



Norwegian family forest owners' willingness to participate in carbon offset programs



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ABSTRACT

Forests act as carbon sinks and can make significant contributions to climate change mitigation efforts. In Norway, family forest owners own 80% of productive forestland and play a central role in the management of the country's forests. Yet little is known about whether these landowners would be interested in increasing carbon sequestration on their land and selling carbon credits. Only a handful of studies have examined the factors that motivate family forest owners to participate in carbon offset programs, and all of these studies have been conducted in the United States. This study addresses this information gap using data from a mail survey of 1500 Norwegian family forest owners. A logistic regression model was developed to examine the effect of various carbon program, forestland, and landowner characteristics on participation in a hypothetical carbon offset program. Results suggest that there is a considerable amount of interest among Norwegian family forest owners and that the most important predictors of participation are payment amount offered, perceived barriers posed by management actions, importance placed on non-market forest amenities, and attitudes towards climate change.

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1. Introduction

Forests act as carbon sinks and therefore play an important role in mitigating climate change, removing carbon from the atmosphere equivalent to about a third of the world's combined annual greenhouse gas emissions (Pan et al., 2011). Certain forest management practices can increase the amount of carbon stored in forests (Nunery and Keeton, 2010; Ruddell et al., 2007) and potentially provide one of the lowest-cost and highest-volume opportunities for climate change mitigation (Galik et al., 2009; Gorte and Ramseur, 2008). If policy mechanisms are in place, private forest owners can be compensated for undertaking management practices that increase the amount of carbon stored on their land. For instance, in California's cap-and-trade system, forest management projects that increase carbon sequestration can generate credits that can be sold to offset emissions elsewhere in the market (CARB, 2014).

In Norway, a quarter of the land area is covered in productive forestland, and overall about 40% of the country is forested (Rognstad and Steinset, 2011). In 2005, Norwegian forests sequestered 29.9 million tons CO₂e, which was equivalent to 55% of the country's

anthropogenic greenhouse gas emissions that year (Norwegian Ministry of the Environment, 2008). It has been estimated that forest management measures could increase sequestration of CO₂ substantially, by up to 12.3 million tons per year over the next 100 years (Norwegian Climate and Pollution Agency, 2010). Family forest owners own 80% of productive forestland in Norway and play a central role in the management of the country's forests (Rognstad and Steinset, 2011). Thus, they also play an important role in Norway's efforts to reduce its net greenhouse gas emissions.

There is currently no policy mechanism in place to encourage increased carbon sequestration on private forestland in Norway or to allow Norwegian family forest owners to sell carbon credits. However, the topic is high on the political agenda, with several public reports and white papers discussing how Norwegian forests may contribute to climate change mitigation published during the past six years (Norwegian Climate and Pollution Agency, 2010; Norwegian Ministry of Agriculture and Food, 2009; Norwegian Ministry of the Environment, 2012; Norwegian Ministry of Climate and Environment, 2015). Although the standing volume in Norway's forests is currently at a high due to intensive planting and afforestation between 1950 and 1990, forest growth and carbon sequestration are projected to decline in the future (Trømborg et al., 2011).

Family forest owners are a diverse group with a wide range of objectives, values, and attitudes that have been found to affect their

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management decisions (Becker et al., 2013; Bolkesjø et al., 2007; Butler et al., 2007; Finley and Kittredge, 2006; Ingemarson et al., 2006; Karppinen, 1998; Kline et al., 2000). If policymakers wish to implement programs aimed at increasing the amount of carbon sequestered in Norwegian forests, it is important to recognize the heterogeneity of family forest owners and the factors that influence their willingness to participate in such programs (Finley and Kittredge, 2006). This study investigates the factors that affect whether Norwegian family forest owners would be willing to manage their forests for increased carbon sequestration and estimates the potential supply of forest carbon offsets from family forestlands in Norway.

2. Background

Only a handful of studies have quantitatively examined factors that influence family forest owner interest in participating in carbon offset programs. Three of these were carried out in Massachusetts, the first being a pilot study conducted by Fletcher et al. (2009), which was expanded on by Dickinson (2010) and Markowski-Lindsay et al. (2011). The studies used mail surveys to ask respondents to rate various hypothetical carbon sequestration programs according to how likely they would be to enroll the program. The programs varied in terms of several program attributes, such as expected payment, time commitment, whether or not a management plan was required, and whether or not there was a penalty for early withdrawal. The studies generally found that respondents preferred programs with higher expected payment, shorter time commitments, no management plan requirement, and no early withdrawal penalty, and suggest that certain landowner characteristics, such as having higher education and believing that forests can reduce climate change, increase the probability of participation. Overall, the three Massachusetts studies found that family forest owner participation would be quite low given program characteristics similar to those in existing carbon sequestration programs, and that non-monetary factors played an important role in landowner decision-making.

Another study was conducted by Thompson and Hansen (2012) using data from a nationwide mail survey of 429 U.S. family forest owners. The survey asked questions gauging respondents' attitudes towards potential economic and environmental impacts of participating in carbon sequestration and trading, as well as questions about the respondent's land characteristics, land-use planning, and demographic information. A cluster analysis revealed two distinct clusters of positive and negative attitudes among respondents about managing their forest for carbon sequestration and trading. Respondents in the positive attitude cluster tended to own smaller parcels and actively manage their forest.

Miller et al. (2012) conducted a study examining the factors influencing landowner participation in forest carbon offset programs in Michigan, Wisconsin, and Minnesota. The study used a mail-back questionnaire that posed a dichotomous choice question about whether respondents would enroll in the program given a specified per acre payment and contract length. The questionnaire also included questions about ownership objectives and practices, forestland characteristics, attitudes towards climate change, familiarity with carbon markets, and landowner demographics. The study found that many landowners would be interested in participating given favorable financial conditions and short contract periods, particularly absentee owners who owned larger parcels and had already completed some of the carbon program requirements. Landowners were also more likely to participate if they had positive attitudes towards using forests to mitigate climate change and if they greatly valued the non-market amenities of their forest.

In general, these previous studies show that landowners are sensitive to program requirements and conditions. As one might expect, they prefer programs with higher compensation amounts and less stringent requirements regarding the time commitment, early withdrawal, and management plans. However, the studies also suggest that landowner interest in carbon programs is primarily motivated by non-

monetary factors, and that active forest managers with higher education and who believe that forestry can play an important role in mitigating climate change may be more likely to participate in carbon programs.

As only a small number of studies on family forest owner interest in carbon programs have been conducted, there are important knowledge gaps that need to be addressed. All of the studies so far have been conducted in the United States, and as Markowski-Lindsay et al. (2011) point out, forest ownership trends and behavior are likely to vary by region. More studies need to be conducted in other parts of the world to better understand how regional differences affect landowner decision-making, particularly as emissions trading and carbon offsetting opportunities continue to develop.

The studies that have been conducted so far have also had samples dominated by relatively small landowner holdings. For instance, Markowski-Lindsay et al. (2011) and Miller et al. (2012) had mean parcel sizes of 48 ac (19 ha) and 63 ac (25 ha) respectively. While small acreage landowners make up the largest number of family forest owners in the respective study regions, they do not necessarily account for the largest share of the total forestland or those landowners who might be most inclined to participate. To estimate the total potential increase in carbon sequestration from a national carbon program in Norway, it is important to understand what influences the behavior of large acreage landowners as well. This study attempts to address both of these knowledge gaps.

3. Data and methods

3.1. Survey development

A mail survey was developed to investigate Norwegian family forest owners' interest in participating in carbon offset programs. The survey was based on the one used by Miller et al. (2012), but underwent extensive review with Statistics Norway and was modified to ensure that the tone and content of the questions were appropriate for Norwegian landowners. The survey was mailed out to a random sample of 1500 landowners who owned at least 8 ha of forestland in Norway. The sample was stratified by property size, using three size classes: 8.0–49.9 ha, 50.0–99.9 ha, and >99.9 ha. The sample in each size class was drawn proportional to the total forest area in each size class. This was done to generate an overrepresentation of large acreage forest owners. Three mailings were sent beginning in April 2013, following the Total Design Method (Dillman, 1978). Each mailing included a personally addressed cover letter, the full survey, and a pre-paid return envelope. Surveys returned by August 1, 2013 were considered for analysis.

The survey presented respondents with a hypothetical carbon program that varied in terms of the number of years a respondent would be required to participate (10, 25, or 50 years) and the payment amount they would receive per hectare per year (50, 200, 400, or 600 NOK).^a Twelve versions of the survey were created using combinations of the three different contract lengths and the four different payment amounts. Respondents were provided information about several management actions they would need to undertake in order to participate, such as having a forest management plan prepared, having the forest certified by an independent third party, and carrying out management actions that increase carbon sequestration in the forest. It was made clear that these management actions would depend on the specific conditions of the landowner's forest and could include harvesting more or less timber, increasing tree planting, or increasing fertilization. Respondents were then presented with a dichotomous choice question asking whether they would participate in the program given the conditions outlined above. The survey did not ask respondents how intensively they would undertake the management actions increasing carbon sequestration or how much of their land they would be willing to enroll

^a These payments correspond to approximately 6, 26, 51, and 77 USD/ha per year, given an exchange rate of 7.8 NOK/USD.

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