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Biomass harvest and Ash recycling: impact on Forest Ecosystem Service

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Context — Wood fuels are an important energy source in meeting EU's renewable energy targets. The increased demand for wood fuels has been seen as an opportunity to increase the profitability of forest management by exploiting hitherto unexploited resources. However, the increased use of wood fuel generates also several environmental issues, including the export of nutrients through residues and stump harvests and thereby potential negative impact on forests' long-term forest productivity. Ash-recycling has been suggested a sustainable remedy for the loss of nutrients. However, there is currently no assessment of about how ash-recycling will influence forest owners' management, e.g. timber harvest decisions, and the associated changes in the supply of the multiple ecosystem services provided by forests. Furthermore, knowledge about the general population's acceptability of ash-recycling is almost non-existing whereas it can play a large role in the decision, private or public one, potentially influencing forest owners and contributing to the policy through their willingness to pay.

Objectives —

- To develop an integrated framework linking biophysical models and forest owners' decision processes which allows assessing the impact of ash-recycling on provision of ecosystem services. In particular, we will analyse to which degree the adoption of ash recycling by private forest owners will influence other forest management decisions.

- Assessment of the acceptability ash-recycling and biomass harvesting by the general population and to carry out an economic valuation of associated changes in the provision of ecosystem services. We will, in particular, focus on the impact of ash recycling and biomass harvesting on the value of recreational services as well as investigating the role of scientific information, and the dissemination hereof, for ash recycling acceptability

Approach — Forest owners' decision-making with respect to ash-recycling was assessed through an online survey carried out in co-operation with the forest owner association Mellanskag in Västmanland. The questionnaire included a choice experiment that allowed the estimation of forest owners' willingness-to-pay for ash-recycling under different scenarios. In particular, we included questions that allow us to account for behavioural motives that may explain forest owners' willingness to pay (Based on the Theory of Planned Behaviour). The general population's acceptability of ash recycling is assessed through a survey of representative sample (1010 individuals) of the French population. The questionnaire included a choice experiment where the main objective was to estimate the willingness to support ash-recycling in French forest given different scenarios for implementation of a policy. In addition to the choice experiment, the questionnaire focused on how information and presentation of ash-recycling policy may influence individuals' acceptability and willingness-to-pay for ash-recycling policies, using a nudging approach. This nudging step was carried out by including different treatments of subsamples with respect to phrasing and presentation of the scenarios. Therefore, our approach has similarities with those developed in behavioral economics.

Key results —

- Swedish forest owners generally have a positive willingness-to-pay for wood ash application in their forests, however it is highly dependent on their psychological characteristics.
- In average, Swedish forest owners would agree to pay 45 SEK/hectare for a one percent increase in soil productivity under wood ash application.
- Swedish forest owner's decision to partially or totally fertilize his/her forest is explained by two different characteristics: her environmental sensitivity and his/her perceived control of wood ash recycling (that is to say, whether he/she thinks he/she is able to implement it).
- Forest owners will pay an average of 184 SEK for two hours of technical help with wood ash application. In particular, owners who do not feel in control will pay a higher value for technical help.
- In general, policies promoting ash-recycling are accepted in France
- The preferences for ash-recycling by the general population depend on how recycling policies will account for the provision of recreational services, i.e. there is a higher willingness to pay when ash-recycling is signaled in the forest.
- The willingness to pay is higher when the ash-recycling has an important impact on productivity.
- The results show that the willingness-to-pay depends on the framing/information treatments. A productivity wording, where the emphasis is on the impact on forest productivity, results in the highest WTP. However, this result depends on the characteristics of the individual with respect to environmental sensitivity and concern for equity.

Main conclusions including key points of discussion — The results show that both forest owners and the general population, in average, accept ash-recycling. For both groups the impact of ash-recycling on maintenance of, or increase in, productivity is important for the acceptability. This highlights the importance of quantifying the effect of ash use on forest productivity and identifying the factors determining this impact. While forest owners in average will pay for ash-recycling a significant share of forest owners will only adopt this practice if supported. The results also show that such a policy should consider the concern of citizens using the forest for recreational purposes. Quantification of the impact of ash recycling on forest management and consequently on the provision of ecosystem is still to be evaluated. This part of the initial project was not carried out, as the project obtained less funding than initially anticipated (reduced from 18 to 12 months)

Future perspectives — While the present project has provided insight in preferences and acceptability of ash recycling by both forest owners and the general population, there is a need to evaluate the impact of biomass harvest in a more integrated framework where secondary effects of ash-recycling on decision-making (harvest intensity, tree species choices,…) are addressed as well as potential impact on provision of ecosystem services.

The project has led to the participation in the Tamobiom project where we will also investigate how information and incentives (monetary and non-monetary) can influence forest managers decision-making and behaviors, i.e. sustainable harvest practices. The design of policies and guidelines which are effective require a good understanding of the motivations of managers and the effect of policy regulations and institutions.

Valorisation —

Publications

Abildtrup, J., Bostedt, G., Ouvrard, B. and Stenger, A. 2018 Closing nutrient cycles through wood-ash re-cycling. Under review in *Ecological Economics*

Abildtrup, J., Ouvrard, B. and Stenger, A. 2018 Nudging acceptability for wood ash recycling in forests: a choice experiment. Under review in *Resource and Energy Economics*.

Presentations at international scientific conferences and workshops

Abildtrup, J., Bostedt, G., Ouvrard, B. and Stenger, A. 2018. Closing nutrient cycles through wood-ash recycling in Sweden, Paper presented at international Conference on Environmental Economics, April 5-6, 2018, Orléans.

Abildtrup, J., Bostedt, G., Ouvrard, B. and Stenger, A. 2018 Closing nutrient cycles through wood-ash re-cycling, 6th World Congress of Environmental and Resource Economists (WCERE) June 25-29, 2018. Gothenburg.

Abildtrup, J., Bostedt, G., Ouvrard, B. and Stenger, A. 2018 Closing nutrient cycles through wood-ash re-cycling, 2nd Workshop of the Research network on Economic Experiments for the Common Agricultural Policy (REECAP) September 26-28, 2018. Vienna.

Abildtrup, J., Ouvrard, B. and Stenger, A. 2018. Nudging acceptability for wood-ash recycling in forests: a choice experiment, Paper presented at international Conference on Environmental Economics, April 5-6, 2018, Orléans

Abildtrup, J., Ouvrard, B. and Stenger, A. 2018 Nudging social acceptability of wood-ash re-cycling in forests? 2nd Workshop of the Research network on Economic Experiments for the Common Agricultural Policy (REECAP) -September 26-28, 2018. Vienna.

Abildtrup, J., Ouvrard, B. and Stenger, A. 2018 “Social acceptability of wood ash recycling in forests: a choice experiment with the French general population. New Frontiers of Forest Economics (neFFE), June 24-28, 2018. Vancouver, Canada, June 24-28, 2018.

Participation in national workshops

Abildtrup, J. 2018. Comment préserver les sols forestiers dans un contexte de récolte accrue de bois ? Séminaire ADEME R&D et transfert, June 25, Paris.