustainable practices. Other gender differences will also be discussed in this category.

3.4.1 Knowledge and Education

Knowledge is power. Pavlis, Terkenli, Kristensen, Busck, and Cosor (2016) find that if the farmers who have more knowledge of sustainable practices that are applicable to them and subsidies schemes to support these investments are more likely to invest. Llewellyn (2007) finds that if information about sustainable practices is considered reliable and easy to access, it is more likely that farmers will invest. One of the ways the Norwegian Agricultural Agency is trying to improve the informational flow is by offering certified climate advisors in every region (Landbruksdirektoratet, 2023). The industry is also trying to improve the knowledge of sustainability in the industry is through the Climate Calculator (Klimasmart landbruk, 2020). This initiative intends to inform the farmer about the greenhouse gasses emitted on their farm and what measures they can take to reduce their emissions.

3.4.2 Time Preferences – Present Bias and Hyperbolic Discounting

Expected utility theory states that consumers are time-consistent, profit-maximizing, independent of the time horizon, and only constrained by their income and wealth (Simon, 1966). This view has been challenged. Behavioral economics has found that people value present consumption more than future consumption. Hyperbolic discounting refers to declining time preferences (Frederick, Loewenstein, & O'donoghue, 2002). This would entail that when consumers are asked to allocate a share of their budget in an experiment, the further away the second period is, the smaller share of the budget is allocated to that period. However, when that period arrives, they would rather have a larger amount in the present and a smaller in the future (Clot & Stanton, 2014). This is pointed out by Frederick et al. (2002) in their discussion of Samuelson’s (1937) discounting utility model. Myopic behavior could lead to suboptimal allocations in which debt is more likely due to impatience and overconsumption (Meier & Sprenger, 2010).

Balakrishnan, Haushofer, and Jakiela (2020) find that farmers are significantly present biased. The present bias may affect the perceived costs and benefits of adopting sustainable practices. The present bias is the extent to which people would rather have instant gratification than future benefits (Doyle, 2013), to a disproportionate degree. In adapting sustainable practices, the immediate costs can be perceived as high and more concrete than the future environmental benefits. These benefits are usually reaped beyond the farmer’s lifetime, which makes it even harder to consider when investing.

Horn, Kiss, and Lénárd (2022) find that women are less present biased but not significantly more time consistent. This would entail that women and men are just as bad at doing what they plan to do in the future. Meissner et al. (2022) find that male respondents are more impatient and present biased than women. Bjorklund and Kipp (1996) believe men and women`s historic parental roles can explain the difference in present bias. As women are more likely to have worked in childcare, they would have developed a sense of delayed gratification since they would need to put the child's needs before their own (Bjorklund & Kipp, 1996). Dittrich and Leipold (2014) argue that this gender difference will depend on the interest rate of investments. If the interstate is high, this gender effect will be canceled, and both genders will delay the investment. If the interest rate is low, both will want an instant payoff. Age seems to be positively correlated with patience (Meissner et al., 2022).

4. Experimental Design

The goal of the three main tasks in my experimental design are first to elicit farmers' risk preferences, second their time preferences, and lastly, to see whether I can nudge their willingness to invest. Based on the literature described in Chapter 3 and the setting described in the introduction, I designed a survey that had the intention of researching whether there are any gender differences in climate-friendly investment and whether female lead farms are significantly different from male lead farms. I intended to do this in the simplest and most effective way. This intention governs my choices in the experimental design.

This chapter will be structured as follows. First, I will briefly describe the platform and distribution process. Then I will define the dependent variable. Afterward, I will argue why I follow Charness and Viceisza (2016)'s method for risk elicitation and Benhabib, Bisin, and Schotter (2010)'s setup for eliciting present bias and quasi-hyperbolic discounting time preferences. My nudge is a descriptive norm nudge, and I will briefly explain the "between-subjects design" since this will be my randomization technique. My hypotheses on these three behavioral tasks are given in Chapter 4.6. In the following Chapter I explain how I test for a treatment effect of the norm nudge and why I choose an OLS estimate when my treatment variable is binary. Then, I will elaborate on the internal and external validity of the study. Closing off, I comment on the differences between incentivized experiments versus non-incentivized studies and why I chose not to incentivize. The complete survey can be found in Appendix A.10.

4.1 Platform and Distribution

My experiment was conducted through an online survey platform[2]. In selecting an organization that could distribute my survey, I asked one of the largest membership organizations in Norwegian agriculture, Nortura, to distribute it. With a membership base of 53% of all Norwegian farmers, they are one of the organizations with the most significant influence on Norwegian agriculture. Nortura is a membership organization for livestock farmers, which would entail that fruit and vegetable farmers would not be included in the survey. Due to privacy concerns, the survey was distributed through Nortura's membership channels to keep complete anonymity. Nortura was, therefore, responsible for the distribution of the survey. According to experimental standards, I sent the link with a welcoming text highlighting the lack of deception and complete anonymity throughout the survey. Nortura informed me that it was distributed to

[2] SurveyXact

20 000 of their farmers. I set the deadline 14 days after distribution; the survey was therefore active from the 15th to the 31st of January. Within that period, 512 opened the link, 669 responded to some questions, and 926 completed the survey. Three of the respondents who completed the survey were dropped due to unreasonable answers, such as an age of 1000. That makes a 44% completion rate from those who opened the survey.

4.2 Dependent Variable

The dependent variable is a willingness to invest in climate-friendly practices. Climate-friendly practices are those recommended by the Norwegian Farmers Union (Norges Bondelag, 2020). They have 11 recommended practices; I elicit nine. I exclude substituting fossil fuels in transportation for biofuel because they report that most farmers consider this to be “not applicable” because of the few operational facilities. Biochar is also excluded because few farmers report it to be accessible to them. I measure the adaptation rate of drainage of fields, precision spreading of fertilizer, deposition of animal manure, increased energy concentration in forage, renewable energy sources in heating, solar panels, biofuels, catch crops, and legumes. I also leave an option for the farmers to have none of the above. See Chapter 2 for an explanation of which practices apply to what kind of production.

The farmers could invest in more than one of these practices. Some would argue that some are “easier” investments that have been a part of agronomical practices for several years. A reasonable argument would be that the more practices the farmer has invested in, the more climate-friendly farm is why I sum up those who report investing in these practices. These are given a score from 0 to 9 according to how many practices they have on their farm. This score is also done for those who have inherited the practices from their predecessors. In comparing these two variables, I could get an indication of who has made the conscious choice to invest and who has simply continued their predecessor’s investment choices.

To profile the climate-friendly farmers, I will only use the subgroup who report having yet to inherit any of the practices from their predecessors. I make this choice because I would argue that continuing a practice that your parents have, does not require you to make a conscious choice. Some may argue that there may be a high correlation between those who inherited a climate-friendly farm and their parents’ attitudes toward climate change. However, this is an unknown that I cannot guarantee, which is why I exclude them from the analysis.

4.3 Eliciting Risk Preferences

Risk preferences influence investment choices, and the literature states that men and women tend to be systematically different in their preferences, which is why it is relevant to elicit the farmer's risk preference. I adopt a version of the Gneezy and Potters method for risk elicitation. Gneezy and Potters (1997) developed an experimental design to elicit risk attitudes in a simple yet effective way to prove that individuals are myopic loss averse. Myopic loss aversion refers to the tendency for individuals to be short-sighted in their evaluation of outcomes over time. This methodology has been adopted by Charness and Villeval (2009), Charness and Gneezy (2012); Haigh and List (2005) for its simplicity in design, minimum requirement of numeracy, energy and time. Charness and Gneezy (2012) find that men on average invest 32% more in the risky option than women. Charness and Viceisza (2016) show that this elicitation method gives a more consistent response rate than more complex elicitation methods. I follow their experimental setup based on Gneezy and Potters (1997).

4.3.1 The Gneezy and Potters Method

The Gneezy and Potters Method utilizes a scheme where the individual is made to choose between a risky investment or saving their endowment (Charness, Gneezy, & Imas, 2013). In my questionnaire the farmers were presented with a payoff matrix, see **Table *1***, which is almost identical to Charness and Viceisza (2016). The farmers were informed that they were supposed to make an investment choice based on the payoffs presented to them in the matrix. They were endowed with ten tokens and asked how much of seed one and two they would like to invest in the two kinds of seeds. They could invest in which sort they wanted and combine freely within those ten tokens. Seed one gives a dividend of 2.5 times the investment 50% of the time and no payoff 50% of the time (Charness et al., 2013), which for context, I framed as the likelihood of good weather vs. bad weather. This seed is, therefore, to be considered the risky seed. Seed two represents the safe investment, or keeping the rest, which gives a constant payoff. The only risk-neutral choice here would be to invest the totality of the endowment in seed one, as this gives the highest payoff.

Table 1 Payoff matrix in risk elicitation task

		Godt vær (50% sannsynlighet)			Dårlig vær (50% sannsynlighet)		
Frø 1	Frø 2	Avling frø 1	Avling frø 2	Samlet avling	Avling frø 1	Avling frø 2	Samlet avling
0	10	0	1000	1000	0	1000	1000
1	9	300	900	1200	0	900	900
2	8	600	800	1400	0	800	800
3	7	900	700	1600	0	700	700
4	6	1200	600	1800	0	600	600
5	5	1500	500	2000	0	500	500
6	4	1800	400	2200	0	400	400
7	3	2100	300	2400	0	300	300
8	2	2400	200	2600	0	200	200
9	1	2700	100	2800	0	100	100
10	0	3000	0	3000	0	0	0

The theoretical framework of this matrix is based on the endowment the farmers are given, in my case, ten tokens; they get different payoffs based on their allocation of the endowment. The amount invested in seed one dividends $\$kx$ (k>1) with a probability p and is lost with a probability *1 - p*. The endowment not invested in seed one is invested in seed two, which gives a constant payoff. The payoff is, therefore $\$(X - x + kx)$ with probability p and $\$(X - x)$ with probability *1-p*. In all cases p and k are chosen to make $k * p > 1$, the expected value of investing in seed one higher than in seed two (Charness et al., 2013).

The main weakness of this elicitation method is that it does not differentiate between risk neutrality or risk-seeking preferences. Investments in the risky seed could be interpreted as risk neutrality because if the individual maximizes the expected utility, the seed is the one that maximizes the expected utility. Seed two gives lower expected utility but a more constant payoff, so it displays risk aversion. However, Charness et al. (2013) show that only some people invest all their endowment in the risky option, which renders most people some degree of risk averse. It should also be noted that with this elicitation method, it is impossible to know the true "risk preference." It will only be an estimation of willingness to take the risk. This is because I cannot calculate the constant relative risk aversion (CRRA) from this data as the Holt & Laury method can.

4.3.2 Multiple Price List Method

The Multiple Price List method combines gambles and multiple pricelists. It is most commonly known as the Holt and Laury (2002) method, as they popularized using this for risk elicitation. The participant is commonly presented with ten decisions between different gambles of different sizes. The payoff between the two gambles on each row remains constant, with only the probabilities changing. The way to elicit the risk preference here is that the respondent usually prefers option A or B up to a certain point at which they switch their preference. This switch point is used to calculate their constant CRRA.

Suppose the MPL methodology is used similarly for eliciting time preferences. In that case, this is a way of jointly estimating both time and risk preferences without estimating loss aversion and modeling hyperbolic discounting in two steps. However, this setup is relatively advanced and assumes that the respondent has the numeracy skills to understand the setup. Jacobson and Petrie (2009) found that 51% of their respondents made inconsistent choices along with Charness and Viceisza (2016) who found that 75% of the farmers in rural Senegal make inconsistent choices which I wanted to avoid in my study. My intention for this survey was to make it as simple as possible to save the farmer's time and mental capacity, so I chose the Gneezy and Potters Method.

4.4 Eliciting Time Preferences

I follow Benhabib et al. (2010) framework to elicit present bias and hyperbolic discounting. Their article presents a framework in which they ask their participants about their preference for an immediate payment versus waiting different periods. They ask;

"*What amount of money, $x, if paid to you today would make you indifferent to $y paid to you in t days?"*

While Benhabib et al. (2010) use six time periods for the component *t;* I limit myself to four periods: six months, a year, three years, and five years. For the amount *y* that makes the farmers indifferent, I used 100 000 NOK to replicate the investment decisions farmers make in their own life. I simplified the Benhabib et al. (2010) set up to ensure a straightforward questionnaire. Israel, Rosenboim, and Shavit (2021) show that people tend to make impulse decisions when exposed to high cognitive load, which I want to avoid. These answers are inserted into the beta–delta model to estimate the farmer's present bias and hyperbolic discounting.

4.4.1 The $\beta\delta$ – Model

Hyperbolic discount functions are characterized by a relatively high discount rate over short horizons and a low discount rate over long horizons. This discount structure sets up a conflict between today's preferences and the preferences that will be held in the future (Laibson, 1997). When considering trade-offs between two future moments, a present-biased person would give more substantial relative weight to the earlier moment as it gets closer (O'Donoghue & Rabin, 1999). A time-consistent person would value consumption at any given time the same, no matter when asked, which tends not to be the case. If a person is asked how they would like to allocate their consumption, they would, in most cases, prefer a greater consumption now and less consumption later. However, when that later point arrives, they would have the same preferences as before, only wanting more consumption later. Whether consumers know this is their pattern determines whether they are *sophisticated* or *naïve* (O'Donoghue & Rabin, 1999).

The $\beta\delta$- model was specified by O'Donoghue and Rabin (1999). It states that for all periods, the individual's utility function can be modeled with a long-term time-consistent discounting factor δ plus a time-inconsistent discount factor β which captures the bias for the present, which the individual is tempted by. If $\beta < 1$ the individual is biased, they would prefer the utility now rather than in the future. Which can be illustrated by

$$U^t = (u_t, u_{t+1}, \dots, u_T) \equiv \delta^t u_t + \beta \sum_{\tau=t+1}^{T} \delta^\tau u_\tau \qquad (4.1)$$

$$where\ 0 < \beta, \delta \leq 1.$$

These parameters are calculated in my study as sketched by my supervisor. In the time preference task, they are asked to consider their endowments through four periods $x_0 = now$, $x_1 = six\ months,\ x_2 = a\ year,\ x_6 = three\ years,\ x_{10} = five\ years.$ Assuming that one period is six months. They would have a value function that can be described as

$$V(x_0, x_1, \dots x_t) = u(x_0) + \sum_{t=1}^{\infty} \beta * \delta^t * u(x_t) \qquad (4.2)$$

Assuming a linear per-period utility function where the utility of a hundred thousand would be a hundred thousand. Rewriting this I would get

$$V(x_0, x_1, \dots x_t) = 100K + \sum_{t=1}^{\infty} \beta * \delta^t * u(x_t)$$

Here we assume that the $u(x_t)$ is a linear, per-period utility function over the endowment where we assume that the utility of zero is zero. If I had utilized a multiple-time list setup to calculate the CRRA, I could have used this in the utility function[3]. However, this is not possible, and I therefore assume a linear per-period utility function. β and δ are the two discounting parameters described in the beta-delta model.

[3] I would have used Phelps and Pollak (1968)'s specification $u(x_t) = \frac{1}{1-\rho} x_t^{1-\rho} + b$

Given the four indifference questions the farmers where exposed to, these can be written as follows. Here 100K is short for 100 000 NOK and ~ meaning "indifferent to".

$$u(x_0) \sim \beta * \delta^1 * u(100K) \tag{4.3}$$

$$\beta * \delta^1 * u(x_1) \sim \beta * \delta^2 * u(100K) => u(x_1) \sim \delta^1 * u(100K) \tag{4.4}$$

$$\beta * \delta^2 * u(x_2) \sim \beta * \delta^6 * u(100K) => u(x_2) \sim \delta^4 * u(100K) \tag{4.5}$$

$$\beta * \delta^6 * u(x_6) \sim \beta * \delta^{10} * u(100K) => u(x_6) \sim \delta^4 * u(100K) \tag{4.6}$$

If the farmer is supposed to be indifferent to the utility at the different periods, it would mean that we can take values given by the farmers to calculate the utility at the different points in time and calculate beta and delta

$$u(x_0) = \beta * \delta^1 * u(100K) \tag{4.7}$$

$$u(x_1) = \delta^1 * u(100K) \tag{4.8}$$

$$u(x_2) = \delta^4 * u(100K) \tag{4.9}$$

$$u(x_6) = \delta^4 * u(100K) \tag{4.10}$$

Since beta is the parameter for present bias it can be calculated by setting the utility of period zero equal to period one. This will give a β that can be calculated by

$$\beta = \frac{u(x_0)}{u(x_1)} \tag{4.11}$$

If I had the possibility to calculate the CRRA to the risk task I would make the utility function subject to the CRRA, however, this is not possible. Therefore, to estimate beta I assume linear utility in each period. This would make the beta equal to,

$$\beta = \frac{100K}{x_1} \tag{4.12}$$

Here x_1 is the response given by the farmers to indifference question number one. And the three δ`s for each time-period after can be calculated by the utility functions for period one, two and six.

$$\delta = \frac{u(x_1)}{u(100K)} = \left(\frac{u(x_2)}{u(100K)}\right)^{\frac{1}{4}} = \left(\frac{u(x_6)}{u(100K)}\right)^{\frac{1}{4}} \tag{4.13}$$

However, because the farmers responded equally to questions two to four, I assume that $\delta = 1$. This does not make intuitive sense as the utility in the future is normally discounted. I know that a linear utility function does not make intuitive sense either as a consumer would rather have a mixed consumption between each period and cannot consume into infinity.

4.5 Norm-Nudge

After eliciting the farmers' risk, time preferences, and background characteristics, I wanted to test whether the willingness to invest could be affected by providing the descriptive investment norm. If there is a tendency for farmers to be more willing to invest if their peers are doing so, this could be helpful for regulators to be aware of in policymaking. If willingness to invest cannot be affected by providing the subjects with information on other farmers' investment patterns, this would indicate that policymakers need to take other actions if they want to increase the adoption rate. A randomized norm nudge is one way to elicit farmers' susceptibility to peer pressure.

4.5.1 Randomization

My randomization technique is a totally randomized "between-subjects" design. Based on a simple choice of a square or triangle figure, the respondents were randomized into control and treatment groups. This is a totally randomized design because I randomize the respondents based on a certain probability independently of background characteristics (Moffatt, 2016, p. 19). See **Figure 4**

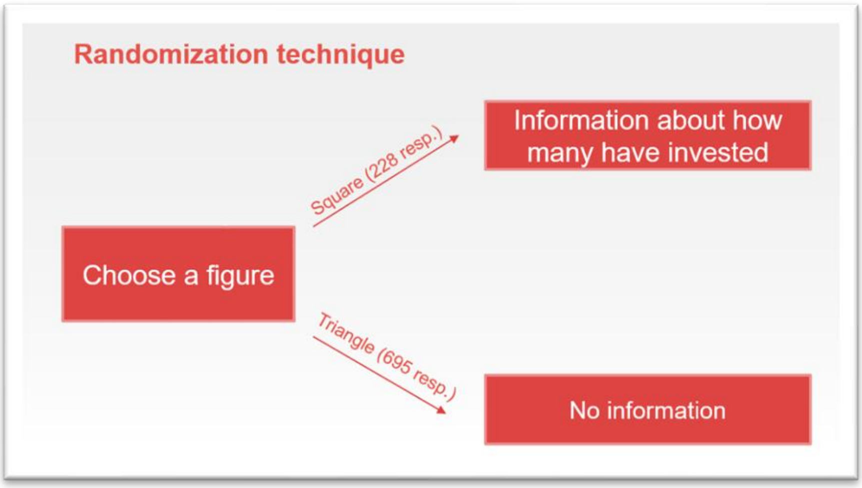

Figure 4 Randomization design

There are two leading randomization methods within experimental economics, either "between-subjects" or "within-subjects" design. A within-subjects design is characterized by each individual being exposed to more than one treatment, while in a between-subjects design, individuals are either in the treatment or control group (Charness, Gneezy, & Kuhn, 2012). Charness et al. (2012) argue that this assignment is done randomly. The causational relation is estimated by comparing the behavior of the different groups. The advantage of this method is that it is easy for the subjects to understand and for the experimenter to control. Since I only had one information treatment to expose the farmers to, it could cause the participants to understand what effect I wanted to measure if I exposed them to the control question of future adaptation and the treatment with the information, which is the “experimenter demand effect” (Zizzo, 2010). The “between-subjects” design sets higher demands for statistical power. However, this is not possible for my outcome variable since it is binary.

4.5.2 Descriptive Norm

The treatment in this experiment is intended to nudge farmers toward investing more. “A *nudge* is any aspect of the choice architecture that alters people’s behavior in a predictable way without forbidding any options or significantly changing their economic incentives” (Thaler & Sunstein, 2009). This norm would be a nudge because it is easy and cheap to avoid and should not change the incentive structure meaningfully.

The treatment group was informed about how many farmers had adopted climate-friendly practices when Ruralis conducted their “Trends in Norwegian Agriculture” survey in 2022. This information is intended to reflect the descriptive norm of Norwegian farmers since this study is conducted on a random representative selection of Norwegian farmers biannually. To properly reflect a descriptive norm, however, the information could not be provided as a growth trend since there has only been data collected on the adaptation of climate-friendly practices from 2020, and the survey was conducted in 2022. It should also be noted that only 8% of the representative population had adapted. This is why I framed it as an absolute number of how many had adapted, 1 400 farmers (Ruralis, 2002-2022). The effect of this descriptive norm will be discussed in the analysis section, and potential improvements will be discussed in Chapter 7.

4.6 Hypotheses

I hypothesize that the descriptive norm will nudge the farmers to be more willing to invest in the future. I believe the information about how many others have invested will increase the likelihood of others wanting to adopt, in line with Kuhfuss et al. (2016). This effect should be more significant for women than men as they are more susceptible to social cues. However, the literature states that descriptive norms affect investment in general. It should also be noted that most farmers have a negative attitude toward climate-friendly practices and feel like they are being pressured toward making these choices, even though they do not see the benefit from it.

H1: Descriptive norm provision increases willingness to invest in climate-friendly practices

While there are many different aspects in which men and women have different characteristics that influence their climate-friendly investment patterns, the leading behavioral factors elicited in this thesis are risk preferences and present bias. Men are found to be more risk-tolerant than women. Since the investment choice in this setting can be perceived as involving uncertainty in output, one could argue that women are less likely to invest. This is why I hypothesize that

H2: Risk preference are positively correlated with gender

Present bias will be the last behavioral trait elicited in my survey, as the literature shows that it is significant for investment patterns. A present biased person could be discouraged from investing in climate-friendly practices because there are more imminent costs associated with investing, and the benefits would occur, in some cases, after that person's lifespan. This is why I hypothesize that:

H2: Present bias is negatively correlated with gender

4.7 Testing for Treatment Effect

To test whether the treatment of descriptive norm has any effect on willingness to invest in the future, I will estimate the average treatment effect and test the direction of the treatment with an ordinary least squares (OLS) regression. The *average treatment effect* is the mean of each individual own treatment effect. This model specification origins from Moffatt (2016) *Chapter 2.2 The Average Treatment Effect*; however, it is customized to the setting in my study. Consider the effect of my norm nudge treatment on the willingness to invest in climate-friendly practices Y. Let T be the binary variable representing the treatment status of every individual: T = 1 for treatment; T = 0 for control. Let $Y_i(T)$ be the outcome for subject i given treatment status T. Assuming the following OLS regression for the outcome variable:

$$Y_i(T) = \alpha + \beta_1 X_i + \beta_2 X_i * T + \bar{\tau} T + \tau_i T + \epsilon_i \tag{4.15}$$

The α is the constant, X_i is observed individual characteristics, in my case gender, β_2 estimates the interaction effect between treatment and gender. $\bar{\tau}$ is the average treatment effect (ATE), τ_i is the subject specific treatment effect, where $E(\tau_i) = 0$. ϵ_i is an independent and identically distributed (i.i.d) random error term. The ATE may then be defined as:

$$\bar{\tau} = E(Y_i(1) - Y_i(0) = E[Y_i(1)] - E[Y_i(0)] \tag{4.16}$$

However, as the randomization technique does not allow both individuals to be in the treatment and control group, it is not possible to observe both the expected value of treatment and control in every individual. We can only observe the expected value of treatment, given that the subject has received treatment, and the expected value of the control group, given that they are in the control group. This is why it is only possible to find an estimate for the treatment effect ($\hat{\tau}$) rather than the actual treatment effect. Which can be estimated as

$$\hat{\tau} = E[Y_i(1)|T = 1] - E[Y_i(0)|T = 0] = E(Y_i(1) - Y_i(0) = E[Y_i(1)] - E[Y_i(0)] = \bar{\tau} \quad (4.17)$$

The treatment effect is unbiased as the randomization is independently distributed of any background characteristics of the subjects[4]. This would make the expected value of the error term equal to zero for all farmers, there should be no multicollinearity and no correlation between individual error terms, and the variance for each error term should be equal (Verbeek, 2017, p. 8). Equal variances for all error terms may not be the case in my dataset since the relationship I am estimating is binary and not linear, so I run the treatment test with robust standard errors. If the other Gauss- Markov conditions hold, which is likey, the estimator is the Best Linear Unbiased Estimator (BLUE).

One might wonder why I chose an OLS regression to estimate the treatment effect, and not a logit regression. When running a regression on a binary variable, the most common method is either a logit or probit estimation. However, in a logit or probit model, the coefficients are estimated by the maximum likelihood method (MLE). This estimation gives coefficients that cannot be interpreted straight from the model. They would have to be utilized to estimate predicted probabilities, which are "hidden" inside the logistic distribution (Stock & Watson, 2012), which makes the model coefficient estimates hard to interpret. Research also shows that the treatment estimate from one model specification cannot be compared to another due to the MLE estimation (Mood, 2010). Since I want to compare the treatment effect to a treatment effect with controls, the Logit specification irrelevant to this study.

4.8 Internal Validity

When I conducted the survey, several internal validity issues needed to be confronted. "*Internal validity* can be defined as the situation in which the inferences about causal effects in a statistical study are valid for the population being studied" (Stock & Watson, 2012, p. 808). Stock and

[4] See the balance sheet in Appendix ***Table A 1***

Watson (2012, pp. 515-519) mention five threats to the internal validity and I consider three to be relevant for this study: experimental effects, sample sizes and sample selection bias.

4.8.1 Experimental Effects

Experimental effects are behavioral changes because of being in an experiment, usually called *the Hawthorne effect* (Stock & Watson, 2012, p. 518). These effects are somewhat mitigated since the experiment is online. Online surveys create a double-blind in that I do not know anything about the subjects to put them in treatment and control, and they do not know if they are in the treatment or control group. This is why there should not be any change in behavior due to background characteristics. One weakness, however, could be that the subjects might have a preconceived notion about either my affiliations, or accumulate experiences in the experimental procedures that affect their responses. This could threaten the internal validity of my study, in which the results may be biased.

4.8.2 Sample Sizes

Power calculations can be done to estimate the right amount participants in an experiment to minimize the likelihood of conducting a Type I and Type II error. *Power* can be understood as the overlap between a sampling distribution of a population parameter under the null hypothesis and a sampling distribution under the alternative hypothesis (Sun, 2020). Sun (2020) states that the degree of overlap of the alternative distribution with the null distribution is the probability of a *Type II* error, the incidence in which we fail to reject the null hypothesis when it is false, which is represented by β. Power is the area under the alternative distribution which does not overlap with the null distribution $(1 - \beta)$, which makes power the probability of correctly rejecting a false null hypothesis (Sun, 2020). The standard level of β is 0.8, which would entail that we only allow 20% of the alternative distribution to overlap with the null distribution. This is not possible to estimate in my outcome variable, willingness to invest, because my outcome variable is binary. Since no parametric technique can measure the power efficiency of a dichotomized variable, it is not meaningful to elaborate further on this (Siegel & Castellan, 1988, p. 44). This could, however, result in the fact that I fail to reject the null hypothesis when it is false, and descriptive norm nudges do influence the willingness to invest.

4.8.3 Sample Selection Bias

Sample selection bias arises when a selection process influences the availability of data and that process is related to the dependent variable, beyond depending on the regressors.

Sample selection induces correlation between one or more regressors and the error term, leading to bias and inconsistency. (Stock & Watson, 2012, p. 365).

In this survey design, selection bias could be present at different levels. First, there could be a selection bias in climate-friendly farmers. If climate-friendly farmers are fundamentally different from "conventional farmers" this may threaten the internal validity of the study. One may argue that climate-friendly farmers are more likely to be "progressive" than conventional farmers. Therefore, willingness to invest could be correlated with omitted variables and therefore the error term.

Another selection bias could arise in the gender difference estimate. There could be arguments made as to female lead farms being more progressive than male lead farms. Because, before 2009 the inheritance law of farms in Norway stated that the firstborn son had the birth right to the farm, not the firstborn (Odelslova, 1975 Chapter III, §12). This made the inheritance process of family farms favor men over women. Over several decades, this may have created a precedence for a male dominated sector. When this ruling came along, the first female lead farms could be considered "progressive" in of them selves as they are breaking a tradition of only men inheriting the farm. This progressive choice could make the female lead farms more susceptible to other progressive measures on the farm, such as adopting climate-friendly practices. This correlation between gender and the omitted variable "progressiveness" could overestimate the willingness to invest between the genders.

4.9 External Validity

"Inferences and conclusions from a statistical study are *externally valid* if they can be generalized from the population and the setting studied to other populations and settings" (Stock & Watson, 2012, p. 807). Two such threats are nonrepresentative samples and irrelevant treatment. Since there are many ways regulators can provide nudges of information or descriptive norms to the farmers, I do not consider irrelevant treatment to be a threat to the external validity. The question of whether I have a representative sample, however, is worth elaborating on.

4.9.1 Representative Sample

To ensure the external validity of my study, I survey whether the background characteristics of my population are representative of the farmer population. If my respondents are not representative of the farmer population, it would not be possible for me to generalize my findings (Bracht & Glass, 1968). One main area for improvement of the external validity of this dataset is that it does not include all types of farmers: fruit, and vegetable farmers specifically. Since Nortura is a membership organization, fruit and vegetable farmers are typically not members in this organization. Because the survey was distributed through Nortura's membership database, fruit and vegetable farmers would not be a part of my population. This means that the external validity of my study is limited to livestock farmers.

Another threat to the external validity of my survey is the chance that only "environmentally friendly farmers" will complete the survey. This could be a self-selection mechanism in which the farmers who can state that they have invested in some of the production practices mentioned will continue to fill out the survey. In comparison, those who cannot fill out any of the boxes will not complete the survey.

4.10 Monetarily Incentivized vs. Non-Incentivized Experiments

I chose not to monetarily incentivize my subjects, and there are several reasons why. *Incentives* can be defined as features of the experiment that form a vital part of the "conditions" of an experiment (Bardsley et al., 2010). In line with this definition, monetary incentives need not be the only motivation farmers have to participate in a study. Loewenstein (2001) argues that monetary incentives may not guarantee the external validity of a study. He argues that although it makes sense to incentivize participants to filter out the alternative cost of participating in a study or put the participant into a profit-maximizing headspace, it still may not give the desired effect. The participant may still be motivated by "not appearing stupid" or acting appropriately. This could then influence the results, and even though it may not be a problem, monetary incentives may not contribute to the external validity of a study.

Thirdly, economic incentives could crowd out intrinsic motivation. Bardsley et al. (2010) argue that when an agent is pursuing an activity for the inherent satisfaction of the activity itself, a monetary reward may make the motivation less present. Bardsley et al. (2010) therefore argue that if incentives are to be used, they should be calculated carefully and reflect the desired effort levels of the participants. The authors also find that the effect of monetary incentives on performance is not monotonic. El Harib et al. (2015) found that the more they paid their participants, the more effort was produced, even though it might not be an improvement. One could argue that focusing on performance may be more of a distraction than motivation. The choice of economic incentive should therefore depend on the respondents' motivation. Since my survey was distributed through Nortura's membership database, with academic credibility from the University of Bergen and Ruralis, one could argue that loyalty to Nortura and could motivate the farmers to take the survey seriously, which is another reason why my survey is not incentivized. I cannot exclude the possibility of a conflict of interest if I used monetary incentives on an organization's members when partnering with a research foundation.

The other side of the coin states that monetary incentives have become one of the more critical parts of the choice architecture in economic experiments. Its importance is based on the argument that incentivizing participants will eliminate hypothetical choices and get unbiased estimates (Charness, Gneezy, & Halladay, 2016; Clot, Grolleau, & Ibanez, 2018; El Harbi, Bekir, Grolleau, & Sutan, 2015). El Harbi et al. (2015) find that when the stakes are high, stated preferences do not change, while when there are no incentives, the individuals may overestimate their positional concerns. When comparing psychological experiments to economic experiments, it has therefore become a trend to incentivize the participants.

5. Data and Descriptive Statistics

In this chapter, I will describe the state of climate-friendly practices in Norwegian agriculture. As few practices have yet to have an documented effect on emission reductions, I elicit those who have previously been mapped by Ruralis and are recommended by the Norwegian Farmers Union (Norges Bondelag, 2020). The dataset is generated through a survey I distributed to Nortura farmers as a UiB and Ruralis master student. In this chapter, I will describe and give an overview of the dataset. At the end of the chapter, **Table *3*** of all variable names is attached, which it is possible to refer to in the analysis.

5.1 Descriptive Statistics

My survey resulted in a dataset of 923 viable respondents with a gender distribution of 123 women and 800 men. **Table *2*** shows the means (standard deviations) of each variable for both men and women in the second and third rows, with a t-test of the difference between the genders in the fourth row. The table is divided into three subsections; the first section consists of basic statistics and the literature variables described in Dessart et al. (2019). The second subsection is the type of production the farmers' state is their primary production on the farm. The third and last subsection is the geographical distribution of farmers using counties. Remember, these statistics are made for only those who have not inherited any from their predecessors, which is why the total is 499, see Figure 6 Number of inherited climate-friendly practices.

Table 2 Summary statistics

Variables[5]	Female	Male	t-test
Invest	1.37(1.55)	1.82(1.51)	-0.45*
Inherit	0.014(0.11)	0.06(0.52)	-0.04
Dekar	3.38(1.69)	4.14(1.5)	-0.75***
Net Income	3.67(1.71)	4.1(1.69)	-0.45*
Animal units	0.0001 (0.00083)	0.67(4.7)	-0.67
Age	5.31(10.51)	49.6(11)	1.74
Risk preference	3(2.94)	3.9(2.6)	-0.94**
Beta	0.79(6.10)	0.03(0.5)	0.75*
Weather conditions	0.57(0.49)	0.54(0.49)	0.02
Neighbours invested	0.5(0.50)	0.63(0.48)	-0.13*
Subsidies received	0.52(0.50)	0.52(0.49)	-0.00
Subsidies exist	0.94(0.23)	0.86(0.34)	0.08
Advisor	0.05(0.23)	0.10(0.30)	-0.02
Knowledge	2.01(0.83)	1.97(0.77)	0.05
Responsibility	2.74(2.17)	2.50(2.13)	0.23
Climate calculator	0.28(0.45)	0.31(0.46)	-0.02
Type of production			
Cattle farmer	0.15(0.36)	0.20(0.40)	-0.04
Egg farmer	0.02(0.16)	0.03(0.18)	-0.008
Dairy farmer	0.12(0.33)	0.29(0.45)	-0.17**
Chicken farmer	0(0)	0.02(0.14)	-0.02
Pig farmer	0.05(0.23)	0.07(0.25)	-0.05
Sheep and goat farmer	0.55(0.50)	0.31(0.46)	0.24***
Other productions	0.07(0.26)	0.05(0.22)	0.02
Regions			
Oslo and Viken	0.10(0.30)	0.10(0.31)	-0.00
Innlandet	0.22(0.42)	0.18(0.38)	0.04
Agder	0.02(0.15)	0.04(0.21)	-0.02
Rogaland	0.05(0.23)	0.09(0.29)	-0.04
Møre and Romsdal	0.05(0.21)	0.07(0.26)	-0.02
Trøndelag	0.19(0.39)	0.21(0.41)	-0.02
Nordland	0.10(0.31)	0.06(0.25)	0.03
Troms and Finnmark	0.05(0.21)	0.04(0.21)	0.00
Vestland	0.17(0.38)	0.14(0.35	0.03
Vestfold and Telemark	0.01(0.09)	0.02(0.13)	-0.01
N	70	429	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The seven variables significantly differ between genders: investments in climate-friendly practices, agricultural land, net income, risk preferences, beta, chicken farming, and sheep and goat farming. Male farmers have on average larger farms in agricultural land than women. The average size of a male lead farm is 200 dekar while women, on average, have a little less than 200 dekar. Men, on average, have a net income of 100 thousand NOK, while women have less

[5] See **Table 3**: Variables for an explanation of the variables

than that. On risk preferences, men tend to be more risk willing than women. No statistically significant difference exists between men and women in any of the other behavioral variables. It should be noted, however, that the responsibility for climate change variable is categorical and signifies different societal figures. However, the distribution is not statistically different for men and women.

5.2 Investment in Climate-Friendly Practices

From the data, I will display a histogram of how many climate-friendly practices have been adopted by the population and how many have inherited these practices. The two graphs below are the number of investments carried out by the current farmer and inherited, respectively, on the horizontal axis and the frequencies on the vertical axis.

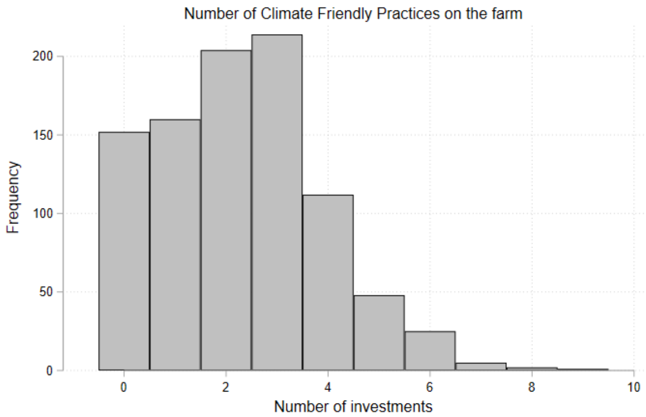

Figure 5 Number of climate-friendly practices carried out by the current farmer

The table reports a left-skewed distribution of climate-friendly investments among farmers. The mean is 2.3(1.6). On the other hand, those who have practices on the farm rarely have more than four. These could be the four that are "easier" to implement: increased energy concentration in forage, deposition of animal manure, precision spreading of fertilizer, and drainage of the fields. Some may argue that these are simply agronomical practices and not only a GHG reduction initiative, so it may be more interesting to analyze farms with more than five or more investments. This, however, is speculation only, and I will consider all the investments when analyzing what a climate-friendly farm is.

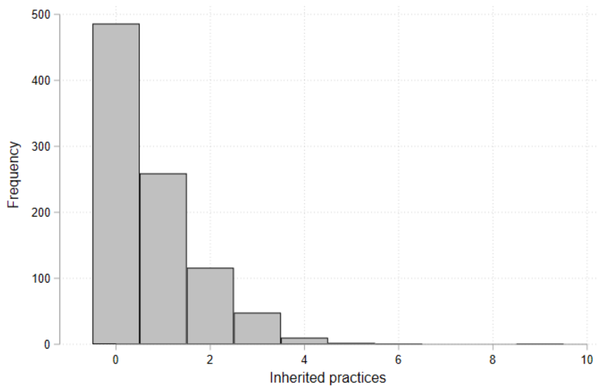

Figure 6 Number of inherited climate-friendly practices

Figure 6 reports that most of those who have inherited climate-friendly practices on the farm. The average number of inherited practices is 0.75(1.0). This would indicate that 95% of farmers have inherited less than two climate-friendly practices. This indicates a low inheritance rate; however, one outlier inherited all nine practices. This is a farmer who is 70 years old, which could indicate that either this is a highly climate-friendly farm that started early to implement climate-friendly practices, or it is a farmer who did not understand the question. This could be the case if they inherited the farm 40 years ago when most practices were not on the market.

When I analyze the characteristics of climate-friendly farmers, I will limit the study to those who report that they have not inherited any climate-friendly practices. I cannot guarantee that those who have inherited these practices would have made the conscious choice themselves. Since they grew up with climate-friendly parents, they most likely have the same values as them. However, this is an unknown that I want to eliminate. To get the most precise picture of who invests and who does not, I will restrict the analysis to those who report not having inherited any of the practices.

5.3 Representativity

Representativity is measured on four dimensions: gender, age, geographical location, and production type. For representativity on the geographical location of Norwegian farmers and the gender distribution, I use data from Statistics Norway (2022b). When testing representativity for age and geographical location, I compare my study to the Trend in Norwegian agriculture survey since this format is more comparable to the official data from Statistics Norway.

The gender distribution in my survey, a 13/87 percent split, reflects the gender distribution in Norwegian agriculture since there are only 17,1% women in the industry as of 2022 (Bjørlo & Øverby, 2023). It is also close to the gender distribution in the Trends Analysis with a 16/84 split (Ruralis, 2002-2022). The mean age of the respondents is 48 years, with the youngest respondent being 18 and the oldest 80 years. 95% of the respondents are in the age group of 37-59. This age distribution indicates that the dataset captures many stages of the farmer's life. Burton and Otte (2022) note that a farmer is in the early stages of their career, around 35. The age distribution in my survey deviates slightly from that of Ruralis. They have a mean age of 55 (std.12), with the youngest being 21 and the oldest being 88 (Ruralis, 2002-2022).

Geographically all regions of Norway are represented; however, some seem to be underrepresented. In **Figure 7** I compare the geographical distribution of farmers in Norway (Statistics Norway, 2022b) to my population distribution. Percentages of the total population illustrate both groups.

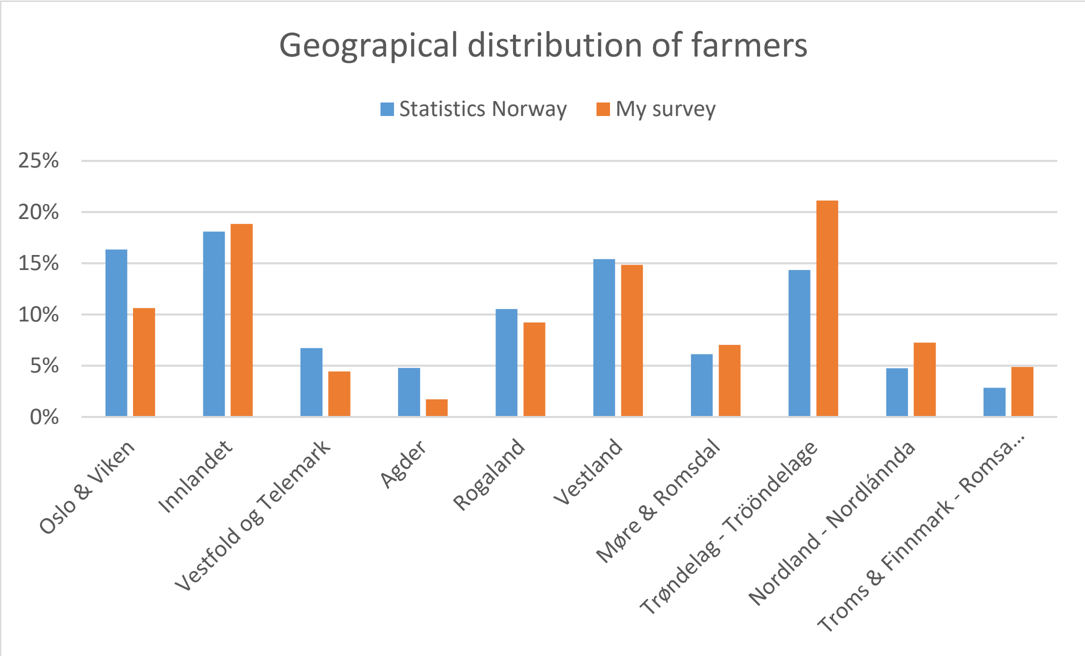

Figure 7 Comparing geographical distribution of respondents between my study and numbers from Statistics Norway

Most regions seem to be slightly underrepresented except for Rogaland, Innlandet, Vestland and Møre, and Romsdal. I have a slight overrepresentation of farmers from Trøndelag. These distributional differences may affect the regional controls.

The main difference between Ruralis' dataset and mine is that my respondents are only Nortura farmers, while Ruralis had the opportunity to recruit farmers from all productions. Since my survey was distributed through Nortura's membership database, it would only include those who qualify for their membership. Nortura is a membership union for livestock producers; fruit and vegetable farmers would not qualify. Most of those who did qualify as Nortura farmers and entered the study have cattle or dairy products as their primary production. Compared to the Ruralis dataset, I have a slight overrepresentation of dairy and pig farmers. I also slightly underrepresent cattle, sheep, and poultry farmers. The distribution of the different productions is presented in **Figure 8**

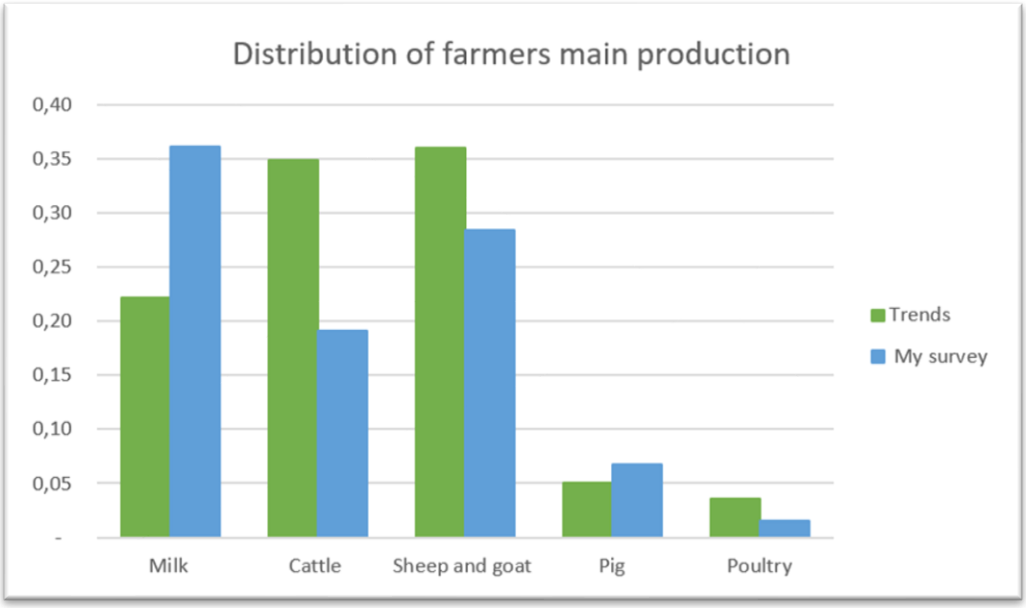

Figure 8 A comparison of main productions in Ruralis' study and mine

To compare the farms across productions, accounting for the different CO2 emissions depending on the animal, I equalize the CO2 footprints of each animal. This normalization allows me to compare the relative CO2 emissions on each farm. The number of animals and type of animal a farmer produces are normalized into "animal manure equivalent" (AME). AME measures how many animals are needed to produce 14 kg of phosphorus from their manure (Forskrift om organisk gjødsel, 2003). This is a way of normalizing the number of animals in the context of their greenhouse gas emissions to compare animals across species. The average animal units for women are 0.076(0.83) and 0.42(4.7) for men. However, the difference is not statistically significant. This variable will primarily serve as a control variable, so the coefficients are not as significant.

5.4 Variables

To make the regressions and analysis more transparent, I will provide a table of all variables and explain their meaning. This table will reflect the survey questions in A.4 in the Appendix.

Table 3 Variable names and description

Dependent variable		
Willingness to invest in the future	Capturing the willingness to invest in the recommended climate-friendly practices in the future	Dummy =1 if planning to invest =0 if not planning to invest
Independent variables		
Invest	A sum of the farmers who state they have invested in the climate-friendly practices.	Scale from 0-9 depending on how many practices the farmers have invested in.
Inherit	A sum of how many climate-friendly practices the farmer state they have inherited	Scale from 0-9 depending on how many practices the farmers have inherited.
Demographical independent variables		
Net Income	Net income variable on the farm	Categorial variable from 1-6 1: Negative income 2: 1 – 49 999 NOK 3: 50 – 99 999 NOK 4: 100 – 249 999 NOK 5: 250 – 399 999 NOK 6: Above 400 000 NOK
Dekar	Agricultural area on the farm in dekar	Categorical variable from 1-6 1: Under 50 dekar 2: 50 – 99 dekar 3: 100 – 199 dekar 4: 200 – 299 dekar 5: 300 – 399 dekar 6: Above 500 dekar
Male	Gender	Dummy variable =1 if male =0 if female
Age	Age of respondents	Continuous
Location	Different regions in Norway	10 Dummy variables for each region of Norway
Main income	Main production income on the farm	Categorical variable
Animal units	Normalizes the CO2 footprint of each animal's manure[6]	Weighted continuous variable based on how many animals the farmers state they have
Industry specific independent variables		
Advisor	Explains if the farmer has a certified sustainability advisor (CSA)	Dummy variable =1 =0

[6] See Forskrift om organisk gjødsel (2003)

Climate calculator	Explains whether the farmer uses a calculator to measure the CO2 footprint on their farm	Dummy variable =1 =0
Subsidies exist	Whether the farmer knows if there are subsidies programs for investments in climate-friendly practices in their region	Dummy variable =1 =0
Subsidies received	Whether the farmer has received subsidies to invest in climate-friendly practices	Dummy variable =1 =0
Weather conditions	Sufficient weather conditions for climate-friendly investments	Dummy variable =1 =0
	Behavioral variables	
Treatment	The descriptive norm provision, randomly assigned	Dummy variable =1 =0
Risk preference	Risky investment [7]	Dummy variable between 1-10
Beta	Present bias[8]	Continuous variable
Neighbors invested	Whether the farmer knows if their physical neighbors have invested in climate-friendly practices	Dummy variable
Responsibility	How much responsibility the farmer believes different societal actors have for CO2 mitigation	Categorical variable =1 if state =2 if municipality =3 if themselves =4 if farmers =5 if other sectors
Knowledge of investments	How much knowledge does the farmer think they have of climate-friendly investment	Categorical variable – Likert scale
Pressure	To what degree do the farmers feel pressured to invest in the climate-friendly investments.	Categorical variable – Likert scale

[7] See chapter X on eliciting risk preferences
[8] See chapter X on eliciting time preferences

6. Results and Analysis

The analysis is divided into four parts. First, I report the results from the risk and time preference task. Then I compare the gender differences in climate-friendly investments. Third, I map out who is willing to invest in the future to investigate whether there are some traits policymakers should be aware of for the future. Lastly, I test whether the willingness to invest in climate-friendly investments is malleable to descriptive norm nudges.

6.1 Risk Preferences

On average, the farmers chose 3.8 (2.7) risky seeds and 5.9 (2.8) safe seeds in the risk preference task. The distribution is displayed in the histograms below. The left diagram displays the distribution for the risky seeds and the right diagram displays the safe seeds. In both diagrams the x-axis is the number of risky, and safe seeds, invested, respectively, and the y-axis is the frequency.

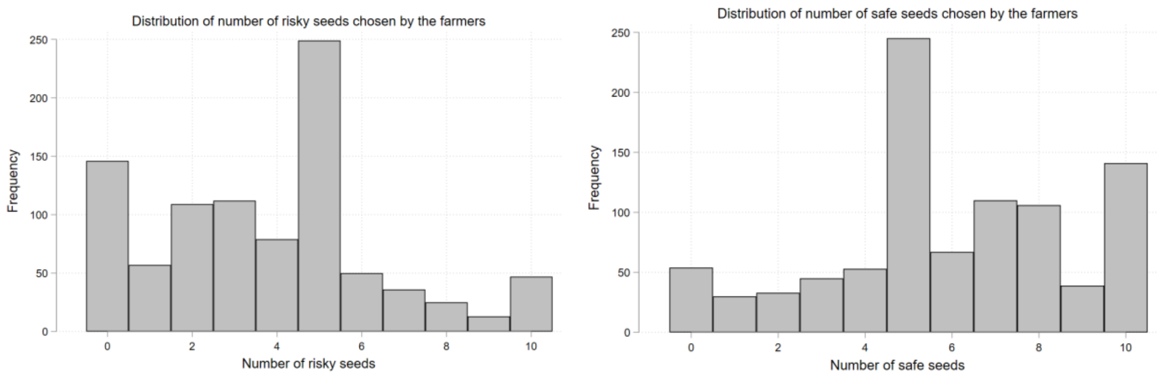

Figure 9 Distribution of risky and safe seeds

In the right diagram there is a clear spike at five seeds and a more left-skewed distribution of the risky seeds, and a right skewed distribution on the safe seeds, diagram to the right. This could indicate that the respondents display a preference for less risk. On average, women invested in 3.2 (2.8) risky seeds, while men invested in 3.9 (2.6) risky seeds. This difference is statistically significant ($p = 0.007$). Women, on average, choose 6.38 (3.1) safe seeds, and men choose 5.8 (2.7), which is significant ($p = 0.04$). These results indicate that female farmers are more risk-averse than male farmers.

6.2 Time Preferences

The responses given by the participants indicate a misunderstanding of the task. In the preliminary analysis, I discovered that the respondents' answers ranged from zero to two hundred million, indicating an insensible present bias. The initial question was, "What amount of money would make you indifferent to receiving 100 thousand in six months?". The farmers have provided the same amount for all four questions. This result states that the farmers require the same amount of money to be indifferent to 100 thousand NOK in six months and three years. This would entail a $\delta = 1$.

However, the beta estimation, present bias, provides slightly more heterogeneity than the other questions. I have estimated the mean beta for the population to be 0.31 (std. 5.03). The results indicate a significant gender difference in the population, women exhibit a present bias of 0.75 (6.1), and men exhibit a present bias of 0.03 (0.5), see **Table *2***. From the $\beta\delta$-model, we know that the closer beta is to zero, the larger the present bias. This indicates that the population is presently biased. Women exhibit less present bias than men. However, the high standard deviations suggest that many of the responses are close in proximity. 838 of the 923 farmers responded within the range of 0 and 5; this would capture 90% of the population. The frequency is illustrated in the graph below.

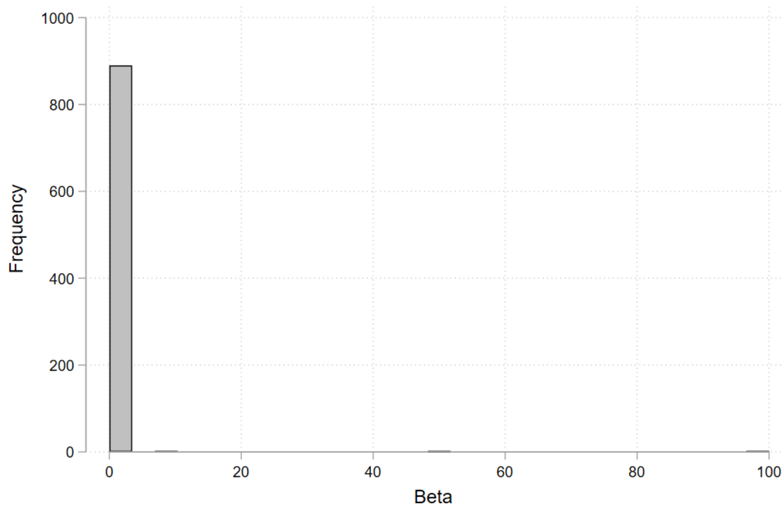

Figure 10 Distribution of Beta – present bias

Figure 10 shows the frequency for beta, estimating the present bias. There is a clear spike where the beta is equal to one. 43% of the respondents report that the amount that makes them indifferent to 100K in six months is 100K.

6.3 Gender Differences in Climate-Friendly Investments

The analysis of gender differences in climate-friendly investments is divided into two parts. First, I analyze whether there are any gender differences in the nine recommended practices. Then I will group the climate-friendly investments together to analyze the behavioral and agronomical differences between a female and male lead farm. The profiling of climate-friendly farmers is based on the farmers who did not already have any climate-friendly practices when they took over the farm from their predecessor.

My results indicate that men and women adopt different kinds of climate-friendly practices. **Table A *2*** in the appendix shows a positive correlation between men, precision spreading of fertilizer, and increased energy concentration in forage. These practices reduce both GHG emissions and improve the agronomic conditions on the farm. Renewable heating sources are the only investments to reduce GHG emissions, which show no significant correlation with the gender variable. On the flip side, if women invest, they are more likely to be in catch crops. There is a significant negative correlation between no investment and gender, meaning that women are more likely to not invest.

To give an overview of the differences between a male lead farm and a female lead farm, I run pairwise correlations between gender (1) and background characteristics, including agricultural area (3), climate-friendly investments (2), net income of the farm (4), risk preferences (8) and primary production (15, 17). The gender variable is coded 1 = male and 0 = female. Table 4 is a shorter version of the full correlation matrix **Table A *3***.

Table 4 Pairwise correlations between gender and background characteristics

Variables	(1)	(2)	(3)	(4)	(5)	(9)
(1) Male	1.000					
(2) Invest	0.103*	1.000				
	(0.022)					
(3) Willingness to invest in the future	-0.004	0.412*	1.000			
	(0.947)	(0.000)				
(4) Agricultural area	0.164*	0.400*	0.237*	1.000		
	(0.000)	(0.000)	(0.000)			
(5) Net income	0.093*	0.218*	0.171*	0.537*	1.000	
	(0.038)	(0.000)	(0.004)	(0.000)		
(9) Risk preference	0.122*	0.116*	0.108	0.065	0.122*	1.000
	(0.006)	(0.010)	(0.070)	(0.146)	(0.006)	
(10) Beta	-0.112*	-0.043	0.046	-0.081	-0.077	0.035
	(0.014)	(0.346)	(0.446)	(0.078)	(0.093)	(0.449)
(13) Neighbors	0.096*	0.310*	0.287*	0.234*	0.136*	-0.007
	(0.033)	(0.000)	(0.000)	(0.000)	(0.002)	(0.876)
(18) Pressure	0.118*	-0.023	-0.075	0.095*	0.033	-0.032
	(0.008)	(0.602)	(0.209)	(0.033)	(0.460)	(0.482)
(23) Sheep and goat farmer	-0.177*	-0.229*	-0.095	-0.505*	-0.390*	-0.143*
	(0.000)	(0.000)	(0.108)	(0.000)	(0.000)	(0.001)
(25) Dairy farmer	0.132*	0.120*	0.072	0.368*	0.322*	0.102*
	(0.003)	(0.007)	(0.224)	(0.000)	(0.000)	(0.022)

**** $p<0.01$, ** $p<0.05$, * $p<0.1$*

The variables in the columns are numbered and correspond to the same number in the rows; and for reference, the variable name is given in the left column. I will mainly focus on the correlations in row one: the variables who significantly correlate with male (1). All correlations are Bonferroni-Holm adjusted[9]. This table only describes the farmers who did not inherit any climate-friendly practices from their predecessors and is important to note for interpreting the results.

Table 4 displays the background characteristics significantly correlated with gender; There is a significant positive correlation between gender and climate-friendly investments (2). This would indicate that men are more likely to have invested, and as the number of investments increases, those respondents are more likely to be male. This result is in line with the finding from gender differences the different climate-friendly practices mentioned above.

The correlations between male (1), agricultural area (4) and net income (5) are significant. The correlation between agricultural area and gender is positive which would indicate that men have larger farms, in terms of agricultural area, than women. Men also tend to have higher net income than women. Interestingly, there is a 52% statistically significant correlation between net

[9] See Appendix on Bonferroni Holm adjustments.

income (5) and agricultural area (4). Which could indicate that the size of the farm may be driving some of the income.

There is a significant positive correlation between risk preference (9) and male (1) on the behavioral specter. This could indicate that men are more risk taking than women, as previously stated from the t-test in Chapter 5.1. What is interesting is how this tie in with other agricultural objectives. For example, risk preference (9) positively correlates with investments in climate-friendly practices (2). This could explain why few farmers have invested. Since the risk preference task results indicated that most Norwegian farmers are risk averse, especially women, they might shy away from the risk involved in climate-friendly practices. Risk preference is also significantly correlated with net income (5). This could indicate that greater risk preference could lead to higher rewards. This, again, could explain why women have lower net income than men because they are more risk-averse than men.

These results indicate that men are more present-biased than women. Since a significant negative correlation exists between beta (10) and male (1), it would indicate that women are more likely to have reported a higher beta. The closer beta is to one the discount function becomes closer to exponential discounting. The table indicates that there is no significant correlation between risk preference and beta.

Out of the Dessart et al. (2019) variables, pressure (18) and neighbors (17) are significant. The neighbor's variable (17) reports how many farmers have neighbors who have invested in climate-friendly practices. This positive correlation indicates that men are more likely to report having neighbors who have invested. Which is also positively correlated with the farmers' own investment in climate-friendly practices (2), willingness to invest in the future (3), agricultural area (4), and net income (5). The pressure variable is a Likert scale to what degree the farmers feel pressured to adopt climate-friendly investments. There is a positive correlation between the degree farmers feel pressured and males (1), which could indicate that men feel more pressure than women. The pressure (18) also significantly correlates with the agricultural area (4).

These results indicate that a male lead farm is more likely to invest in climate-friendly practices than female lead farms. This farm has a larger agricultural area, a higher net income, and is most likely a dairy farm. It should, however, be noted that these correlations do not control for any of the other variables. Much of the correlations might be explained by men taking more risks than women.

6.4 Who is Willing to Invest in the Future?

A part of increasing the adaptation rate of climate-friendly investments involves identifying individuals or groups who are willing to invest in the future. This part of the analysis is based on the subgroup of farmers who state that they did not have any climate-friendly practices when they took over the farm and are willing to invest in these practices in the future. The respective correlations are given in **Table *5***, see appendix **Table A *4***

Table 5 Willingness to invest in the future

Variables	(1)	(2)	(3)	(4)	(5)
(1) Willingness to invest in the future	1.000				
(2) Invest	0.412*	1.000			
	(0.000)				
(3) Male	-0.004	0.103*	1.000		
	(0.947)	(0.022)			
(4) Agricultural area	0.237*	0.400*	0.164*	1.000	
	(0.000)	(0.000)	(0.000)		
(5) Net income	0.171*	0.218*	0.093*	0.537*	1.000
	(0.004)	(0.000)	(0.038)	(0.000)	
(12) Knowledge	-0.278*	-0.210*	-0.023	-0.119*	-0.071
	(0.000)	(0.000)	(0.609)	(0.008)	(0.113)
(13) Neighbors	0.287*	0.310*	0.096*	0.234*	0.136*
	(0.000)	(0.000)	(0.033)	(0.000)	(0.002)
(14) Advisor	0.260*	0.181*	0.051	0.160*	0.149*
	(0.000)	(0.000)	(0.253)	(0.000)	(0.001)
(15) Climate calculator	0.267*	0.199*	0.020	0.313*	0.222*
	(0.000)	(0.000)	(0.655)	(0.000)	(0.000)
(16) Weather	0.372*	0.179*	-0.018	0.151*	0.159*
	(0.000)	(0.000)	(0.686)	(0.001)	(0.000)
(21) Chicken farmer	0.148*	-0.008	0.055	-0.031	0.118*
	(0.012)	(0.854)	(0.222)	(0.486)	(0.008)

**** $p<0.01$, ** $p<0.05$, * $p<0.1$*

The variables in the columns are numbered and correspond to the same number in the rows; for reference, the variable name is given in the left column. I will mainly focus on the correlations in row one: those who report they are willing to invest in the future. This table only describes the farmers who did not inherit any climate-friendly practices from their predecessors and is important to note for interpreting the results.

First, it should be noted that there is a significant positive correlation between those who are willing to invest in the future and those who report having already invested in climate-friendly practices. This could be interpreted as the number of climate-friendly investments on farms increases; it is more likely for them to be willing to plan for further investments. There is no significant gender difference in willingness to invest in the future, which could indicate that women do not shy away from the investment when time passes, and the perceived risk decreases.

Farmers willing to invest in the future are also more likely to have larger agricultural areas and high net income. The table also displays a positive correlation between net income and the agricultural area, as previously noted. This result could indicate that farmers who plan to invest in the future want some risk diversification in larger agricultural areas and high net income. It is, therefore, not surprising that agricultural area and net income are positively correlated with willingness to invest in the future.

Knowledge of climate-friendly practices is negatively correlated with willingness to invest in the future. Since knowledge is a Likert scale variable where a high value indicates little to no knowledge of climate-friendly investments, this coefficient should be interpreted with caution. It states that little to no knowledge of climate-friendly practices is associated with little plans to invest in the future. The knowledge-increasing initiatives, advisor, and climate calculator positively correlate with willingness to invest in the future. Neighbors who have invested are significant for willingness to invest in the future, which is also a knowledge-increasing factor. Neighbors could mitigate the start-up costs. Good weather conditions also seem significant for willingness to invest in the future. Lastly, the results indicate that chicken farmers are more likely to be willing to invest in the future than other farmers.

6.5 Treatment Effect

The effect of descriptive norms on willingness to invest in climate-friendly practices was not significant in this experiment. The treatment and control groups are balanced, see **Table A *1*** for the balance sheet. This would indicate that climate-friendly investment decisions are not easily influenced by norm nudges. Even when controlling for background characteristics, the treatment effect remains insignificant. The regression result is displayed in **Table 6** Treatment Effect of nudge. The rows consist of the coefficients of gender, treatment, the interaction between the two, the risk and present bias, farmers own investment, and the constant. Lastly, the number of observations and the adjusted R2 is added at the bottom.

Table 6 Treatment Effect of nudge

Variables	(1) Willingness to invest in the future	(2) Willingness to invest in the future	(3) Willingness to invest in the future	(4) Willingness to invest in the future
Treatment	0.084	0.052	0.068	0.058
	(0.050)	(0.149)	(0.135)	(0.127)
Male		-0.078	-0.222*	-0.200
		(0.082)	(0.110)	(0.116)
MaleXtreat		0.036	0.037	0.070
		(0.158)	(0.144)	(0.135)
MaleXrisk			0.024	0.020
			(0.023)	(0.023)
Risk preference			-0.001	-0.002
			(0.022)	(0.021)
Beta			0.002***	0.003*
			(0.001)	(0.001)
Invest			0.104***	0.063***
			(0.013)	(0.015)
Inherit				-0.046*
				(0.020)
Constant	0.478***	0.548***	0.349**	0.214
	(0.026)	(0.077)	(0.106)	(0.197)
Observations	503	503	457	457
Adjusted R^2	0.0035	0.0016	0.163	0.288

Standard errors in parentheses. Number of observations are limited due to responses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Since the coefficients for treatment, gender, and the interaction between the two are not significant on the 5% level, I cannot discard the null hypothesis of no treatment effect. My results indicate that the preference for climate-friendly investments is not susceptible to norm-nudging. The model specification does not affect the pure treatment effect, and the significance does not change with a logit or probit estimation for these three variables; see **Table A *8*** in appendix for logit specification.

In the third model specification, I include the interaction between gender and risk, risk preference, beta, and investment pattern. These controls do not change the significance of the treatment effect. Here the male coefficient becomes significant in a negative direction, indicating that women could be more inclined to report to be willing to invest in climate-friendly practices in the future. The controls invest, inherit, and beta are significant. This could indicate that previous experiences with climate-friendly practices affect the willingness to invest in the future. The investment coefficient is positive, which could indicate that farmers who have climate-friendly practices on their farms are more willing to invest in the future.

In the fourth and last model, I control all background characteristics, such as age, location, primary production on the farm, and all the Dessart et al. (2019) variables. The invest, inherit, and beta variables are also significant in these models. However, those who have inherited them are less likely to invest in the future. This could be an indication of the fact that those who inherit climate-friendly practices do not share the same beliefs as their predecessors. Furthermore, the coefficients are significantly smaller, indicating that the previous models' coefficients were overestimated. Robustness tests for this treatment effect are added in the appendix.

Even though my outcome variable is binary, I choose to do a treatment test with a linear regression model. I choose to report the linear regression results and conclude with no treatment effect because Mood (2010) shows evidence of the coefficient estimates changing independently of uncorrelated dependent and independent variables. The nonlinearity of the maximum likelihood estimator (MLE) makes it challenging to compare effect sizes as it depends on where along the logit curve it occurs. This makes it irrelevant to compare model specifications and stepwise build out the treatment effect as done in this analysis. Ai and Norton (2003) also find that interpreting interaction effects in the logit model would not be the same as a marginal increase. This would have complicated my analysis since I want to include the interaction term for gender and treatment and include an exploratory interaction between gender and risk.

7. Discussion

This chapter is divided into two parts; a discussion of the results found in the analysis and improvements for future research. There were several parts of this research project that I would change looking back, which I would urge future researchers to consider.

7.1 Results

This thesis analyzed gender differences in climate-friendly practices in Norwegian agriculture and whether a norm nudge could influence the willingness to invest. The analysis was done based on a dataset I gathered from my survey. This survey elicited the background and behavioral characteristics of Norwegian farmers. After gathering this information, I tested whether the willingness to invest was impressionable by descriptive norms.

7.1.1 Gender Differences in Investments

I find that women are significantly less associated with climate-friendly practices compared to men. Men are more likely to be associated with investment in precision spreading of fertilizer and improved energy concentration of their forage. If women are associated with investments, it is catch crops. There could be several reasons for this. Firstly, cropping plants that store carbon from the air in the crop may require little effort and resources from the female farmer. Women in my study generally report to have fewer resources, in the sense of net income and agricultural area, which may lead them to either invest in practices that require little resources, such as catching crops or not invest at all. Lack of access to resources has been found to explain much of the gender differences in sustainable investments (Gebre, Isoda, Rahut, Amekawa, & Nomura, 2021; Ndiritu, Kassie, & Shiferaw, 2014; Quisumbing, 1995). Therefore, future research should consider this and investigate if the resource gap could be mitigated by differentiating subsidies based on the individual's propensity to risk.

The gender difference in climate-friendly practices could also indicate that men mainly adopt agronomically sensible climate-friendly investments. Precision fertilizer spreading could be categorized as a cost-minimizing initiative where the resources are more effectively utilized. Improved energy concentration in forage could also be an efficiency measure. These findings align with some of the research mentioned in Chapter 3, which points out that farmers invest if it aligns with farming objectives (Dessart et al., 2019). Even though Dessart et al. (2019) do not have a gender perspective, these findings could extend their line of research.

On the behavioral side, women tended to be more risk averse than men, which confirms my second hypothesis of gender differences in risk preference. In Table 4 it seems like risk could be one of the main drivers for investment in climate-friendly practices. Since there are statistically significant differences between men and women in risk preference, this could indicate why women invest less. My results also point toward a significant correlation between risk preference and net income, which could explain why men were more likely to have a higher net income than women. This result aligns with the literature on gender differences in risk preferences (Charness & Gneezy, 2012). If women have smaller farms, less income, and take less risk, this could also indicate a gender difference in access to resources. Which is again in line with the literature mentioned earlier in the chapter.

While Greiner et al. (2009) find that sustainable practices negatively correlate with economic objectives, I find a significant positive correlation between investment in climate-friendly practices and net income. I also find a positive correlation between net income and willingness to invest in the future. This finding could indicate that financial stability affects a farmer's long-term investment choices. Greiner et al. (2009) also find that intrinsic motivation is significant for adopting sustainable practices. This could be why I do not find any correlations between net income and investments. Future research could investigate ways of estimating "intrinsic motivation," either by fairness preference tasks or social preference games.

Furthermore, the gender difference in climate-friendly adaptation may be due to the nature of the farms run by women and men. My results indicate that women are associated with sheep and goat keeping, while men are associated with dairy farming. I also find a significant negative correlation between climate-friendly practices and farmers who keep sheep and goats, while dairy farmers are positively associated with climate-friendly practices. At first glance, one might think that this could indicate that dairy farmers are more interested in reducing GHG emissions than sheep and goat farmers. However, this difference could be due to differences in the farmers' gender. The primary production of farmers could therefore be a bad control for willingness to invest in climate-friendly practices.

On the other hand, it should also be noted that sheep, goat, and dairy farmers have a comparative advantage in adapting climate-friendly practices. There are more climate-friendly practices applying to sheep, goat, and dairy farming. These farmers could invest in more practices than, say, a pig farmer. Since a pig does not have the same methane production in the digestive system as a cow, they do not have to increase the energy concentration in their forage, which makes them "more climate-friendly" per se. Investments a pig farmer could make are for example renewable heating sources, however, these require more capital and probably involve more risk. This could be a barrier of entry for female pig farmers as women are associated with less risk tolerance and capital. The primary production variables could therefore capture the difference in how many climates friendly practices apply to the different productions and not simply the gender difference. Another factor that could influence these estimates an overrepresentation of dairy farmers and an underrepresentation of sheep and goat farmers.

7.1.2 Time Preferences

The specification of linear per-period utility is at best a simplification. Standard economic theory normally assumes a concave utility function in which the marginal utility is decreasing. There are several other specifications that could have been more relevant for the $\beta\delta$-model. If I had calculated the constant relative risk aversion (CRRA) of the farmers, then this could have modified the incline and shape of the per-period utility curve.

The responses given by the farmers indicate that they have a $\delta = 1$. This result is inferred by the fact that the farmers reported identical answers to time-preference questions two - four, which is why they are difficult to interpret; see Chapter 6.2 on time preferences. This could either entail an indifference toward consumption in six months and future periods or a lack of comprehension regarding the distinction between the time preference questions, providing consistent but potentially inaccurate responses. Considering the data, estimating $\delta's$, the long-term discounting factor, therefore become irrelevant because of the consistency in responses.

One explanation for this could be that the farmers had been confronted with a cognitively challenging task, i.e., the risk preference task, and when confronted with another cognitive challenge that looked similar which may have increased the chance of impulsive choices and, thereby, a response error. Israel et al. (2021) tested time preferences under cognitive load and found that the subjects were more likely to be present-oriented and more impulsive under high cognitive load. Suppose the farmers found the risk elicitation task unusual and required cognitive effort. In that case, the following time preference question may have led them to make an impulse decision and answer the questions identically. This hypothesis could be why my results of the time preference questions may align with Israel et al. (2021). Improvements for future research to mitigate a high cognitive load could be to choose the multiple price list set-up. This improvement could make the participant less exposed to cognitive fatigue.

Another weakness of this question could be that it is not economically incentivized. As mentioned in Chapter 4.10, there are arguments in experimental literature that if experiments are not incentivized, respondents will not take them seriously. Since my survey was not incentivized, I cannot exclude the possibility that the farmers did not consider the questions carefully. However, Loewenstein (2001) argues that monetary incentives cannot guarantee to filter out experimental effects, such as cognitive fatigue.

There is slightly more heterogeneity in the beta estimation. I find a significant negative correlation between beta, the present bias, and gender. This indicates that women are more likely to report a β closer to one, making men the more present biased. This result could be in line with Balakrishnan, Haushofer, and Jakiela (2020) who find that farmers are present biased, however, my result modifies the finding by pointing to a significant assoication between men and present bias.

7.1.3 Treatment Effect

When testing for a treatment effect, there are several aspects to discuss. Firstly, the choice of model to test the treatment effect. When dealing with a binary outcome variable, the most intuitive choice of the model specification would be a logit or probit estimation, as it limits the coefficient estimates of the regression to values between 0 and 1. The maximum likelihood estimator (MLE) would also estimate the coefficient according to the values most likely to predict the observed data (Stock & Watson, 2012, p. 438). However, since the MLE is done based on what variables are included in the model, the coefficient estimates for each variable would vary for each model. This is one of the reasons why Mood (2010) argues that comparing coefficient estimates across models is difficult. This result is regardless of whether the coefficients are uncorrelated, so it would not be possible to compare the clean treatment effect in a logit model with another model, including controls, to filter out noise.

Due to these concerns regarding the interpretation and comparison of a logit model, I chose to do a treatment test through a linear regression model. I do this because with robust standard errors, the model and the coefficient estimates should be unbiased for the treatment effect, and I can include controls to filter out noise. I do, however, not claim that the other coefficients are unbiased. These can be correlated with each other and the error term, which is why they are not interpreted. They only filter out noise in the treatment effect. I find no statistically significant effect of descriptive norms on the general population's willingness to invest in the future.

However, there are several limitations to the OLS regressions as well. First, the OLS regression does not limit the coefficients to only 0 and 1. This makes interpreting coefficients above the cut-off or around the limit difficult. My treatment and gender coefficients, however, do not come close to being outside of the interval of zero and one, which is why it is of no concern to me. Since my gender and treatment variable are both binary, it may explain why it would be unlikely for these coefficients to be outside of that interval.

I think there are several reasons why I did not find a treatment effect. First, I think the design of the nudge could have been better. Since I did not elicit the farmer's prior beliefs of investment rate, I do not know whether the number was higher or lower than the farmers thought before receiving the information. The lack of control over prior beliefs may draw the treatment effect in different directions. If I had elicited previous beliefs and controlled for this, I could have tested if and how this descriptive norm corrected their previous beliefs.

Second, previous studies have found that descriptive norms alone do not affect behavior; it needs an injunctive norm to push (Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007). If I had added information about whether this number was "good" or "bad," it may have made the treatment effect more significant. However, this idea could have been problematic because there is a consensus in the farming community that there is too much pressure from the big cities for farmers to invest in climate-friendly practices. If I had added some messaging that "investment in climate-friendly practices is good," it could have given me more negative feedback and been considered partisan, which could lead to experimental effects that I want to avoid. Adding injunctive norms for a more robust treatment effect may not have been wise.

7.2 Recommendations for Future Research

Overall improvements to this study can be summarized into three categories, knowledge of the participants, internet surveys vs. in-person experiments, and selection bias problems.

Much of my troubles with this survey could have been mitigated if I had more time to get to know Norwegian farmers before sending out the survey. Looking back, I could have run a pre-survey to understand farmers' attitudes toward sustainability. I suspect this would have revealed a lack of enthusiasm toward the subject, judging by the feedback I got. Had I gotten some feedback on the question formulations before handing out the survey, it would have made me capable of changing the phrasing as well. Knowing the participant's numeracy and literacy level is a recommendation I make along with many other researchers.

A pre-survey was not executed due to limited resources and time. To my knowledge, I could not ensure that the farmers who were part of the pre-survey would not be a part of the actual survey. If these farmers had been included in the final survey, they could have skewed the results and risked the validity of my research. Instead, I sent the survey for approval and feedback to Ruralis, the head of survey distribution in Nortura, and my supervisor. Who helped to improve the quality of my survey.

While there are pros and cons with online and in-lab experiments, I believe some of the noise could have been mitigated if the study had been conducted in a lab. This set-up would give me more control over the participants and the possibility to explain the study in more detail. It could also have allowed me to randomize the participants into treatment and control groups before starting the experiment, making my study more causal.

The downside of a lab experiment is that it would have been more costly and most likely would not give as much diversity in responses. It cannot be guaranteed that I could have gotten as many responses as I did with a lab experiment as with the online survey format. The farmers live all over the country and could most likely not come to Bergen for the experiment as it would take time away from their work on the farm. Then the survey population should either be students or residents of Bergen, which would make it an entirely different study.

One selection bias that concerned me was that only farmers who had invested in climate-friendly practices would complete the survey. In the preliminary analysis, I found that 771 of the 923 farmers had climate-friendly practices on their farms, which could indicate a selection bias. However, the degree of investment varies among farmers. Most farmers have one or two practices that mitigate some selection bias and give a degree of GHG mitigation. I also noted that out of the 771 farmers who have invested in climate-friendly practices, 54,7% have inherited them from their predecessors. I only analyze those who have not inherited any of the practices. While there may be a high correlation between the predecessor's climate friendliness and the current farmer, there is no guarantee.

Another selection bias that should be considered is the systematic differences between female and male lead farms. One concern could be that the female lead farms are systematically different from the male lead farms because it is a progressive choice for a woman to inherit the farm, see subchapter 4.8.3. This argument could indicate that the females have an "openness" advantage compared to the male lead farms. This argument would indicate that women have a more significant advantage in willingness to invest in climate-friendly practices.

Whether or not this is present in my study can be discussed. I cannot exclude the possibility to some extent, as I do not know. However, I have some indicators. For example, there are no statistically significant differences in the responsibility for climate change question between the genders. This result could indicate that men and women take the same or lack thereof, amount of responsibility for climate change. Men and women have no statistically significant differences in their usage of certified sustainability advisors or knowledge of climate-friendly investments, which could be instrument variables for progressiveness. However, this is for future researchers to discover.

8. Conclusion

The Norwegian Farmers Union and The Norwegian Farmers and Smallholder Union have signed an intentional agreement with the Norwegian government to reduce GHG emissions from the sector with 5 million tons of CO2-equivalents by 2030 (Norges Bondelag, 2020). This is roughly equivalent to the annual emissions generated by the sector (Statistics Norway, 2022c). Zahl-Thanem and Stræte (2022) find that the adaptation rate for some of the recommended climate-friendly practices is low. With seven years to go, some measures could be taken if the parties want to increase the adaptation rate. The results in Chapter 6.5 indicate that norm nudges cannot easily influence the willingness to invest. This result disproves my first hypothesis and implies that the study cannot with certainty recommend any measures to increase the adoption rate.

While Dessart et al. (2019) make a comprehensive model of behavioral characteristics influencing the farmer's choice of sustainable investment, few studies have been done in Norway. Flaten et al. (2005) compare the risk preferences of conventional farmers versus organic farmers, and the Climplement project by Ruralis investigates the possibilities for investment in climate-friendly practices in Norway. My thesis is an extension of the Climplement project as I test whether there are gender differences in the recommended climate-friendly investments and if the willingness to invest is susceptible to a norm nudge.

I find results which indicate female farmers are less associated with invest in climate-friendly practices. One of the variables I found to be significant for this result was risk aversion, which confirms my second hypothesis, see Chapter 4.6. Thus, these findings align with literature that states women invest less in sustainable practices due to a lack of resources. Women are significantly associated with less resource intense practices, and no investment. Men are significantly associated with climate-friendly practices that make agronomically sense. Future research could investigate the associations I find between risk preference, net income, and agricultural land.

The third hypothesis in my study was that there is a negative correlation between gender and present bias, which I find indicating that men are more present-biased than women. These results should be cautiously treated as high cognitive load may have influenced them. Future research could elicit risk and time preferences jointly by multiple price list set-ups to investigate this result further.

I did not find any treatment effect of the norm-nudge on the stated willingness to invest in the future, even when including controls. Those who state they are willing to invest in climate-friendly practices within the next five years are typically chicken farmers who have already invested in some climate-friendly practices. These farmers were also associated with large agricultural areas, high net income, have hired a climate advisor, use the climate calculator, and report high degrees of knowledge of climate-friendly practices. These results suggest that knowledge and capital could be significant in influencing investment decisions. To mitigate the lack of investment among women, the government and the farmer organizations could consider measures to increase knowledge and resources, such as agricultural area and income, in their annual negotiations.

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Appendix

My appendix will first give a brief note on Bonferroni-Holm correction as this is the corrections, I make for the correlation tables. Secondly, I will give a balance sheet for the treatment and control group. Then I report the full correlational tables mentioned in the analysis, along with the full table for the treatment effect, robustness checks and logit specification are given. Later the recruitment message, survey questions and information leaflet are given at the end of the appendix.

A.1 Multiple Hypothesis Testing Correction

When tabulating the correlational matrix, I make sure that the correlations are corrected for multiple hypothesis testing. I do this because all the variables are endogenous and could make the coefficient significant without being truly significant. When testing multiple hypotheses within a dataset, the chance of conducting a type 1 error increases. A type 1 error is the likelihood of rejecting the null hypothesis when it is true (Abdi, 2007). The effect would therefore be a false positive if not corrected for multiple hypotheses. When testing multiple hypotheses, the likelihood of finding false positives increases as we test a family of tests on the same dataset. This error could lead to an inflation of the alpha level. Even with a 5% significance level, the likelihood of error will increase for each hypothesis we test. Since I am interested in the gender differences among different investment patterns, it is crucial to consider the possibility of conducting a type 1 error. Different methods exist to control this, such as the Sidak-Bonferroni correction (Abdi, 2007) and the Holm-Bonferroni (Abdi. Herv, 2010).

In the Sidak-Bonferroni correction, the probability of detecting a Type 1 error is multiplied by the number of tests, making it the most stringent test. The Holm-Bonferroni test, however, is more likely to correct for the inflation of test results while also being able to detect statistically significant effects. This correction is based on the Bonferroni inequality, which states that we want to minimize the probability of finding a type 1 error by dividing the error term by how many coefficients are estimated. This can be written as

$$\Pr\left\{\min\left(P_j : 1 \leq j \leq m\right) \leq \frac{\alpha}{m}\right\} \leq \alpha \tag{4.13}$$

Where *m* is the number of parameters calculated in the regression (Newson & Team, 2003) this correction, the p-values for each test need to be calculated first, then it is ordered, and the test with the lowest p-value is tested with a Bonferroni correction involving all tests. The second test is tested with a Bonferroni correction minus one test (i) and so on for the remaining tests until it finds a non-significant test (Abdi, 2007). This can be described through the equation:

$$p_{Bonferroni,i|m} = (m - i + 1)/p_\alpha \qquad (4.14)$$

Table A 1 Balance sheet Treatment and Control group

Variables[10]	Control	Treatment	t-test
Invest	2.30(1.65)	2.22(1.52)	0.07
Inherit	0.76(1.02)	0.74(0.98)	0.01
Dekar	4.29(1.54)	4.13(1.51)	0.16
Net Income	4.25(1.67)	4.22(1.51)	0.03
Animal units	0.39(3.79)	0.53(5.84)	-0.21
Age	48(10)	48(11)	0.123
Risk preference	3.8(2.64)	3.78(2.74)	0.019
Beta	441(5973)	21.6(130)	419
Delta_mean	0.50(0.29)	0.50(0.30)	-0.005
Weather	0.57(0.49)	0.60(0.48)	-0.03
Neighbors	0.70(0.45)	0.71(0.45)	-0.008
Subsidies received	0.54(0.49)	0.59(0.49)	-0.04
Subsidies exist	0.88(0.32)	0.87(0.33)	0.009
Advisor	0.10(0.30)	0.10(0.30)	-0.000
Knowledge	1.96(0.75)	1.95(0.76)	0.016
Responsibility	2.51(2.12)	2.77(2.24)	-0.26
Climate calculator	0.39(0.48)	0.32(0.46)	0.07
Type of production			
Cattle farmer	0.18(0.39)	0.20(0.40)	-0.01
Egg farmer	0.02(0.16)	0.03(0.19)	-0.008
Dairy farmer	0.36(0.48)	0.33(0.47)	0.03
Chicken farmer	0.01(0.11)	0.01(0.13)	-0.003
Pig farmer	0.06(0.24)	0.08(0.27)	-0.02
Sheep and goat farmer	0.29(0.45)	0.25(0.43)	0.04
Other productions	0.04(0.20)	0.7(0.26)	-0.03
Regions			
Oslo and Viken	0.11(0.31)	0.09(0.28)	0.01
Innlandet	0.18(0.39)	0.18(0.39)	-0.00
Agder	0.03(0.18)	0.06(0.24)	-0.02
Rogaland	0.09(0.28)	0.09(0.19)	-0.005
Møre and Romsdal	0.06(0.25)	0.07(0.27)	-0.01
Trøndelag	0.21(0.40)	0.21(0.40)	0.00
Nordland	0.07(0.26)	0.05(0.23)	0.02
Troms and Finnmark	0.04(0.21)	0.04(0.21)	0.00
Vestland	0.15(0.35)	0.13(0.34)	0.01
Vestfold and Telemark	0.01(0.11)	0.02(0.16)	-0.01
N	695	228	

[10] See **Table 3** Variables for an explanation of the variables

Table A 2 Pairwise correlations – gender and type of climate-friendly investment

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Male	1.000										
(2) Drainage of fields	0.061	1.000									
	(0.173)										
(3) Precision spreading of fertilizer	0.140*	0.153*	1.000								
	(0.002)	(0.001)									
(4) Deposition of animal manure	0.003	0.080	0.185*	1.000							
	(0.945)	(0.073)	(0.000)								
(5) Increased energy concentration in forage	0.146*	0.289*	0.349*	0.217*	1.000						
	(0.001)	(0.000)	(0.000)	(0.000)							
(6) Renewable energy in heating	0.056	0.085	0.115*	0.141*	-0.009	1.000					
	(0.208)	(0.059)	(0.010)	(0.002)	(0.849)						
(7) Solarpanels	-0.018	0.065	0.120*	0.088*	0.074	0.224*	1.000				
	(0.685)	(0.149)	(0.007)	(0.049)	(0.099)	(0.000)					
(8) Biofules	0.048	0.041	0.070	-0.032	0.079	0.063	0.011	1.000			
	(0.283)	(0.361)	(0.119)	(0.476)	(0.078)	(0.159)	(0.811)				
(9) Catch Crops	-0.115*	0.027	0.052	0.084	-0.023	0.060	0.107*	0.081	1.000		
	(0.010)	(0.551)	(0.251)	(0.060)	(0.612)	(0.178)	(0.017)	(0.069)			
(10) Legumes	0.018	0.118*	0.064	0.111*	0.142*	0.100*	0.078	0.103*	0.276*	1.000	
	(0.695)	(0.008)	(0.152)	(0.013)	(0.001)	(0.025)	(0.082)	(0.021)	(0.000)		
(11) None of the above	-0.111*	-0.461*	-0.377*	-0.321*	-0.474*	-0.184*	-0.209*	-0.041	-0.192*	-0.161*	1.000
	(0.013)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.355)	(0.000)	(0.000)	

Table A 3 Pairwise correlations – modelling a female and male farm

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)
(1) Male	1.000																							
(2) Invest	0.103*	1.000																						
	(0.022)																							
(3) Willingness to invest in the future	-0.004	0.412*	1.000																					
	(0.947)	(0.000)																						
(4) Dekar	0.164*	0.400*	0.237*	1.000																				
	(0.000)	(0.000)	(0.000)																					
(5) Net income	0.093*	0.218*	0.171*	0.537*	1.000																			
	(0.038)	(0.000)	(0.004)	(0.000)																				
(6) Age	-0.054	-0.034	-0.108	-0.082	0.049	1.000																		
	(0.231)	(0.450)	(0.068)	(0.068)	(0.273)																			
(7) Inherit	0.035	0.231*	-0.070	0.023	0.099*	0.102*	1.000																	
	(0.440)	(0.000)	(0.240)	(0.606)	(0.026)	(0.022)																		
(8) Animal units	0.040	-0.006	0.086	0.021	0.086	0.051	-0.012	1.000																
	(0.368)	(0.887)	(0.147)	(0.643)	(0.054)	(0.260)	(0.798)																	
(9) Risk preference	0.122*	0.116*	0.108	0.065	0.122*	-0.039	0.060	0.053	1.000															
	(0.006)	(0.010)	(0.070)	(0.146)	(0.006)	(0.388)	(0.178)	(0.236)																
(10) Beta	-0.112*	-0.043	0.046	-0.081	-0.077	-0.030	-0.007	-0.006	0.035	1.000														
	(0.014)	(0.346)	(0.446)	(0.078)	(0.093)	(0.518)	(0.875)	(0.892)	(0.449)															
(13) Neighbors	0.096*	0.310*	0.287*	0.234*	0.136*	-0.205*	-0.044	0.069	-0.007	-0.054	1.000													
	(0.033)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.325)	(0.121)	(0.876)	(0.235)														
(14) Advisor	0.051	0.181*	0.260*	0.160*	0.149*	0.036	-0.037	0.052	0.038	0.012	0.043	1.000												
	(0.253)	(0.000)	(0.000)	(0.000)	(0.001)	(0.426)	(0.408)	(0.250)	(0.393)	(0.800)	(0.332)													
(15) Climate calculator	0.020	0.199*	0.267*	0.313*	0.222*	-0.050	-0.050	0.007	0.043	-0.021	0.091*	0.349*	1.000											
	(0.655)	(0.000)	(0.000)	(0.000)	(0.000)	(0.261)	(0.263)	(0.869)	(0.342)	(0.642)	(0.041)	(0.000)												
(16) Weather	-0.018	0.179*	0.372*	0.151*	0.159*	0.032	-0.028	0.019	0.026	-0.042	0.219*	0.085	0.082	1.000										
	(0.686)	(0.000)	(0.000)	(0.001)	(0.000)	(0.469)	(0.534)	(0.668)	(0.565)	(0.354)	(0.000)	(0.057)	(0.066)											
(17) Responsibility	-0.039	0.003	-0.008	0.027	0.010	-0.068	0.040	-0.015	-0.011	-0.038	-0.011	0.073	0.015	-0.010	1.000									
	(0.386)	(0.951)	(0.888)	(0.545)	(0.827)	(0.128)	(0.368)	(0.745)	(0.809)	(0.410)	(0.801)	(0.103)	(0.741)	(0.828)										
(18) Pressure	0.118*	-0.023	-0.075	0.095*	0.033	-0.138*	0.060	0.027	-0.032	0.060	0.049	-0.031	-0.008	-0.094*	0.099*	1.000								
	(0.008)	(0.602)	(0.209)	(0.033)	(0.460)	(0.002)	(0.183)	(0.544)	(0.482)	(0.191)	(0.277)	(0.485)	(0.860)	(0.035)	(0.027)									
(19) Knowledge	-0.023	-0.210*	-0.278*	-0.119*	-0.071	0.060	0.165*	-0.018	-0.022	-0.053	-0.173*	-0.072	-0.169*	-0.224*	-0.001	0.121*	1.000							
	(0.609)	(0.000)	(0.000)	(0.008)	(0.113)	(0.181)	(0.000)	(0.683)	(0.618)	(0.244)	(0.000)	(0.108)	(0.000)	(0.000)	(0.985)	(0.007)								
(20) Egg farmer	0.016	-0.047	-0.062	0.002	0.119*	-0.041	-0.022	-0.019	0.082	-0.012	0.043	0.048	0.010	0.046	0.032	0.013	0.059	1.000						
	(0.717)	(0.295)	(0.296)	(0.958)	(0.008)	(0.358)	(0.620)	(0.667)	(0.067)	(0.798)	(0.343)	(0.285)	(0.818)	(0.308)	(0.478)	(0.769)	(0.191)							
(21) Pig farmer	0.021	0.033	0.027	0.116*	0.183*	-0.023	0.162*	-0.027	-0.060	-0.015	0.024	-0.008	0.003	0.012	0.037	0.015	0.066	-0.053	1.000					
	(0.647)	(0.462)	(0.655)	(0.009)	(0.000)	(0.611)	(0.000)	(0.541)	(0.184)	(0.751)	(0.598)	(0.859)	(0.940)	(0.784)	(0.404)	(0.746)	(0.144)	(0.236)						
(22) Cattle farmer	0.042	0.154*	0.054	0.143*	-0.075	0.017	-0.026	0.012	0.002	-0.002	0.001	0.046	-0.028	-0.004	-0.069	0.018	-0.035	-0.096*	-0.137*	1.000				
	(0.352)	(0.001)	(0.364)	(0.001)	(0.096)	(0.703)	(0.557)	(0.795)	(0.972)	(0.961)	(0.983)	(0.305)	(0.536)	(0.935)	(0.126)	(0.692)	(0.440)	(0.032)	(0.002)					
(23) Sheep and goat farmer	-0.177*	-0.229*	-0.095	-0.505*	-0.390*	0.072	-0.007	-0.073	-0.143*	0.059	-0.078	-0.178*	-0.371*	-0.081	-0.007	-0.129*	0.052	-0.142*	-0.201*	-0.364*	1.000			
	(0.000)	(0.000)	(0.108)	(0.000)	(0.000)	(0.108)	(0.883)	(0.103)	(0.001)	(0.197)	(0.081)	(0.000)	(0.000)	(0.072)	(0.880)	(0.004)	(0.243)	(0.002)	(0.000)	(0.000)				
(24) Chicken	0.055	-0.008	0.148*	-0.031	0.118*	0.000	-0.016	0.553*	0.122*	-0.008	0.076	0.008	0.007	0.062	-	0.021	-0.074	-0.026	-0.037	-0.067	-	1.000		

farmer															0.097*						0.099*			
	(0.222)	(0.854)	(0.012)	(0.486)	(0.008)	(0.993)	(0.728)	(0.000)	(0.006)	(0.854)	(0.089)	(0.861)	(0.872)	(0.165)	(0.029)	(0.634)	(0.099)	(0.559)	(0.407)	(0.133)	(0.027)			
(25) Dairy	0.132*	0.120*	0.072	0.368*	0.322*	-0.059	-0.034	-0.061	0.102*	-0.038	0.044	0.155*	0.464*	0.025	0.068	0.141*	-0.050	-	-	-	-	-0.083	1.000	
farmer																		0.119*	0.169*	0.306*	0.450*			
	(0.003)	(0.007)	(0.224)	(0.000)	(0.000)	(0.190)	(0.449)	(0.170)	(0.022)	(0.407)	(0.332)	(0.001)	(0.000)	(0.577)	(0.129)	(0.002)	(0.262)	(0.008)	(0.000)	(0.000)	(0.000)	(0.063)		
(26) Other	-0.031	-0.020	-0.107	-0.028	-0.056	-0.006	-0.028	-0.024	0.024	-0.014	-0.029	-0.047	-	0.039	-0.010	-0.076	-0.029	-0.046	-0.066	-	-	-0.032	-	1.000
farmer													0.102*							0.119*	0.175*		0.147*	
	(0.491)	(0.650)	(0.070)	(0.539)	(0.214)	(0.888)	(0.539)	(0.594)	(0.599)	(0.754)	(0.513)	(0.297)	(0.022)	(0.388)	(0.817)	(0.089)	(0.519)	(0.302)	(0.143)	(0.008)	(0.000)	(0.470)	(0.001)	

Table A 4 Full table pairwise correlations – future investors

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
(1) Willingness to invest in the future	1.000																						
(2) Invest	0.412*	1.000																					
	(0.000)																						
(3) Male	-0.004	0.103*	1.000																				
	(0.947)	(0.022)																					
(4) Dekar	0.237*	0.400*	0.164*	1.000																			
	(0.000)	(0.000)	(0.000)																				
(5) Net income	0.171*	0.218*	0.093*	0.537*	1.000																		
	(0.004)	(0.000)	(0.038)	(0.000)																			
(6) Age	-0.108	-0.034	-0.054	-0.082	0.049	1.000																	
	(0.068)	(0.450)	(0.231)	(0.068)	(0.273)																		
(7) Inherit	-0.070	0.231*	0.035	0.023	0.099*	0.102*	1.000																
	(0.240)	(0.000)	(0.440)	(0.606)	(0.026)	(0.022)																	
(8) Animal units	0.086	-0.006	0.040	0.021	0.086	0.051	-0.012	1.000															
	(0.147)	(0.887)	(0.368)	(0.643)	(0.054)	(0.260)	(0.798)																
(9) Risk preference	0.108	0.116*	0.122*	0.065	0.122*	-0.039	0.060	0.053	1.000														
	(0.070)	(0.010)	(0.006)	(0.146)	(0.006)	(0.388)	(0.178)	(0.236)															
(10) Beta	0.046	-0.043	-0.112*	-0.081	-0.077	-0.030	-0.007	-0.006	0.035	1.000													
	(0.446)	(0.346)	(0.014)	(0.078)	(0.093)	(0.518)	(0.875)	(0.892)	(0.449)														
(12) Knowledge	-0.278*	-0.210*	-0.023	-0.119*	-0.071	0.060	0.165*	-0.018	-0.022	-0.053	0.016	1.000											
	(0.000)	(0.000)	(0.609)	(0.008)	(0.113)	(0.181)	(0.000)	(0.683)	(0.618)	(0.244)	(0.717)												
(13) Neighbors	0.287*	0.310*	0.096*	0.234*	0.136*	-0.205*	-0.044	0.069	-0.007	-0.054	-0.035	-0.173*	1.000										
	(0.000)	(0.000)	(0.033)	(0.000)	(0.002)	(0.000)	(0.325)	(0.121)	(0.876)	(0.235)	(0.442)	(0.000)											
(14) Advisor	0.260*	0.181*	0.051	0.160*	0.149*	0.036	-0.037	0.052	0.038	0.012	0.012	-0.072	0.043	1.000									
	(0.000)	(0.000)	(0.253)	(0.000)	(0.001)	(0.426)	(0.408)	(0.250)	(0.393)	(0.800)	(0.782)	(0.108)	(0.332)										
(15) Climate calculator	0.267*	0.199*	0.020	0.313*	0.222*	-0.050	-0.050	0.007	0.043	-0.021	0.064	-0.169*	0.091*	0.349*	1.000								
	(0.000)	(0.000)	(0.655)	(0.000)	(0.000)	(0.261)	(0.263)	(0.869)	(0.342)	(0.642)	(0.157)	(0.000)	(0.041)	(0.000)									
(16) Weather	0.372*	0.179*	-0.018	0.151*	0.159*	0.032	-0.028	0.019	0.026	-0.042	-0.078	-0.224*	0.219*	0.085	0.082	1.000							
	(0.000)	(0.000)	(0.686)	(0.001)	(0.000)	(0.469)	(0.534)	(0.668)	(0.565)	(0.354)	(0.083)	(0.000)	(0.000)	(0.057)	(0.066)								
(17) Egg farmer	-0.062	-0.047	0.016	0.002	0.119*	-0.041	-0.022	-0.019	0.082	-0.012	0.039	0.059	0.043	0.048	0.010	0.046	1.000						
	(0.296)	(0.295)	(0.717)	(0.958)	(0.008)	(0.358)	(0.620)	(0.667)	(0.067)	(0.798)	(0.387)	(0.191)	(0.343)	(0.285)	(0.818)	(0.308)							
(18) Pig farmer	0.027	0.033	0.021	0.116*	0.183*	-0.023	0.162*	-0.027	-0.060	-0.015	-0.041	0.066	0.024	-0.008	0.003	0.012	-0.053	1.000					
	(0.655)	(0.462)	(0.647)	(0.009)	(0.000)	(0.611)	(0.000)	(0.541)	(0.184)	(0.751)	(0.362)	(0.144)	(0.598)	(0.859)	(0.940)	(0.784)	(0.236)						
(19) Cattle farmer	0.054	0.154*	0.042	0.143*	-0.075	0.017	-0.026	0.012	0.002	-0.002	0.004	-0.035	0.001	0.046	-0.028	-0.004	-0.096*	-0.137*	1.000				
	(0.364)	(0.001)	(0.352)	(0.001)	(0.096)	(0.703)	(0.557)	(0.795)	(0.972)	(0.961)	(0.923)	(0.440)	(0.983)	(0.305)	(0.536)	(0.935)	(0.032)	(0.002)					
(20) Sheep farmer	-0.095	-0.229*	-0.177*	-0.505*	-0.390*	0.072	-0.007	-0.073	-0.143*	0.059	-0.072	0.052	-0.078	-0.178*	-0.371*	-0.081	-0.142*	-0.201*	-0.364*	1.000			
	(0.108)	(0.000)	(0.000)	(0.000)	(0.000)	(0.108)	(0.883)	(0.103)	(0.001)	(0.197)	(0.109)	(0.243)	(0.081)	(0.000)	(0.000)	(0.072)	(0.002)	(0.000)	(0.000)				
(21) Chicken farmer	0.148*	-0.008	0.055	-0.031	0.118*	0.000	-0.016	0.553*	0.122*	-0.008	-0.022	-0.074	0.076	0.008	0.007	0.062	-0.026	-0.037	-0.067	-0.099*	1.000		
	(0.012)	(0.854)	(0.222)	(0.486)	(0.008)	(0.993)	(0.728)	(0.000)	(0.006)	(0.854)	(0.628)	(0.099)	(0.089)	(0.861)	(0.872)	(0.165)	(0.559)	(0.407)	(0.133)	(0.027)			
(22) Dairy farmer	0.072	0.120*	0.132*	0.368*	0.322*	-0.059	-0.034	-0.061	0.102*	-0.038	0.102*	-0.050	0.044	0.155*	0.464*	0.025	-0.119*	-0.169*	-0.306*	-0.450*	-0.083	1.000	
	(0.224)	(0.007)	(0.003)	(0.000)	(0.000)	(0.190)	(0.449)	(0.170)	(0.022)	(0.407)	(0.022)	(0.262)	(0.332)	(0.001)	(0.000)	(0.577)	(0.008)	(0.000)	(0.000)	(0.000)	(0.063)		
(23) Other farmer	-0.107	-0.020	-0.031	-0.028	-0.056	-0.006	-0.028	-0.024	0.024	-0.014	-0.031	-0.029	-0.029	-0.047	-0.102*	0.039	-0.046	-0.066	-0.119*	-0.175*	-0.032	-0.147*	1.000
	(0.070)	(0.650)	(0.491)	(0.539)	(0.214)	(0.888)	(0.539)	(0.594)	(0.599)	(0.754)	(0.493)	(0.519)	(0.513)	(0.297)	(0.022)	(0.388)	(0.302)	(0.143)	(0.008)	(0.000)	(0.470)	(0.001)	

**** p<0.01, ** p<0.05, * p<0.1*

Table A 5 Pairwise correlations subsidies and regions

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Received Subsidies	1.000										
(2) Oslo and Viken	0.128	1.000									
	(0.000)										
(3) Innlandet	0.019	-0.166	1.000								
	(0.571)	(0.000)									
(4) Agder	0.053	-0.074	-0.104	1.000							
	(0.108)	(0.024)	(0.002)								
(5) Rogaland	-0.051	-0.110	-0.154	-0.069	1.000						
	(0.124)	(0.001)	(0.000)	(0.037)							
(6) Møre and Romsdal	-0.021	-0.095	-0.133	-0.059	-0.088	1.000					
	(0.521)	(0.004)	(0.000)	(0.072)	(0.008)						
(7) Trøndelag	0.024	-0.178	-0.249	-0.112	-0.165	-0.142	1.000				
	(0.459)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)					
(8) Nordland	-0.072	-0.096	-0.135	-0.060	-0.089	-0.077	-0.145	1.000			
	(0.028)	(0.003)	(0.000)	(0.067)	(0.007)	(0.019)	(0.000)				
(9) Troms and Finnmark	-0.043	-0.078	-0.109	-0.049	-0.072	-0.062	-0.117	-0.063	1.000		
	(0.190)	(0.018)	(0.001)	(0.138)	(0.028)	(0.058)	(0.000)	(0.054)			
(10) Vestland	-0.073	-0.144	-0.201	-0.090	-0.133	-0.115	-0.216	-0.117	-0.095	1.000	
	(0.027)	(0.000)	(0.000)	(0.006)	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)		
(11) Vestfold and Telemark	0.051	-0.046	-0.064	-0.029	-0.042	-0.037	-0.069	-0.037	-0.030	-0.055	1.000
	(0.125)	(0.165)	(0.052)	(0.385)	(0.199)	(0.267)	(0.037)	(0.259)	(0.362)	(0.092)	

Table A 6 Treatment effect full table

Variables	(1) Willingness to invest in the future	(2) Willingness to invest in the future	(3) Willingness to invest in the future	(4) Willingness to invest in the future
Treatment	0.084	0.052	0.068	0.058
	(0.050)	(0.149)	(0.135)	(0.127)
Male		-0.078	-0.222*	-0.200
		(0.082)	(0.110)	(0.116)
MaleXtreat		0.036	0.037	0.070
		(0.158)	(0.144)	(0.135)
MaleXrisk			0.024	0.020
			(0.023)	(0.023)
Risk preference			-0.001	-0.002
			(0.022)	(0.021)
Beta			0.002***	0.003*
			(0.001)	(0.001)
Invest			0.104***	0.063***
			(0.013)	(0.015)
Inherit				-0.046*
				(0.020)
Net income				-0.005
				(0.016)
Dekar				0.007

	(0.019)
Animal units	0.004
	(0.003)
Age	-0.003
	(0.002)
Innlandet	-0.072
	(0.070)
Agder	-0.109
	(0.111)
Rogaland	-0.198*
	(0.089)
Møre & Romsdal	-0.042
	(0.089)
Trøndelag	-0.082
	(0.075)
Nordland	-0.067
	(0.093)
Troms & Finnmark	-0.079
	(0.102)
Vestland	-0.083
	(0.092)

Vestfold & Telemark	-0.348^{*} (0.158)
Subsidies exist	0.007 (0.062)
Subsidies recieved	0.086 (0.050)
Advisor	0.152^{*} (0.064)
Climate calculator	0.102^{*} (0.051)
Weather	0.184^{***} (0.044)
Neighbors	0.077 (0.052)
Responsibility =1	0.000 (.)
Responsibility =2	0.567^{***} (0.144)
Responsibility=4	0.094 (0.061)
Responsibility=5	0.125 (0.101)

Responsibility=6	-0.057 (0.046)
Pressure =1	0.000 (.)
Pressure=2	0.095 (0.081)
Pressure=3	0.079 (0.072)
Pressure=4	0.081 (0.078)
Pressure=5	0.021 (0.077)
Knowledge =1	0.000 (.)
Knowledge =2	-0.019 (0.047)
Knowledge=3	-0.158* (0.069)
Knowledge=4	-0.195* (0.077)
Cattle farmer	0.150

				(0.086)
Chicken farmer				0.453***
				(0.128)
Egg farmer				0.124
				(0.135)
Dairy farmer				0.131
				(0.088)
Pig farmer				0.290**
				(0.104)
Sheep and goat farmer				0.223**
				(0.084)
Constant	0.478***	0.548***	0.349**	0.214
	(0.026)	(0.077)	(0.106)	(0.197)
Observations	503	503	488	488
Adjusted R^2	0.0035	0.0016	0.163	0.288

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

A.2 Robustness Checks

To test the robustness of my treatment results, I have tested whether geographical location or primary production affects the treatment effect for the population. For a complete table on the robustness checks see **Feil! Fant ikke referansekilden.**. I tested whether geographic location and p rimary production affect the treatment effect.

In the primary treatment test, I used the different livestock farmers as controls and compared them to other farmers in the survey. This would be the farmers who report to have other primary productions than livestock production. If I subsequently change the reference group for all main productions, the treatment effect for the whole population remains insignificant, which is in favor of the robustness of the results.

The reference group for geographical location in the treatment test is Oslo and Viken because they consequently had higher willingness to invest than any other region. The other regions varied more in willingness to invest, so I found it sensible to compare the regions that were not as willing to invest to the most willing ones. However, the robustness checks conclude that the estimate remains the same, independent of regions, which is why location does not influence the estimates.

Table A 7 Robustness Checks of Treatment Effect, dependent variable: willingness to invest in the future.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
	(0.127)	(0.127)	(0.127)	(0.127)	(0.127)	(0.127)	(0.127)	(0.127)
Male	-0.200	-0.200	-0.200	-0.200	-0.200	-0.200	-0.200	-0.200
	(0.116)	(0.116)	(0.116)	(0.116)	(0.116)	(0.116)	(0.116)	(0.116)
MaleXtreat	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070
	(0.135)	(0.135)	(0.135)	(0.135)	(0.135)	(0.135)	(0.135)	(0.135)
MaleXrisk	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Invest	0.063***	0.063***	0.063***	0.063***	0.063***	0.063***	0.063***	0.063***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Inherit	-0.046*	-0.046*	-0.046*	-0.046*	-0.046*	-0.046*	-0.046*	-0.046*
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Risk preference	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Beta	0.003*	0.003*	0.003*	0.003*	0.003*	0.003*	0.003*	0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Net income	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005

	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Dekar	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
Animal units	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Age	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Innlandet	0.006	0.125	-0.072	-0.072	-0.072	-0.072	-0.072	-0.072
	(0.093)	(0.078)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)
Agder	-0.030	0.089	-0.109	-0.109	-0.109	-0.109	-0.109	-0.109
	(0.122)	(0.114)	(0.111)	(0.111)	(0.111)	(0.111)	(0.111)	(0.111)
Rogaland	-0.119		-0.198*	-0.198*	-0.198*	-0.198*	-0.198*	-0.198*
	(0.103)		(0.089)	(0.089)	(0.089)	(0.089)	(0.089)	(0.089)
Møre & Romsdal	0.036	0.155	-0.042	-0.042	-0.042	-0.042	-0.042	-0.042
	(0.104)	(0.094)	(0.089)	(0.089)	(0.089)	(0.089)	(0.089)	(0.089)
Trøndelag	-0.003	0.116	-0.082	-0.082	-0.082	-0.082	-0.082	-0.082
	(0.091)	(0.079)	(0.075)	(0.075)	(0.075)	(0.075)	(0.075)	(0.075)
Nordland	0.012	0.131	-0.067	-0.067	-0.067	-0.067	-0.067	-0.067
	(0.108)	(0.096)	(0.093)	(0.093)	(0.093)	(0.093)	(0.093)	(0.093)
Oslo & Viken	0.079	0.198*						
	(0.102)	(0.089)						

Vestland	-0.004	0.114	-0.083	-0.083	-0.083	-0.083	-0.083	-0.083
	(0.106)	(0.095)	(0.092)	(0.092)	(0.092)	(0.092)	(0.092)	(0.092)
Vestfold & Telemark	-0.269	-0.151	-0.348^{*}	-0.348^{*}	-0.348^{*}	-0.348^{*}	-0.348^{*}	-0.348^{*}
	(0.172)	(0.165)	(0.158)	(0.158)	(0.158)	(0.158)	(0.158)	(0.158)
Subsidies exist	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007
	(0.062)	(0.062)	(0.062)	(0.062)	(0.062)	(0.062)	(0.062)	(0.062)
Subsidies recieved	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086
	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
Advisor	0.152^{*}	0.152^{*}	0.152^{*}	0.152^{*}	0.152^{*}	0.152^{*}	0.152^{*}	0.152^{*}
	(0.064)	(0.064)	(0.064)	(0.064)	(0.064)	(0.064)	(0.064)	(0.064)
Climate calculator	0.102^{*}	0.102^{*}	0.102^{*}	0.102^{*}	0.102^{*}	0.102^{*}	0.102^{*}	0.102^{*}
	(0.051)	(0.051)	(0.051)	(0.051)	(0.051)	(0.051)	(0.051)	(0.051)
Weather	0.184^{***}	0.184^{***}	0.184^{***}	0.184^{***}	0.184^{***}	0.184^{***}	0.184^{***}	0.184^{***}
	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)
Neighbors	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077
	(0.052)	(0.052)	(0.052)	(0.052)	(0.052)	(0.052)	(0.052)	(0.052)
Responsibility=1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Responsibility=2	0.567^{***}	0.567^{***}	0.567^{***}	0.567^{***}	0.567^{***}	0.567^{***}	0.567^{***}	0.567^{***}
	(0.144)	(0.144)	(0.144)	(0.144)	(0.144)	(0.144)	(0.144)	(0.144)
Responsibility=4	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094
	(0.061)	(0.061)	(0.061)	(0.061)	(0.061)	(0.061)	(0.061)	(0.061)

Responsibility=5	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125
	(0.101)	(0.101)	(0.101)	(0.101)	(0.101)	(0.101)	(0.101)	(0.101)
Responsibility=6	-0.057	-0.057	-0.057	-0.057	-0.057	-0.057	-0.057	-0.057
	(0.046)	(0.046)	(0.046)	(0.046)	(0.046)	(0.046)	(0.046)	(0.046)
Pressure=1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Pressure=2	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)
Pressure=3	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079
	(0.072)	(0.072)	(0.072)	(0.072)	(0.072)	(0.072)	(0.072)	(0.072)
Pressure=4	0.081	0.081	0.081	0.081	0.081	0.081	0.081	0.081
	(0.078)	(0.078)	(0.078)	(0.078)	(0.078)	(0.078)	(0.078)	(0.078)
Pressure=5	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021
	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)
Knowledge = 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Knowledge =2	-0.019	-0.019	-0.019	-0.019	-0.019	-0.019	-0.019	-0.019
	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)
Knowledge =3	-0.158*	-0.158*	-0.158*	-0.158*	-0.158*	-0.158*	-0.158*	-0.158*
	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)
Knowledge =4	-0.195*	-0.195*	-0.195*	-0.195*	-0.195*	-0.195*	-0.195*	-0.195*

	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)
Cattle farmer	0.150	0.150		-0.303**	0.019	0.026	-0.140	-0.073
	(0.086)	(0.086)		(0.114)	(0.059)	(0.124)	(0.082)	(0.062)
Chicken farmer	0.453***	0.453***	0.303**		0.323**	0.329*	0.163	0.230*
	(0.128)	(0.128)	(0.114)		(0.113)	(0.151)	(0.125)	(0.113)
Egg farmer	0.124	0.124	-0.026	-0.329*	-0.007		-0.166	-0.099
	(0.135)	(0.135)	(0.124)	(0.151)	(0.122)		(0.137)	(0.120)
Dairy farmer	0.131	0.131	-0.019	-0.323**		0.007	-0.159*	-0.093
	(0.088)	(0.088)	(0.059)	(0.113)		(0.122)	(0.078)	(0.062)
Pig farmer	0.290**	0.290**	0.140	-0.163	0.159*	0.166		0.067
	(0.104)	(0.104)	(0.082)	(0.125)	(0.078)	(0.137)		(0.085)
Sheep and goat farmer	0.223**	0.223**	0.073	-0.230*	0.093	0.099	-0.067	
	(0.084)	(0.084)	(0.062)	(0.113)	(0.062)	(0.120)	(0.085)	
Troms & Finnmark		0.119	-0.079	-0.079	-0.079	-0.079	-0.079	-0.079
		(0.103)	(0.102)	(0.102)	(0.102)	(0.102)	(0.102)	(0.102)
Other farmer			-0.150	-0.453***	-0.131	-0.124	-0.290**	-0.223**
			(0.086)	(0.128)	(0.088)	(0.135)	(0.104)	(0.084)
Constant	0.135	0.016	0.364	0.667**	0.345	0.338	0.504*	0.437*
	(0.200)	(0.195)	(0.200)	(0.217)	(0.206)	(0.221)	(0.211)	(0.192)
Observations	488	488	488	488	488	488	488	488
Adj R^2	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A 8 Logit specification for treatment effect

Variables	(1) Willingness to invest in the future	(2) Willingness to invest in the future	(3) Willingness to invest in the future	(4) Willingness to invest in the future
Treatment	0.337	0.214	0.374	0.233
	(0.202)	(0.612)	(0.656)	(0.699)
Male		-0.315	-1.058*	-1.312
		(0.330)	(0.499)	(0.687)
MaleXtreat		0.140	0.111	0.591
		(0.648)	(0.695)	(0.774)
MaleXrisk			0.112	0.125
			(0.104)	(0.122)
Risk preference			-0.005	0.000
			(0.097)	(0.110)
Beta			0.042	0.030*
			(0.044)	(0.015)
Invest			0.492***	0.386***
			(0.075)	(0.099)
Inherit				-0.305*
				(0.126)
Net income				-0.046
				(0.091)

Dekar	0.077 (0.109)
Animal units	0.045 (0.072)
Age	-0.020 (0.011)
Innlandet	-0.644 (0.471)
Agder	-0.860 (0.670)
Rogaland	-1.495* (0.605)
Møre & Romsdal	-0.535 (0.548)
Trøndelag	-0.701 (0.486)
Nordland	-0.549 (0.556)
Troms & Finnmark	-0.629 (0.599)
Vestland	-0.754 (0.568)

Vestfold & Telemark	-2.156
	(1.135)
Subsidies exist	0.149
	(0.431)
Subsidies recieved	0.500
	(0.274)
Advisor	0.958*
	(0.428)
Climate calculator	0.610*
	(0.303)
Weather	1.116***
	(0.245)
Neighbours	0.437
	(0.309)
Responsibility=1	0.000
	(.)
Responsibility=2	0.000
	(.)
Responsibility=4	0.547
	(0.360)
Responsibility=5	0.000

		(.)
Responsibility=6	-0.267	(0.271)
Pressure=1	0.000	(.)
Pressure=2	0.472	(0.486)
Pressure=3	0.394	(0.428)
Pressure=4	0.264	(0.457)
Pressure=5	-0.069	(0.481)
Knowledge=1	0.000	(.)
Knowledge=2	-0.060	(0.269)
Knowledge=3	-0.834	(0.440)
Knowledge=4	-1.693*	(0.775)

Cattle farmer				1.360* (0.554)
Chicken farmer				3.496** (1.226)
Egg farmer				0.746 (0.948)
Dairy farmer				1.117 (0.573)
Pig farmer				2.518** (0.820)
Sheep and goat farmer				1.821** (0.580)
Constant	-0.087 (0.105)	0.191 (0.310)	-0.702 (0.472)	-1.900 (1.180)
Observations	503	503	488	485

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

A.3 Recruitment Message

Hei!

Mitt navn er Vita K. Rakkenes og sammen med Ruralis har jeg laget en **spørreundersøkelse** om hvordan du tar **investeringsvalg** på gården din. Undersøkelsen vil være et viktig grunnlag i forbindelse med et arbeid for Ruralis og min masteroppgave i samfunnsøkonomi ved Universitetet i Bergen.

Undersøkelsen tar ca. **15 minutter** og du vil være fullstendig **anonym**.

Hvis du kunne tenke deg å delta kan du klikke på denne lenken:
https://www.survey-xact.no/LinkCollector?key=T8SLNMASJ695

Fristen for å fylle ut undersøkelsen er mandag 30.01.23

Tusen takk på forhånd!

A.4 Questionnaire

Tusen takk for at du tar deg tiden til å ta denne undersøkelsen.

Du vil nå få en del spørsmål knyttet til driften av gården din, samt produksjonsapparatet ditt.

Det er helt frivillig å delta og du kan på hvilket som helst tidspunkt velge å ikke svare eller trekke deg fra undersøkelsen,
men da vil ingen av svarene telles.

Undersøkelsen er beregnet til å ta 10-15 minutter.

Neste side

Har du noen av disse produksjonsmetodene på gården din? (flere svar mulig)

- Forbedret drenering av dyrket areal
- Mer presis spredning av kunstgjødsel
- Nedfelling av husdyrgjødsel
- Forbedret fôrkvalitet på egenprodusert grovfôr
- Tatt i bruk fornybar oppvarming i bygninger og anlegg
- Solcellepaneler på fjøs/hustak som produserer strøm
- Levert husdyrgjødsel til biogassproduksjon på egen gård eller i sambehandlingsanlegg
- Bruk av fangstvekster
- Dyrking av belgvekster
- Ingen av disse

Hvilke av disse produksjonsmetodene var på gården din når du overtok/kjøpte? (flere svar mulig)

- Forbedret drenering av dyrket areal
- Mer presis spredning av kunstgjødsel
- Nedfelling av husdyrgjødsel
- Forbedret fôrkvalitet på egenprodusert grovfôr
- Tatt i bruk fornybar oppvarming i bygninger og anlegg
- Solcellepaneler på fjøs/hustak som produserer strøm
- Levert husdyrgjødsel til biogassproduksjon på egen gård eller i sambehandlingsanlegg

- Bruk av fangstvekster
- Dyrking av belgvekster
- Ingen av disse
-

Har noen i ditt nærmiljø en eller flere av produksjonsmetodene nevnt over? (kun et svar mulig)

- Ja
- Nei
- Ikke som jeg vet om

Er det tilstrekkelige klimatiske vilkår for disse investeringene i regionen din? (kun et svar)

- Ja
- Nei
- Vet ikke

Neste side

Du vil nå bli bedt om å ta stilling til et investeringsvalg. Ta deg god tid for å forstå diagrammet før du går videre.
Neste side

Se for deg at du står ovenfor et investeringsvalg mellom to ulike frøsorter. Disse gir ulik størrelse på avlingen avhengig av mengden du investerer og været.

Tabellen under viser estimert avlingsstørrelse av din lokale rådgiver for de to frøene. Frø 2 gir samme avling uavhengig av været, mens frø 1 gir èn avlingsstørrelse ved godt vær og ingen avling ved dårlig vær. Det er like stor sannsynlighet for at det er godt vær som at det er dårlig vær.

I de to første kolonnene står det antall frø du kan investere fra 0 til 10. I de tre neste er avlingstørrelsene hvis det er godt vær, med samlet avling som den siste. Og i de tre siste kolonnene står avlingsstørrelse hvis det blir dårlig vær gitt hvor mange frø du velger å investere.

		Godt vær (50% sannsynlighet)			Dårlig vær (50% sannsynlighet)		
Frø 1	Frø 2	Avling frø 1	Avling frø 2	Samlet avling	Avling frø 1	Avling frø 2	Samlet avling
0	10	0	1000	1000	0	1000	1000
1	9	300	900	1200	0	900	900
2	8	600	800	1400	0	800	800
3	7	900	700	1600	0	700	700
4	6	1200	600	1800	0	600	600
5	5	1500	500	2000	0	500	500
6	4	1800	400	2200	0	400	400
7	3	2100	300	2400	0	300	300
8	2	2400	200	2600	0	200	200
9	1	2700	100	2800	0	100	100
10	0	3000	0	3000	0	0	0

Trykk neste når du er klar for å gå videre.

Neste side

Gitt avlingsstørrelsene som ble presentert i diagrammet på forrje side, og som er vedlagt under, hvor mye ønsker du å investere i hvert frø?

Du kan ikke investere mer enn 10 enheter totalt fordelt på begge frøsorter, men velger selv hvordan du vil investere de. (For å investere 0 i et av frøene, klikk på glideren sånn at den blir blå)

		Godt vær (50% sannsynlighet)			Dårlig vær (50% sannsynlighet)		
Frø 1	Frø 2	Avling frø 1	Avling frø 2	Samlet avling	Avling frø 1	Avling frø 2	Samlet avling
0	10	0	1000	1000	0	1000	1000
1	9	300	900	1200	0	900	900
2	8	600	800	1400	0	800	800
3	7	900	700	1600	0	700	700
4	6	1200	600	1800	0	600	600
5	5	1500	500	2000	0	500	500
6	4	1800	400	2200	0	400	400
7	3	2100	300	2400	0	300	300
8	2	2400	200	2600	0	200	200
9	1	2700	100	2800	0	100	100
10	0	3000	0	3000	0	0	0

Hvor mye vil du investere i frø 1?

Hvor mye vil du investere i frø 2?

Neste side

Du vil nå få spørsmål om din preferanse for penger nå eller å vente en gitt tidsperiode.

Neste side

Hvilken pengesum ville gjort deg like fornøyd i dag som hvis du fikk 100 000 NOK om 6 måneder? (skriv inn et [beløp] i NOK)

Hvilken pengesum ville gjort deg like fornøyd om 6 måneder som hvis du fikk 100 000 NOK om et år? (skriv inn et [beløp] i NOK)

Neste side

Hvilken pengesum ville gjort deg like fornøyd om et år som hvis du fikk 100 000 NOK om tre år? (skriv inn et [beløp] i NOK)

Hvilken pengesum ville gjort deg like fornøyd om tre år som hvis du fikk 100 000 NOK om fem år? (skriv inn et [beløp] i NOK)

Neste side

Hvem mener du har hovedansvaret for å redusere klimaendringene? (kun et svar mulig)

- Staten
- Kommunen
- Jeg
- Bønder
- Andre sektorer

Neste side

I hvilken grad er du enig i følgende påstand «Jeg føler meg presset til å innføre klimatiltak på gården min» (kun et svar mulig)

- Helt uenig
- Delvis uenig
- Både og
- Delvis enig
- Helt enig

Neste side

I så fall, hvem føler du deg hovedsakelig presset av? (kun et svar mulig)

- Regjeringen
- Kommunestyret
- Samfunnet
- Faglagene (F.eks. Bondelaget el. Småbrukarlaget)
- Nortura
- Andre
- Miljøorganisasjoner
- Partier på høyresiden (H, FrP, KrF, V)
- Partier på venstresiden (R, SV, Ap, MDG)
- Naboer eller andre som bor i bygda

Neste side

Bruker du klimakalkulatoren? (kun et svar mulig)

- Ja
- Nei
- Ikke aktuelt

Tar du, eller har du tidligere, tatt i bruk en sertifisert klimarådgiver? (kun et svar mulig)

- Ja

- Nei
- Har ikke tilbud om dette

Neste side

I hvilken grad føler du at du har kunnskapen til å gjøre klimavennlige investeringer? (kun et svar mulig)

- I stor grad
- I noen grad
- I liten grad
- Har ingen kunnskap

Neste side

Finnes det regionale tilskuddsordninger for klimatiltak (f.eks. RMP el SMIL) der du bor? (kun et svar mulig)

- Ja
- Nei
- Ikke som jeg vet om

Neste side

Har du mottatt midler fra denne tilskuddsordningen i løpet av de siste fem årene? (kun et svar mulig)

- Ja
- Nei
- Har søkt, men ikke fått

Neste side

Hva er hovedproduksjonen på gården din? (kun et svar mulig)

- Egg
- Svin

- Storfe
- Småfe
- Kylling
- Melk
- Annen produksjon

Neste side

Hvilken produksjon får du hovedinntekten din fra? (kun et svar mulig)

- Egg
- Svin
- Storfe
- Småfe
- Kylling
- Melk
- Annen produksjon

Neste side

Hvor mange dyr har du omtrent på gården din i dag? (fyll inn antall, hvis du ikke har noen skriv 0)

- Melkekyr
- Ammekyr
- Annen storfe
- Sauer
- Geiter
- Purker
- Slaktegriser
- Verpehøner
- Slaktekyllinger

Neste side

Hvor mange dyr var det omtrent på gården når du overtok/kjøpte? (fyll inn antall, hvis du ikke har noen skriv 0)

- Melkekyr
- Ammekyr
- Annen storfe
- Sauer
- Geiter
- Purker
- Slaktegriser
- Verpehøner
- Slaktekyllinger

Neste side

Hvilken region ligger gården din i? (kun et svar mulig)

- Oslo og viken
- Innlandet
- Agder
- Rogaland
- Møre og Romsdal
- Trøndelag
- Nordland
- Troms og Finnmark
- Vestland
- Vestfold og Telemark

Neste side

Hva er nettoinntekten på gården din? (kun et svar mulig)

- Negativ inntekt
- 1 – 49 999
- 50 000 – 99 999

- 100 000 – 249 999
- 250 000 – 399 999
- 400 000 eller mer

Neste side

Hvor stort jordbruksareal driver du? (kun et svar mulig)

- Under 50 dekar
- 50 – 99 dekar
- 100 – 199 dekar
- 200 – 299 dekar
- 300 – 399 dekar
- 500 dekar eller mer

Neste side

Hva er ditt biologiske kjønn? (kun et svar mulig)

- Mann
- Kvinne

Neste side

Hvor gammel er du? (fyll inn alderen din)

Neste side

Har du barn? (flere alternativer mulig)

- Ja
- Nei
- Venter barn

Neste side

Velg en figur (kun et svar mulig)

- Trekant
- Sirkel

Neste side

Hvis valgt trekant

I Trender i Norsk Landbruk undersøkelsen fra 2022 oppga 1 400 bønder at de har investert i minst et av de anbefalte klimatiltakene fra Landbrukets Klimaplan.

Skal du investere i minst et av de anbefalte klimatiltakene fra Landbrukets Klimaplan i løpet av de neste to årene? (kun et svar mulig)

- Ja
- Nei
- Vet ikke

Neste side

Hvis valgt sirkel

Skal du investere i minst et av de anbefalte klimatiltakene fra Landbrukets Klimaplan i løpet av de neste to årene? (kun et svar mulig)

- Ja
- Nei
- Vet ikke

Neste side

Hvor fornøyd var du med denne undersøkelsen?

Neste side

Har du andre tilbakemeldinger?

Neste side

Tusen takk for at du tok deg tiden til å svare på undersøkelsen!

Ønsker du informasjon eller å gi tilbakemeldinger angående undersøkelsen skriv gjerne til vra010@uib.no

Undersøkelse slutt.

A.5 Information Leaflet

Hei,

Beklager at det har tatt litt tid før jeg har fått sendt deg informasjonsskrivet om forskningsprosjektet, men her kommer det.

Dette er et informasjonsskriv til deg som var interessert i forskningsspørsmålet til spørreundersøkelsen som ble sendt ut gjennom Nortura sine medlemslister. Først og fremst vil jeg takke for at du tok deg tiden til å fylle ut spørreskjemaet. Jeg vet at det tar tid å fylle ut disse i en travel hverdag.

Forskningsspørsmålet til masteroppgaven min er hvorvidt det er kjønnsforskjeller i bærekraftige investeringer i Norsk landbruk. Dette gjøres gjennom et adferdsøkonomisk perspektiv. Adferdsøkonomi er et fagfelt som har som mål å forstå hvordan enkeltindividets valg påvirker økonomien. Fordi vi alle er forskjellige vil vi ha ulike forutsetninger for å ta valg vil det være forskjellig hva som påvirker valgene våre, men det finnes trender i forskningen. Det er vist at blant annet vår risikotoleranse, preferanse for umiddelbar nytte og gruppementalitet påvirker valgene våre. Disse tre tingene har jeg målt gjennom spørreundersøkelsen du har fylt ut.

Risikotoleransen ble målt i avveiningen mellom et «tryggere» valg versus et valg som ga høyere profitt. Dette var frøspørsmålet. Ifølge forsknings litteraturen vil en risiko avers person, en som ikke liker å ta risiko, velge å investere mer i det frøet som ga samme avling uavhengig av «godt eller dårlig vær». En risikotagende person vil heller velge å investere mer i det frøet som ga større avling og ta sjansen. Dette viser litteraturen at det er store kjønnsforskjeller i. Her vil kvinner som regel velge det mindre risikofylte alternativet, mens menn tar mer risiko. Forskning kan ikke si noe om dette er gener eller samfunnet som er grunnen til dette, men uavhengig av grunnen mener noen forskere at vi er nødt til å tilrettelegge for disse forskjellene.

"Present bias", kan defineres som en persons preferanse for umiddelbare fordeler. Dette er også mye diskutert i forskningen. Et klassisk eksempel er at de fleste har nyttårsforsett om å trene mer eller gå ned i vekt, men når nyttår kommer holder en ofte ut et par uker også faller en ut av det. Dette ble målt gjennom spørsmålet om hvor mye penger hadde gjort deg like fornøyd for eksempel i dag som om seks måneder. Hvor tålmodig og villig du er til å vente på de 100 000 er avhengig av hvor mye du verdsetter nåtiden. Her viser litteraturen at kvinner er mer tålmodige og i større grad villig til å vente på et gode enn å få det umiddelbart. Noen forskere mener at dette kan være på grunn av at kvinner tradisjonelt sett har oppdratt barn og derfor må i større grad utsette sine egne behov framfor sine barns.

Siste adferdsøkonomiske variabel jeg har er gruppementalitet. Dette er tendensen mennesker har til å gjøre noe hvis andre også gjør det. Et eksempel er at det er enklere å trene sammen med andre eller motetrender blir populære fordi «alle andre har XYZ». Dette målte jeg gjennom det siste spørsmålet i undersøkelsen hvor jeg spurte om du hadde planer om å investere i noen av klimatiltakene som er nevnt i Landbrukets Klimaplan. Her fikk noen informasjon om hvor mange som hadde svart i Trender i Norsk Landbruk hadde gjennomført minst et av tiltakene. Disse vil være en «treatment gruppe» som får informasjon om en trend blant norske bønder, mens de som ikke fikk denne informasjonen vil være en kontroll gruppe. Dette er et nødvendig grep for å kunne si noe om hvorvidt informasjonen om hvor mange som har investert har noe å si for individets valg om å investere. Her viser litteraturen at kvinner er mer mottagelige for sosiale hint eller trender. Om dette er samfunnet eller gener kan litteraturen ikke si noe om.

Resten er bakgrunnsspørsmål som jeg skal bruke som kontrollvariabler i de statistiske beregningene mine. Min hypotese er at det vil være færre kvinner som investerer i disse tiltakene fordi de er mer risikofylte.
Jeg har ikke startet å analysere dataene enda så kan derfor ikke si noe for sikkert, men om du ønsker mer informasjon når prosjektet begynner å nærme seg slutten er det bare å si ifra.

Håper dette besvarte noen av spørsmålene dine.
Hvis ikke er det bare å spørre.

Beste hilsen
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