

: Family forestry issues in climate change mitigation contract policies

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■ ABSTRACT

Family forest play an important role in climate change mitigation policies. However, several issues may affect their actual mitigation efforts. These are crucial information for policy makers, when dealing with family forest owners. We have conducted two surveys in Finland, first in 2021 and second in 2023, with different choice experiment (CE) settings, focusing on willingness to accept additional carbon in family forests. The common feature in both survey CEs is a payment for increased carbon inventory measured as additional standing stock equivalent (EUR/m³). The other CE attributes have been in the first survey: initial payment levels of the contract, compensation levels of management plan costs, lengths of contract; and in the second survey: the initiators of the deal, sources of payment financing and inclusion of forest damage risk on standing stock. Other issues, e.g., effects of information and intergenerational issues of possible mitigation policies have been considered in surveys by employing statements and questions.

■ KEYWORDS

Family forestry, climate change mitigation, contract, choice experiment, information, intergenerationality

■ 1 INTRODUCTION

Carbon sequestration in family-owned forests is subject to roundwood markets and several other issues in managing private forests in the long run. These issues can be substantially different from public forests or even forests owned by forest industries and other private institutions. It is typical, that we do not know the exact importance of these issues for forest owners and their ownership cycle situations, and therefore it is possible that policy makers may focus on insignificant policies instead of the significant ones.

Carbon sequestration in family forests can be considered as a part of carbon markets, where the general public has *willingness to pay* for improvements in forest carbon sequestration and the forests owners have *willingness to accept* these improvements. The policy determination is not simple, as the willingness to pay and willingness to accept differ considerably by individuals. In addition, information may play a crucial role in both sides of the market.

In family forestry, contracts on carbon sequestration are still rather non-existent compared to longer experience of contracts on biodiversity and forest conservation. The optimal compensation cost and payment allocation question related to willingness to pay and willingness to accept has been solved in many countries by employing voluntary conservation approaches. In Finland, these voluntary biodiversity conservation actions have been branded under the METSO-programme.

Willingness to pay as well as the forest owners' willingness to accept climate policies can be estimated by employing survey approaches. Surveys may include fictitious decision situations for forest owners, general questions and information on the forest estate and on its owner as well as statements to figure out e.g., the owner attitudes. Choice Experiment (CE) is a method, originally introduced by McFadden (1973), where alternative choice sets are presented to respondents and analyzed with conditional logit analysis.

In this study, we follow the earlier biodiversity related contract experiences with family forest owners. We focus on the issues affecting the willingness to accept additional carbon sequestration in family forests on voluntary basis.

■ 2 METHODS

We have carried out two separate Finnish family forest owner surveys with relatively similar choice experiment settings to collect data for analyses. The background for surveys has been to test theoretically sound result-based contracts, although in practise an estate-level measurement of a result in any natural capital may turn out too costly.

The first survey (N=386) was carried out in spring 2021 in the project CONSOLE, financed by EU Horizon 2020 (Contract nr. 817949). The second survey (N=1,460) was carried out in summer 2023 in the project HILMARI, financed by Ministry of agriculture and forestry in Finland. In both surveys, email contacts and electronic quantitative survey questionnaire with some qualitative open responses was employed. In the CONSOLE survey, the sample was based on Taloustutkimus market research company's panel of frequent respondents, who indicated themselves as forest owners. In the HILMARI survey, the forest owners were sampled from the Finnish Forest Centre database by utilizing existing database information on forest estate sizes by counties in interval sampling.

For a respondent convenience, the number of CE choice sets are usually reduced for a single respondent so that respondents are divided optimally into choice set blocks. In CONSOLE, the choice experiments were provided for respondents in six choice sets, for which the respondents were divided into five blocks (in total 30 choice sets). In HILMARI nine choice sets were allocated to four blocks (in total 36 choice sets). In both projects, a small survey was used first to receive prior information on the coefficients, which was followed by optimization of the choice design to be utilized in the major survey.

The employed CE attributes and their levels are presented in Table 1. The common feature in both surveys is a payment (EUR/m³) for carbon inventory measured as additional to recommended standing stock equivalent (m³), paid afterwards every tenth year if the contract had lasted that long. Theoretically, these payments were set to correspond carbon rent for a limited period. Thus, the payment levels are lower than for a permanent carbon stock inventory and there is neither need for repayment when

the contract ends. In the CONSOLE survey, the other employed CE attributes were initial payment of the contract, cost of carbon forestry plan and length of the contract. In the HILMARI survey the other attributes were the initiator of the compensation arrangement, source of payment financing, and forest damage risk on standing stock. In the HILMARI, the contract length was set as ten years with voluntary renewal option. The initial payment for contract was also fixed as 500 EUR for the estate. In both surveys, the only withdrawal cost for forest owner was losing the initial payment. Other issues, like effects of information and intergenerational issues of possible mitigation policies were considered in both surveys by employing statements and questions.

Table 1. Choice experiment attributes and their levels in CONSOLE and HILMARI surveys.

| CONSOLE attributes | CONSOLE attribute levels | HILMARI attributes | HILMARI attribute levels |
|---|--|---|---|
| Plan for carbon forestry | No free-of-charge plan Free-of-charge plan in the beginning Free-of-charge plan in the beginning and update every tenth year | Initiator for the compensation arrangement | Own initiative Familiar forest professional makes the initiative Forest representative of public authority makes the initiative |
| Duration of compensation contract | 20 years 30 years 40 years | Source of financing for compensation payments | Government tax revenues Carbon compensation payments paid by domestic companies Carbon compensation payments paid by foreign companies |
| Initial compensation payment | 10 EUR/ha 50 EUR/ha 100 EUR/ha | Risk of forest damage to additional forest inventory | All damaged wood left in and harvested from forest entitle to additional inventory Damaged wood only left in forest entitles to additional inventory |
| Carbon compensation payment for m ³ (o.b.) equivalent to additional inventory to silviculturally recommended | 2 EUR/m ³ 5 EUR/m ³ 10 EUR/m ³ 15 EUR/m ³ 20 EUR/m ³ | Carbon compensation payment for m ³ (o.b.) equivalent to additional inventory to silviculturally recommended | 2 EUR/m ³ 5 EUR/m ³ 10 EUR/m ³ 15 EUR/m ³ 20 EUR/m ³ 30 EUR/m ³ |

The CE design optimizations were done with NGENE software, and results were calculated and analysed with statistical tools Stata, SPSS and R.

■ 3 RESULTS

In the CE results, all attributes are statistically significant, and their signs are in accordance with the expectations. The results reveal the importance of carbon compensation payments (EUR/m³) for contract acceptance. The longer the contract period the lower is the acceptance of a contract is also the case in CONSOLE results, where only very long 20-, 30- and 40-years contracts were introduced rather due to ecological than economic reasons. In fact, it seems to be evitable that these contract periods are too long for current forthcoming forest ownership periods (intergenerationality). In CONSOLE, they most probably resulted into low acceptance of any chosen contract: only half of forest owners did choose any contract.

Therefore, in HILMARI survey the contract period was fixed to ten years, with possible voluntary renewal option upon forest owner's interest. As a result, the acceptance rate of any contract in HILMARI survey was considerably higher (3/4), but it must be heard in the mind that the HILMARI design (9x4) was also slightly different and favoured higher acceptance compared to CONSOLE design (6x5). In HILMARI there was also one higher carbon compensation payment level compared to CONSOLE. Although all other attributes were in minor role, they still have decisive significance in individual cases. Especially the forest damage risk may affect the acceptance.

However, the most interesting and practically applicable results may lie outside the result-based CE outcomes. The HILMARI statements and questions on more traditional policy instruments on tax, forest and support policies provide very interesting results.

■ 4 DISCUSSION AND CONCLUSION

Email surveys with electronic questionnaire reach forest owners with above-average ICT equipment, internet connections and ICT skills. This leads to many ways biased results when considering all forest owners. In some features this bias is possible to overcome by weighting the results. This requires information on the population and nonresponse analysis. Comparisons to the most comprehensive forest owner survey in Finland (Karppinen et al., 2020) reveal that, for instance, although the Finnish Forest Centre manages comprehensive forest data, the data seems to lack contact information on heirs (HILMARI survey), whereas heirs were surprisingly well reached by employing the panel of frequent respondents by Taloustutkimus (CONSOLE survey). The employed languages may also lead to biased results in countries where several languages are present. In Finland, there are two official languages, Finnish and Swedish. The HILMARI questionnaire was provided in both languages whereas in CONSOLE the questionnaire was only in Finnish, with possibly mostly Finnish-speaking sample. As a result, in HILMARI the Swedish speaking forest owners responded as well as the Finnish speaking respondents, but in CONSOLE the responses were almost non-existent in the predominantly Swedish speaking areas.

Result-based contracts may sound fascinating due to their theoretical exactness. Also forest owner attitudes are favourable towards payment for achieved results. However, in practise their relevance may vanish in their variable estate level applicability and high monitoring costs. Employed surveys reveal information deficits among forest

owners, which decrease the applicability of result-based instruments. Therefore, existing policies and markets in line with desired carbon sequestration targets should be evaluated before creating any new instruments. In Finland, for instance, inheritance and gift tax policy, forest legislation restrictions on harvesting, and financial support for forest fertilization could be well worth of amendments instead of establishing new and possibly conflicting estate-level forest carbon policies.

■ 5 REFERENCES

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