

A Climate for Change? Norwegian Farmers' Attitudes to Climate Change and Climate Policy

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Synopsis

Climate change is one of the major challenges of our time, and particularly so for agriculture. Agriculture is a significant contributor to climate change and, according to projections from the Intergovernmental Panel on Climate Change (IPCC), will experience alterations in production conditions in the future. The Norwegian government's Report no. 39 (2008–09) *Climate change—Agriculture as a part of the solution*, is based on the point of view that the agricultural sector can and should contribute to Norway fulfilling its climate policy commitments. This requires changes in farm operations and production methods, making the farmer an important agent when it comes to the implementation of climate change mitigation measures.

In this article, I study Norwegian farmers' climate change perceptions and priorities, and examine what it would take for them to consider implementing mitigation measures on their own farms. The analysis is based on a survey focusing on climate change from a representative sample of Norwegian farmers in 2011, the only survey of its kind conducted on this group so far. The results show that even if farmers perceive climate change as real and manmade, they do not appear to experience the changes as requiring immediate action. Moreover, farmers seem to view adapting to new environmental policy as a greater challenge than adapting to climate change itself. Farmers also appear to place production-related goals and managing the farm economy higher on the agenda than curbing emissions. Financial incentives, in the form of public support schemes or higher prices for food produced in a more environmentally friendly way, are factors which could increase the likelihood of implementing environmental measures on their own farms. A majority of farmers also believe that sectors other than agriculture should contribute more to cuts in greenhouse gases. Factors that most clearly explain the variation in attitudes to climate change are education levels, political or ideological factors, and the feeling of proximity; that is to say, to what extent one perceives climate change to be something that will affect one's own productivity in the future. In order to fulfill environmental policy commitments in the agricultural sector, farmers' motivation must be strengthened, and the focus should be placed on measures that view productivity goals, farm economies and mitigation measures in a wider context.

Keywords: climate change, mitigation, farmers' perceptions, food production, agricultural policy

Introduction¹

At the Ministry of Agriculture and Food's (LMD) climate conference in June 2009, the current Minister of Agriculture, Lars Peder Brekk, presented the second Stoltenberg government with the report *Climate Challenges—Agriculture as a part of the Solution* (Report no. 39, 2008–09). During the presentation of the report, also called *Agricultural Climate Report* (Lyssandtræ 2009), Brekk stated that agriculture subsists on and lives alongside the environment, and counts among those sectors which are the most vulnerable to weather and temperature conditions. As food production also contributes to the release of emissions, Brekk emphasised the necessity for measures which would contribute to curbing emissions while ensuring that Norwegian food production adapts to future challenges surrounding the increase in demand for food (LMD 2009). He argued that the agricultural sector should “contribute by ensuring the implementation of measures which reduce greenhouse gas emissions (...) which will ensure that Norway contributes in a positive way to reducing the global output of emissions,” (LMD 2009:10) through, for instance, increasing efficiency in the meat and dairy sectors, investment in the production of biofuels, increased precision in the handling of artificial fertilisers, changes in soil preparation in the autumn and a reduction in the planting of marshes. In addition, the government expressed a wish to “strengthen the use of forestry-related incentives with an aim to increase the uptake of CO₂ through sustainable, active forestry and planting” (LMD 2009:14).² In a national context, emissions from agriculture are estimated to constitute between eight and nine percent of total emissions (Hohle et al. 2016). If we break this down into the

¹ I am grateful to Hilde Bjørkhaug, Rural Research, for her constructive comments on concluding this article. I'd also like to thank the participants at the PhD seminar at the Department of Sociology and Political Science at NTNU for their contributions in the early phases, as well as NST's anonymous consultants.

² The climate report stated that agriculture has the potential to exceed its sector obligations by including measures in the forest sector. The net amount of CO₂ absorbed by Norwegian forests is equivalent to half of total emissions, but this can be increased through additional planting and a net amount of growth (Bøhn 2013). However, the relationship between increased forest activity and new planting, and perspectives on natural diversity and the protection of forests, makes this a controversial proposal (see for example Hofoss 2012; Holstmark 2010; Norwegian Environment Agency 2013).

greenhouse gases CO₂, methane and nitrous oxide, these made up one percent, 50% and 49% respectively of emissions from Norwegian agriculture in 2007 (SFT 2009). The background to the agricultural climate report was the general climate agreement made at the Storting (Recommendation no.145, 2007–08), which influenced the application of a more sector-encompassing environmental policy (Elvsaaas 2007) with a production-focused agricultural policy. The report was issued in a period reflecting a marked international change of pace in environmental politics as a result of the fourth main report issued by the United Nations' International Resource Panel in 2007 (Kasa 2013), in the aftermath of the years of food and financial crisis in 2007–08.

Norwegian environmental and climate policy is characterised by some overarching principles. Firstly, there is a *sector principle*, which means that different public sectors are expected to contribute to and ensure that national environmental and climate targets are met, and that these targets are reflected in practice (Kleven 2000). Secondly, there is a principle that the *polluter should pay*.³ Report no. 34 (2006–07) *Norwegian environmental policy* stipulates that the law of pollution should be made applicable for greenhouse gas emissions. This implies that emissions which are caused by human activity must be regarded as pollution, and that costs arising from these emissions should fall on the sector in question, in this case, agriculture. The agricultural climate report is founded upon these principles, and reasons that agriculture should assume a sectoral responsibility by contributing to the fulfillment of Norwegian climate commitments internationally, and should bear the cost of reducing emissions by an amount at least equivalent to the amount released by the sector (Report no. 39, 2008–09).

Given the degree of seriousness in predictions for the environment, and the level of ambition underpinning environmental policy, knowledge of the potential for putting the suggested measures into practice is important. If the environmental goals for the agricultural sector are to be achieved, the farmer must be a central figure, if we consider that emissions from agriculture are the sum of production-related choices made at the farm level (Bonesmo and Harstad 2013). Furthermore, changes must happen at the farm level in order for environmental targets to be reached. It is therefore important to get a clear view of Norwegian farmers' attitudes towards this in order to gauge the potential for putting into practice the measures suggested in the agricultural sector's climate report. Until now, Norwegian opinion studies within the environmental field (Austgulen and Stø 2013; Fløttum, Rivenes and Dahl 2014; TNS Gallup poll 2015) have not been aimed at farmers as a group to any great extent. The aim of this study is therefore to establish a broadly representative body of

³ Bruvoll and Dalen (2008) have argued that, in reality, this is a weak principle in the context of environmental politics, and indicate, for instance, hidden subsidies in the transport and energy sectors. I don't enter into this discussion in my analysis, but believe that the principle itself can be used as a basis for developing a policy framework.

knowledge of Norwegian farmers' views on climate change and mitigation measures. The analyses in this article are based on data from a representative survey distributed amongst Norwegian farmers and carried out by the Institute for Rural and Regional Research in 2011. This is currently the only available Norwegian study of its kind with agriculture and climate change as its themes.

Agriculture and climate change

In a study from 2011 of how climate change will affect agriculture in the north of Norway, several farmers were interviewed about their views on the relationship between environmental policy, climate adaptation and agronomy. Researchers found that the farmers did not necessarily have negative views on climate change, but were equally interested in the possibility for a longer growing season. Several farmers reported that the growing and grazing season had already grown longer. Moreover, an uncertainty regarding the implementation of mitigation measures was expressed. Requirements for a reduction in the number of livestock, restrictions on the planting of marshes, and a tariff on fossil fuels come in addition to requirements for effective food production, maintaining a certain number of farms in the districts, and reorganisation in order to adapt to climate change (Dannevig 2011; Kvalvik, Dalmansdottir, Dannevig, Hovelsrud, Rønning, and Uleberg, 2011). In a similar study from the western and middle part of Norway, central figures in the industry were interviewed about their views on changes occurring as a consequence of direct and indirect environmental effects. Here, farmers related that they had already noticed direct effects, such as a longer growing season, but also increased amounts of rain and more extreme weather conditions. They showed an interest in the development of new technology and in improving their knowledge in order better to adapt to these changes in the future. A majority of those interviewed were initially positive to demands for the implementation of mitigation measures in agriculture, but expressed scepticism towards some of the concrete proposals as well as towards the research they are founded on. The absence of an analysis of possible consequences, and the lack of a holistic view was mentioned in this context. Furthermore, an increased usage of feed concentrate in production might lead to a less productive exploitation of pastures and locally produced forage, restrictions in the planting of marshes and a reduced use of artificial fertilisers could affect crop levels and food production, and the production of biofuels from manure is not likely to be profitable. In addition, development towards fewer and larger farms will increase emissions through increased need for transport and reduced soil quality as a consequence of larger and heavier machinery in the fields (Skarbø and Vinge 2012).

The year 2010 is considered to have been a bad one for farms in Troms, with crops suffering great damage due to a hard winter and a late spring, and a short, poor growing season with a lot of rain.

In the aftermath of this bad year, an analysis of the situation was conducted (Rønningen, Bjørkhaug, Holm and Vik 2011), where representatives from the industry were asked to analyse the situation. If farming in peripheral regions, such as in the north of Norway, is to be better equipped to tackle future climate-related extreme weather conditions, a more differentiated policy taking into account regional variations is needed. The central actors who were interviewed in Troms stated that the existing policy framework is not suited to compensating farmers for years with particular climate-related challenges, such as the poor year in 2010.

The studies in the north and the west of Norway have three traits in common. Firstly, the farmers indicate what they perceive to be conflicting agricultural policy goals, and fear that the demand for the implementation of mitigation measures (climate policy) will have a negative effect on production volumes and the economic sustainability of farms in regional areas (district policy). Moreover, farmers express that adapting to an altered policy framework, especially environmental policy, is a greater challenge than adapting to climate change in itself. Thirdly, studies show that scepticism toward climate change is reflected on many levels, and has different nuances. This scepticism reflects a general uncertainty and is not a rejection of climate knowledge or direct opposition to proposals for new climate policies.

In a Master's thesis from NTNU that builds on the same survey data I am using in this article, Aasprang (2012) studied Norwegian farmers' understanding of how they believe climate change will affect their farms in the next ten years. She finds that a majority of farmers believe their farms will be directly affected, and that few have no opinion on the matter. Age, level of agricultural education, political beliefs and production conditions on the farm are all factors which help clarify whether they believe the environmental effects will be positive or negative. Aasprang also indicates that, in quantitative studies, it can be difficult to determine whether farmers refer to local weather variations, or climate change in more general terms, when they respond to questions regarding vulnerability and risk from climate change (Aasprang 2012: 83-84). She suggests that those who work on farms on a daily basis tend to be more concerned about local weather conditions, and that climate change on political and physical levels seems to be perceived by many as something distant and difficult to handle (see also Alfsen, Hessen and Jansen 2012).

In a study from 2013 and 2014, Asplund (2014) finds that Swedish farmers do not reject the idea of manmade environmental changes, but that they do not quite believe environmental researchers. Here, they indicate that the weather is always changing, and point out that farmers have long experience in adapting to this on a local level. Farmers interviewed by Asplund state that they per-

ceive a gap between researchers' theoretical knowledge on an aggregated level, and farmers' practical experience in handling seasonal variations from year to year. One consequence of this view is a scepticism towards the implementation of mitigation measures, which are perceived as a potential threat towards the competitiveness of Swedish farming within the EU and to production targets within the sector, partially because farmers are fearful of increased costs and restrictions in farming activity. Similar attitudes were observed by Hogan et al. (2011) in an Australian study encompassing 4,000 farmers. Here, a quarter of the respondents expressed disagreement with the scientific consensus in the field, and therefore did not perceive a need for climate change mitigation measures within farming.

Explanatory background factors

In a study of climate change scepticism among farmers in Scotland, Islam, Barnes and Toma (2013) point out that no independent theories have been developed relating to factors that can help to explain scepticism to climate change, and variations in attitudes to climate change specifically among farmers. Therefore, they have founded their analyses on explanations deriving from general environmental studies, with an emphasis on demographic factors, levels of education and knowledge, personal experiences or proximity to climate-related events, ideology and personal values.

Demographics, knowledge, and education

A much cited finding from environmental studies both in Norway and internationally is that young and highly educated people have a more positive attitude to environmental policy and mitigation measures than older people, and this is in part connected to Inglehart's thesis about new politics (Båtstrand 2015; Kvaløy, Finserås and Listhaug 2012). As an extension of this approach, we can refer to the information deficit model (Norgaard 2011). This stipulates that increased knowledge of the reasons for and effects of climate change will affect both attitudes and actions, an argument which is supported by Ryghaug (2011), who maintains that a fundamental understanding of environmental challenges is an important factor when it comes to garnering support for the implementation of measures. Rickinson (2001) offers an interesting perspective in this context with the argument that, as knowledge of the environment and climate change gains an increasingly important place in general education, we will see the steady growth of educated youth who have a greater awareness of the environment and of climate change than previous generations. In sum, one can therefore make the assumption that age, levels of education and knowledge of climate change are all factors that will also affect Norwegian farmers' attitudes to climate change.

Proximity and personal experience

A number of studies have shown that proximity to and personal experience of extreme weather and the negative effects of climate change affect attitudes and the view of the need for mitigation measures to a great extent, which is reflected in the study from the farms in Troms following the bad year in 2010 (Rønningen et al. 2011). Australian and American farmers have for a long time been perceived as being climate sceptics, rejecting the notion that climate change is manmade, contending rather that it is caused by long-term, continuous and natural cycles (Beilin, Hill and Sysak 2011; Hogan, Berry, Peng Ng and Bode 2011). This perception has gradually changed with changes in rainfall patterns and drought to a level, and at times of the year, that they have no experience in adapting to (Arbuckle, Morton and Hobbs 2013). Lujala, Lein and Rød (2015) describe how experiences of natural catastrophes affect the perception of risk and feelings of vulnerability, while Myers, Maibach, Roser-Renouf, Akerlof and Leiserowitz (2012), and Howe and Leiserowitz (2013) have shown that attitudes are affected when climate-related changes become apparent. A Norwegian study has shown that individuals who have been harmed by natural catastrophes are more worried about themselves and their local area than others, but that this feeling does not lead to viewing climate change as a future threat to society as such (Lujala et al. 2015).

On the other hand, climate change may be construed as something abstract, which is distant both in terms of time and space (Lujala et al. 2015). Despite the fact that scientific studies are ever more certain that climate change does occur, and that it is manmade, a Norwegian poll by TNS Gallup shows that the proportion of Norwegians who are worried about the consequences of climate change has decreased from 60% in 2010 to 44% in 2015 (TNS Gallup poll 2015). The survey *Trends in Norwegian Farming*, reflects the same tendency among Norwegian farmers: one third of the respondents do not believe environmental changes will have significant consequences, and only 4% believe that the effects will be very negative (Storstad and Rønning 2014).

Ideology and political position

Austgulen and Stø (2013), Hernes (2012) and Whitmarsh (2011) indicate that examining differences in outlook, expressed through political ideology and personal values, can contribute greatly to explaining the variation in attitudes to climate change. Austgulen and Stø (2013) and Aasen (2015) have shown that respondents who harbour individualistic values and vote conservatively are more sceptical to climate change than those who harbour more egalitarian values and do not vote conservatively. Nevertheless, it is arguably uncertain that the traditional left-right axis is suited to explaining the variation in attitudes to climate change, as the most recent climate agreements at the Storting enjoyed cross-party support. In a study of the parliamentary election in 2009, Tjernshaugen, Aardal

and Gulleberg (2011) point out that the question of whether climate change is manmade was focused in great part on the Progress Party against “the rest,” even though those who voted for the Socialist Left Party and the central parties stood out as being more environmentally conscious than the rest of the voters. Although Norwegian farmers vote across the whole spectrum of parties at parliamentary elections, a clear majority votes for the Centre Party. The question is whether those who are not Centre Party supporters have different attitudes to the environment from those who vote for traditionally “green” parties such as the Socialist Left Party and the Liberal Party.

Issues and hypotheses

In this article, I examine more closely the potential for change among Norwegian farmers, and ask which attitudes farmers have in relation to climate change and environmental policy, which political priorities—including mitigation measures—they feel are important for agriculture, and what it will take for them to consider implementing these measures on their own farms.

Data and methods

The data in this study is based on a survey completed during 2011 by the Institute for Rural and Regional Research, and was funded by the Norwegian Research Council. The respondents were selected at random from the producer register⁴ at the Norwegian Agriculture Agency. In total, 1,500 questionnaires were sent out by post, and respondents could choose whether they wanted to answer electronically or on paper. Seventeen percent in total selected the electronic version. We gathered 646 answers, which yields a response of 43%. Based on population numbers from the producer register, and a comparison between those who answered and the selection of 1,500 respondents, we found that the final selection is sufficiently representative. There has been no weighting of the material in connection with the analyses in this article.

The data is analysed using SPSS, and includes a mix of frequency reports, and factor and reliability analysis of two sets of questions about climate-related attitudes. In addition, an OLS regression model to explain the variation in attitudes to climate change has been used.

One aim of the survey was to map Norwegian farmers’ perception and adaptation to climate change and environmental policy within agriculture. We also wished to identify factors that form the basis for operational choices and environmentally related risk assessments carried out by farmers on their farms. The questionnaire was made up of four principal parts, in addition to a section with background questions. The first two parts focused on conditions connected to operations and

⁴ A national registry that encompasses all owners of agricultural property who have applied for and received production support in the current year. In 2011, just over 44,000 farms were granted support for operational costs.

production on the farm, and asked which political priorities farmers think are important for agriculture. This information supplied us with useful background information that we believe can contribute to explaining the variation in both attitudes and motivation to implementing mitigation measures on one's own farm. The third part focused on the issues of implementing mitigation measures and adapting to climate change. Here, we mapped out attitudes to climate change in general, and the relationship between environmental and agricultural policy. We also asked whether climate-related measures had been implemented on the farms, and which factors would convince farmers to put into practice operational changes with the environment in mind. The last major part brought up environmental debate and political questions.

In this article, results from the analyses of three of the principal parts of the survey are presented. In the first part, Norwegian farmers' political priorities when it comes to agriculture are described. In the second part, a multivariate analysis of farmers' attitudes to climate change is carried out, while in the third part, I take a closer look at what it would take for farmers to consider implementing mitigation measures on their own farms.

Operationalisation of variables

Dependent variable: attitudes to agriculture and climate

The theme agriculture and climate change is about the relationship between human activity and biophysical and biochemical natural processes. I have therefore started with two sets of questions with thirteen statements in total regarding attitudes to climate change, agricultural production and nature. The questions regarding attitudes had a scale of five answers, ranging from "completely or mostly agree," "either/or" and "completely or mostly disagree." In the additional analyses, and in the construction of an attitude index, everyone who answered "don't know," and those who did not answer, are placed in the middle category on the five-part scale. The division of answers to the thirteen statements about the environment are first analysed through a factor analysis. The results are shown in Table 1, and here, four factors are identified. In the regression analysis I have chosen to start with the seven questions about attitudes which are identified in the first factor, and which have a factor loading greater than .300 (Bjerkan 2012). A reliability test (Cronbach's Alpha) on these seven attitude variables yields a result of $\alpha=0.811$, which is regarded as sufficient consistency (Clausen and Johansen 2012). In other words, these variables make up a good measure of attitudes to climate change. Based on the seven attitude variables, an index with 35 categories in total was constructed. These are then transformed into a scale from 0 to 100, where 0 represents the position "climate change is manmade/emissions are too high," while 100 represents the position "we can't do anything about climate change/climate change is due to natural variation."

Table 1. Factor analysis of climate change attitudes, agriculture and nature*

| | Factor | | | |
|---|--------|------|-------|------|
| | 1 | 2 | 3 | 4 |
| Climate change is man-made | .794 | | | |
| GHG-emissions are too high | .551 | .412 | -.358 | |
| Organic production is more climate friendly | .321 | .654 | | |
| Biofuels | | .731 | | |
| Other sectors are more important | | | .812 | |
| Energy self-sufficient | | .727 | | |
| Problems of reputation | .383 | .547 | -.328 | |
| Is already taken seriously | | | .615 | |
| The balance of nature is fragile | .728 | | | |
| Nature is important, but not sacred | | | | .787 |
| We can't do anything about climate change | -.664 | | | .428 |
| Man reigns nature | | | | .653 |
| Nature is self-adapting | -.781 | | | |

* Principal Component Analysis, Varimax with Kaiser Normalization, 8 rotations

Independent variables in the regression models

In addition to background variables such as gender, age, levels of education and knowledge, the regression model is based on variables tied to farm production, financial situation, the extent to which one believes that climate change will affect oneself, and political preferences. A complete overview of the variables can be found in the appendix.

Levels of education and knowledge are measured through two variables, education level and self-reported levels of knowledge, in the question “How much or little knowledge do you yourself think you have regarding climate change and agriculture?” with a five-point response scale ranging from “a lot of knowledge” to “little knowledge.”

Production and conditions on the farm are made up of the variables main production and takeover. Regarding takeover, we asked if there were any plans for offspring to take over the farms, and allowed for degrees of doubt in the response categories. This variable is coded as a dichotomy with the values “definitely”/“possibly” and “definitely not”/“possibly not.” In response to the question about main production there was the possibility of marking one or two crosses. Many farms have several income streams, and are organised in a way that can sometimes make it difficult to determine what the main production is. For each of the six answer alternatives, dummy variables were constructed. Meat production constitutes the reference category in the regression analysis.

Risk perception, and to what extent one thinks one will be affected by climate change in the future are, to a certain degree, related. In the analysis I have included the question “How likely do you think it is that your farm will be affected by climate change in the course of the next ten years?” Here we measured the perceived likelihood of being affected using a five-point scale which goes from “very likely” to “very unlikely.” The responses are assumed to be affected by personal preferences and local conditions. In this instance we have not stated the direction in which one is affected (negative or positive) but base ourselves on the assumption that there is a relationship between the extent to which one believes one will be affected and attitudes to climate change. A positive effect of climate change can, for instance, be a longer growing season due to shorter and milder winters.

Two variables connected to the financial situation of the farm are included in the analysis. The first measures the respondents’ experience of the actual financial situation on the farm, and the question was whether this situation had changed in a positive or negative way during the last five years. The other variable is tied to optimism, and here we asked whether the respondents believed the financial situation would change in a positive or negative way in the next five years.

The final main category consisting of two variables is politics and ideology, which includes a question related to organic production. In addition to encompassing a financial component due to production-support, the choice to produce organically also embraces an ideological component (Bjørkhaug 2006). The organic variable is coded as a dichotomy, where everyone who produces organically—either completely or partially—or whose production is currently undergoing conversion to organic, is put into one category. The political variable is based on questions relating to voting “if a parliamentary election were imminent.” Politically speaking, Norwegian farmers make up a relatively homogenous group, and in the survey, nearly 40% have indicated that they would vote for the Centre Party, which is a centrist rural party. One third of farmers have not answered which party they would vote for. This category is included as a separate category, and has been included in the regression analysis in order to see whether it is concealing information, but must not be confused

with the category “other parties,” which includes the choices The Red Party and various village lists. In the analysis, the Centre Party is listed as a reference category.

In order to supplement the regression analysis, and in order to address the expanded group of issues, the results for two questionnaires focusing on which political priorities farmers deem important for agriculture, and on what it would take for farmers to consider implementing mitigation measures on their own farms, are also shown.

Analysis results

Regression analysis: Attitudes to climate change

The variables that form the foundation for the attitude index in the regression analysis are made up of claims from two questionnaires with a similar five-point response scale, from “completely agree” to “completely disagree,” with the middle category “don’t know”/“either/or”. These results are shown in Table 2.

Table 2. Statements about climate change, agricultural production and nature. Percentage and Valid N

| | Com- pletel y agree | Par- tially agree | Ei- ther/Or | Par- tially disa- gree | Com- pletel y dis- agree | N= |
|---|------------------------------|-------------------------|----------------|---------------------------------|-----------------------------------|-----|
| Climate change is manmade | 15 | 45 | 12 | 19 | 10 | 623 |
| GHG emissions from Norwegian agriculture are too large | 2 | 13 | 12 | 45 | 28 | 623 |
| Organic production is more climate-friendly than conventional production | 6 | 21 | 17 | 33 | 23 | 624 |
| Growing plants for biofuels is a sensible strategy for improving the climate | 5 | 25 | 17 | 27 | 26 | 625 |
| It is more important to reduce GHG emissions in sectors other than agriculture | 35 | 45 | 11 | 8 | 2 | 624 |
| Norwegian agriculture can become energy self-sufficient if all the resources in the sector are utilised | 9 | 35 | 29 | 22 | 5 | 623 |

| | | | | | | |
|--|----|----|----|----|----|-----|
| If Norwegian agriculture does not take climate challenges seriously, it will acquire a poor reputation | 6 | 30 | 18 | 30 | 16 | 624 |
| In my experience, climate challenges in agriculture are already taken seriously by Norwegian farms | 15 | 55 | 19 | 10 | 2 | 626 |
| The balance of nature is very fragile and easily disturbed by human activity | 16 | 51 | 9 | 19 | 5 | 622 |
| Nature is important, but not sacred | 14 | 52 | 8 | 17 | 9 | 619 |
| We can't do anything about climate change | 5 | 24 | 8 | 43 | 20 | 624 |
| Human beings were created to control nature | 6 | 15 | 15 | 25 | 39 | 619 |
| Nature is self-adapting | 7 | 35 | 11 | 31 | 16 | 619 |

Sixty percent of respondents completely or partially agree with the statement that climate change is manmade, and 67% of respondents believe that the balance of nature is fragile and easily disturbed by human activity. Seventy three percent of respondents do not agree with the statement that GHG emissions from Norwegian agriculture are too high, while 80% of respondents believe that it is more important to reduce emission in sectors other than in agriculture. Seventy percent of respondents believe that agriculture's climate challenges are already taken seriously.

In order to uncover further variation in climate change attitudes, I carried out an OLS regression with an attitude index as a dependent variable. The themes for the background variables are knowledge, conditions surrounding production on the farm, the size of the farm, proximity to environmental challenges, and politics and ideology. The OLS results are shown in Table 3. A complete overview of the operationalisation of the variables included in the model can be found in the appendix.

Table 3. OLS regression with attitude index as a dependent variable. Bivariate correlation coefficients and unstandardised regression coefficients (B). $R^2 = .198$, adjusted $R^2 = .181$.

| | Bivariate correlation | Sig. | B | Sig. |
|--|-----------------------|------|---------|------|
| Constant | | | 80.068 | |
| Age | -0.007 | | -0.097 | |
| Education level | -0.154 | ** | -1.024 | ** |
| Climate change knowledge | -0.037 | | -1.338 | ** |
| Myself or my farm most likely affected by climate change | -0.316 | ** | -3.836 | *** |
| Labour Party | -0.058 | | -1.29 | |
| Conservative Party | 0.029 | | 2.479 | |
| Progress Party | 0.111 | ** | 6.116 | * |
| Socialist Left Party | -0.203 | ** | -16.166 | *** |
| Christian Democratic Party | -0.038 | | 0.532 | |
| Liberal Party | -0.11 | * | -7.927 | * |
| Other Parties | -0.01 | | 2.114 | |
| Political Party (do not wish to name) | 0.182 | ** | 5.662 | *** |
| Organic Production | 0.082 | * | 2.108 | |

*** sig. < 0.001

** sig. < 0.01

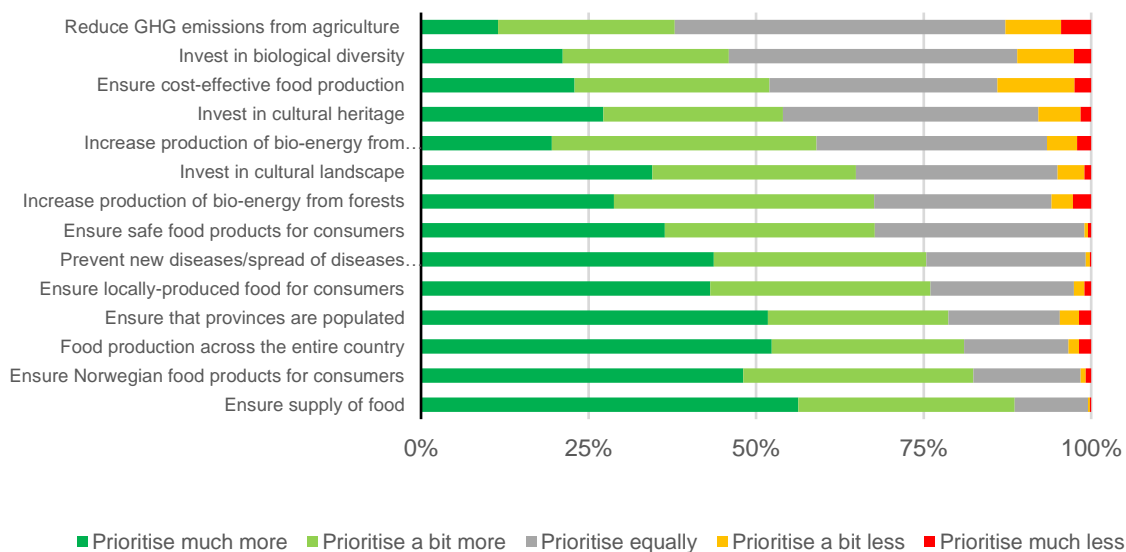
* sig. < 0.05

The regression analysis shows that both levels of education and self-reported knowledge about climate change have a significant impact on climate change attitudes. The higher the level of education of the respondents, the lower they score on the attitude index. This means that those with the highest levels of education, who report that they have a high level of knowledge on the subjects of environment and climate change, tend to believe that climate change is manmade, and that nature therefore will not self-adapt. Furthermore, we see that the extent to which one believes that one's own farm will be affected by climate change is also significant for the variation in attitudes to climate change. The more one believes one's own farm will be affected, the more one tends to believe that climate change is manmade. In the group of background variables that are related to political stance and ideology, four contexts are significant. Those which are traditionally referred to as green parties—the Socialist Left Party and the Liberal Party (Tjernshaugen, Aardal and Gulleberg 2011)—are significant in relation to attitudes to climate change in the sense that farmers who vote for one of these parties will have a tendency to believe that climate change is manmade. Socialist Left voters believe this to be true to a greater extent than those who vote for the Liberal Party, according to the regression analysis. In the regression analysis, the additional category “don't wish to name” which party one would vote for is included. This has a significant effect, but in the opposite direction of those who would have voted for the Socialist Left Party or the Liberal Party, and in the same direction of those who vote for the Progress Party, with about the same level of strength as the Liberal Party category. We can only speculate on what is concealed within the category “don't wish to name” (which party one would vote for should there be an imminent parliamentary election), but there is reason to assume that these respondents belong to the opposite end of the environmental scale to those who vote for the Socialist Left Party and the Liberal Party.

Political prioritisations in agriculture

In the next table, the division of answers to questionnaires about political prioritisations in agriculture are presented.

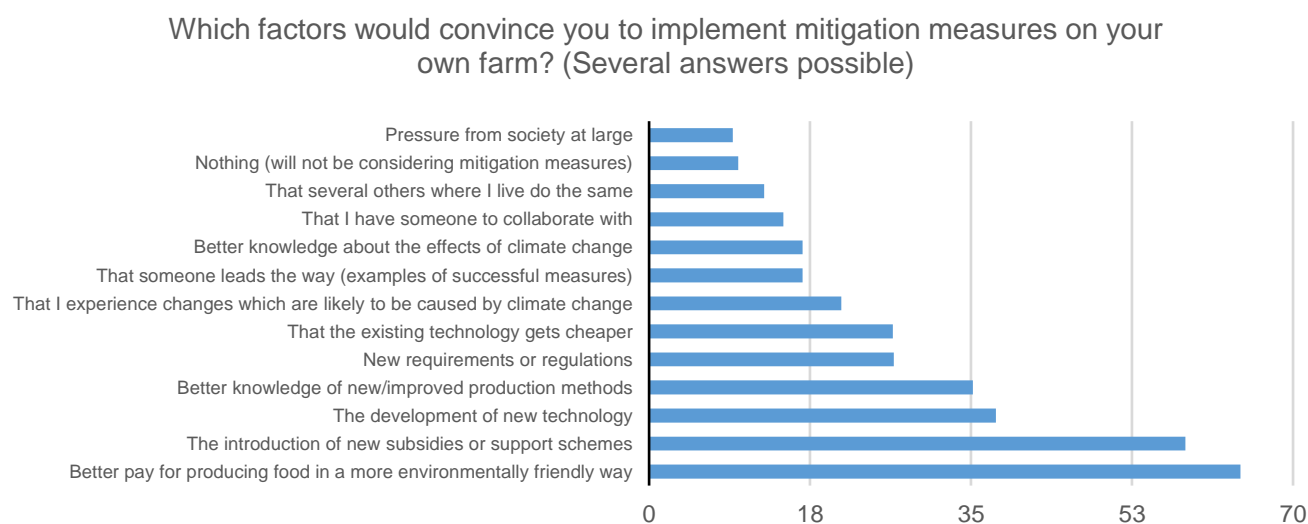
Should Norwegian agriculture prioritise the following more or less in the next five years?



The results show that, faced with a series of political aims, farmers prioritise their role as food producers far more highly than their role as producers of common goods such as cultural heritage, biodiversity or climate mitigation measures. In other words, the farmers’ attitudes reflect the political prioritisations made on a government level, which have to do with production-related conditions; for instance, output, food security, and supporting agriculture across the whole country, as expressed in the agricultural report to the Storting *Velkommen til Bords* (Report no. 9, 2011–12). If we solely examine their prioritisations linked to climate policy, the importance of production is also clear. The production of bioenergy from forests and/or manure is prioritised more strongly than cuts in GHG emissions.

The implementation of mitigation measures

In the survey, farmers' views on the implementation of mitigation measures were measured through two sets of questions. In the first set, we asked if measures on their farms (operational changes) had been put in place or were being concretely planned, due to climate change. Only 14 of 646 respondents (2%) answered positively. Those who answered positively had the opportunity to list the types of measures implemented. The measures referred to included new energy solutions on their farms (phasing out of fossil fuels), changes in soil preparation, improved drainage in order to prevent emissions of nitrous oxide and CO₂, and forest planting in order to increase carbon storage. In the other set of questions, we asked what it would take for farmers to consider implementing mitigation measures on their farms. Here, it was possible to choose more than one option. The results can be seen in the figure below.



The results reveal that the willingness to implement mitigation measures is to a great extent connected to financial factors, either through improved payment for producing food in a more climate friendly way (64%), or the introduction of new support schemes (58%). Factors such as requirements and regulations, or that the farmer experiences change as a result of climate change, show lower scores: 27% and 21% respectively. One in ten stated that under no circumstances would they consider implementing climate mitigation measures.

Discussion and conclusions

In the regression analysis, it was revealed that knowledge-related conditions (levels of education and self-reported knowledge about climate change), political position, and the belief that one's farm

will be affected by climate change all contribute to explaining variations in the attitude index. In line with earlier studies, I find that a higher level of education (Austgulen and Stø, 2013; Kvaløy et al. 2012), and the belief that one will be affected by climate change (Howe and Leiserowitz 2013; Lujala et al. 2015; Myers et al. 2012) correlate to a low score on the attitude index; that is to say, a belief that climate change is manmade and that measures ought to be implemented in the sector. Here it is important to note that nearly half of the farmers included in this material express that they see it as either very or quite unlikely that they will be affected by climate change during the next ten years.

In the introduction to the regression analysis, it was tested whether financial conditions (status and optimism about the future) can contribute to explaining a variation in attitudes to climate change. I found no significant effects in connection with this. This could indicate that farmers' views on climate change, mitigation measures and natural variation are not dependent on the financial situation of the farm. To what extent the implementation of mitigation measures increases the cost of running the farm is not obvious for all types of production and land. Puuponen, Kortetmäki, Paloviita and Järvelä (2015) have shown that investment costs are a considerable barrier to considering the implementation of mitigation measures for many. An Australian study found that the implementation of mitigation measures can contribute to a reduction in income up to 50% (John, Pannell and Kingwell 2005), and, faced with the prospect of increased costs, denial of or scepticism towards climate change might prove a more attractive option (Silberner 2014). On the other hand, Smith and Olesen (2010) show that environmentally smart adaption strategies, such as a more effective use of fertiliser and improved soil preparation in order to decrease the release of emissions into the atmosphere, can reduce cost levels while maintaining current levels of productivity. This is more or less in line with earlier research showing that both high and low incomes can contribute to explaining both scepticism of and support for mitigation measures. The relationship between farmers' financial situation and their attitudes to climate change and environmental politics therefore stands out as a field which should be studied more closely in the future.

In line with earlier studies by, among others, Tjernshaugen et al. (2011) and Austgulen and Stø (2013), there is a strong connection between ideological and political position and attitudes to climate change and mitigation measures. In my study, I find that whether or not you are voting for "green parties"—the Socialist Left Party and the Liberal Party—help explain variation in the regression model. Farmers who vote for these parties hold a stronger opinion than others that climate change is manmade, a belief that justifies the implementation of mitigation measures. If we quantify this, the actual contribution to influencing attitudes to climate change amongst the population is ra-

ther small, since only 4% of my sample says they would vote for the Socialist Left Party or the Liberal Party. The proportion of “green” farmers and those open to implementing measures thus make up too small a part to have a significant influence on agriculture becoming more positive to the implementation of mitigation measures. Those who answered that they would have voted for the Progress Party, or did not wish to reveal which party they would have voted for, also affects the model significantly, but in the opposite direction to those who would have voted for the Socialist Left Party or the Liberal Party. There is reason to believe that this category to some extent conceals climate-sceptic farmers. I can only speculate on why as many as 15% of respondents do not wish to reveal their preferred political party. However, there might be reason to believe that this conceals people who are sympathetic to the political right given the level of climate scepticism displayed, and that one does not wish to give an answer that is considered not politically correct. Another explanation might be that one holds a view of the environment that runs contrary to that of the party one would have voted for, but that one does not wish to reveal this. In my material, four out of ten state that they would have voted for the Centre Party, and Norwegian farmers are often perceived as being supporters of this party. Revealing that one sympathises with the Progress Party, for instance, and is sceptical to climate change, could in such a context be experienced as uncomfortable, even though one’s anonymity in the survey is guaranteed.

Compared with studies in other countries, Norwegian farmers in my study do not appear to be particularly sceptical to climate change. Still, my analysis reveals an inconsistency in the farmers’ answers. Even though six out of ten Norwegian farmers believe in manmade climate change, mitigation measures are not prioritised highly in the agricultural sector compared with other issues. It is estimated that Norwegian agriculture contributes between eight and nine percent of emissions, and it is considered to be technically possible to reduce emissions by up to 20% going towards 2030 without it affecting overall food production (Hohle et al. 2016: 11-12). Moreover, in Report no. 39 on climate change and agriculture, it was made clear to farmers that they must contribute to climate policy through reducing emissions and introducing measures to capture CO₂. Nevertheless, this isn’t reflected in my analyses: seven out of ten believe that climate challenges are already taken seriously and that GHG emissions are not too high, while eight out of ten believe that other sectors ought to make a bigger contribution. This must be interpreted as a constant rejection both of the sector principle and the principle that the polluter should pay, principles that dominate the management of Norwegian environmental and climate policy (Kleven 2000).

I would argue that what becomes clear here is climate scepticism, but of a different kind than was mentioned earlier in this section. Austgulen and Stø (2013:125) describe three types of climate scepticism: trend-based scepticism (is climate change taking place), reason-based scepticism

(if the changes are manmade), and effect-based scepticism (are climate changes only negative, or over-exaggerated). Norgaard (2011) mentions a fourth type of scepticism, described as consequence-based scepticism (implicatory denial), which indicates that we behave as if the effects of climate change are of little significance. I would argue that the type of scepticism demonstrated by Norwegian farmers in my data constitutes a fifth type of skepticism: *solution scepticism*. I believe this to be directed towards the effects of suggested climate policies. The qualitative climate studies from the north of Norway (Kvalvik et al. 2011) and the west of Norway (Skarbø and Vinge 2012), and Asplund's (2014) study from Sweden, all show that farmers are unsure of what kind of effect the proposed climate mitigation measures will have on productivity on their farms and their economy in the long term. This implies that the challenges in Norwegian agriculture are not necessarily about whether farmers think climate change is manmade, or if they doubt the scientific basis of climate predictions, but has more to do with the types of proposed political solutions. Farmers know a lot about how to adapt to weather variability but less about how to adapt to the unknown effects of proposed climate policies. In my study, what the farmers themselves indicate to be their preferred framework of measures relates to economy and production: ranked on top are being more highly paid for producing food in a more climate friendly way, and new support schemes for implementing mitigation measures on farms. Some might claim that this shows that farmers do not do anything unless they receive state subsidies, but I consider this to be too simplistic a conclusion. My view is that farmers' attitudes reflect the fact that they primarily are food producers with independent responsibility for the financial running of farms, and that they are unsure of how the proposed measures will affect their productivity and financial situation.

Concerning the question of political priorities for agriculture, production-related issues are also ranked the highest: to ensure the preparedness of foods, and to secure Norwegian foods and production across the whole country. The aim to reduce GHG emissions is ranked at the very bottom. This corresponds with other studies, which show that among all the different roles a farmer can have, the role as the producer of food or grain is the most important (Burton and Wilson 2006; Gorton, Davidova and Latruffe 2008). Based on this, we can assume that farmers are answering also as producers, not solely as consumers, when they are presented with questions in a survey about climate change. The responses are thereby characterised by a producer perspective and not a consumer perspective, and this explains in part both the uncertainty tied to the consequences of requirements for mitigation measures in the sector, and that production-related goals are prioritised more highly than climate-related goals. This does not mean that Norwegian farmers don't consider climate change to be a great challenge, or that mitigation measures are not important, just that other goals within agricultural policy and in farm operations are at least equally important. Norwegian

farmers are considered to be very adaptable. In the 1980s and 1990s they adapted to stricter environmental regulations, as was the case throughout the rest of Europe, despite the fact that they originally expressed scepticism towards several of the restrictive proposals. Based on these experiences, there is reason to believe that if politicians issue clear signals that mitigation measures must be implemented in the agricultural sector, and follow up with concrete requirements and guidelines, the sector will gradually adapt and do its part when it comes to implementing the required climate mitigation measures.

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Appendix

Appendix 1. Operationalisation of variables in the regression analysis.

| <i>Dependent variable</i> | <i>Operationalisation</i> |
|--|---|
| Attitude index | Index based on 7 claims about agriculture, climate change and nature ($\alpha=.811$), with a five-point response scale where 1=Completely agree, 2=Partially agree, 3=Either/Or/Don't know, 4=Partially disagree and 5=Completely disagree. The index goes from 0-100, where 0 represents the position "Climate change is man-made/Emissions are too great", while 100 represents the position "We can't do anything about climate change/Climate change is due natural variation". |
| <i>Independent variables</i> | |
| Age | Continuous, based on year of birth |
| Level of education | Ordinal level with four categories: 1=Primary school, 2=Secondary school, 3=University level/Further education up to 4 years, and 4=University level/Further education of 4 years of more |
| Knowledge of the environment | Question about how much environmental knowledge the respondent considers he/she has regarding climate change and agriculture. A five-point response scale with the categories 1=A great amount of knowledge, 2=Quite a lot of knowledge, 3=Either/Or, 4=A limited amount of knowledge, 5=Little knowledge |
| Whether he/she is affected by climate change | Question about how likely the respondent thinks it is that his/her farm will be affected positively or negatively by climate change in the next 10 years. Response categories are 1=Extremely likely, 2=Quite unlikely, 3=Don't know/Unsure, 4=Quite unlikely, 5=Extremely unlikely |
| Politics | Question about which party the respondent would vote for in the event of an imminent parliamentary election. Coded as dichotomies with the values 1=would have voted for and 0=everyone else. Dichotomies: the Labour Party, the Conservative Party, the Progress Party, the Socialist Left Party, the Christian Democratic Party, the Liberal Party of Norway, other parties, and "do not wish to name". The Centre Party is listed as a reference category. |
| Organic production | Question about organic production on farms. Coded as a dichotomy with the values 1=those who produce completely/partially organically, or whose production is under conversion to organic, and 0=all others. |