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Joining or not joining non-industrial private forests into a single management unit: A case-study shaped as an Analytic Network Process

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ABSTRACT

The study aims to find out how the management of non-industrial private forests (NIPF) can be improved by a larger and more consistent participation of all important stakeholders involved in making one of the most important decisions the forest management planning system copes with: whether or not the forest planner shall create a separate forest management unit for NIPFs, considering a wider variety of interconnected benefits, costs risks and opportunities.

The decision making process was conceived as an Analytic Network Process (ANP) and all important aspects worth being taken into consideration were embodied in four conceptual subnets that gather benefits, opportunities costs and risks defined from three different perspectives: social, economic and ecological. The method was tested on an important decision which is made each ten years when the forest management plans shall be updated. The input data were collected from two small associations of landowners whose forests are managed by Solca forest district (FD), county of Suceava, Romania. The total forest area supposed to be included in the new management unit is about 360 ha and the natural type of forest is beech, mixed with silver fir. Two alternatives were taken into account: the business as usual scenario (the same rotation for all stands and the same silvicultural system, irrespective to the ownership type) and a new management unit, explicitly designed for NIPF, where coppice with standards will produce fuelwood and small size round wood for rural construction.

An extensive survey was carried out in order to find out the most important criteria worth being taken into account when such a decision shall be made, as well as the landowners' expectations, concerns and uncertainties with respect to the two options: business as usual scenario and a new FMU respectively. A second survey was distributed among the villagers of a neighboring commune in order to appraise the local demand for fuelwood. Based on the information collected at the first hand four subnets referring to benefits, costs, opportunities and risks have been produced and, within each subnet, three different clusters were defined in order to appraise the relative importance of economic, social, and ecologic aspects. Making pairwise comparisons between alternatives against criteria, clusters, and subnets, we have concluded that a new management unit for NIPFs is feasible and desirable. Even though ANP seems to be a very flexible tool for making complex decisions, any potential user shall be aware of some risks pertaining to ANP methodology, especially the tendency to make too complex networks, compelling to pairwise comparisons that make less sense. On the other hand, the case study presented in this article has demonstrated that pairwise comparisons may refer not only to the relative importance of whatever two criteria or alternatives, but also to the likelihood or desirability of some certain processes that might occur in case of pursuing one of the two alternatives taken into consideration. The procedure we have proposed for making or not making a new FMU can be developed or adapted to other situations where a consistent dialogue between the decision makers and the stakeholders is a more than necessary.

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1. Introduction

The forest management has to cope with numerous challenges raised by a large variety of stakeholders and most of these stakeholders refer to two main issues of public concern: on the one hand, how the forest management could be sustainable on long term and on the other hand how to uphold the ecosystem resilience, taking into account the economic and social objectives pursued by forest owners or forest managers (Blanco et al., 2005; Rist and Moen, 2013).

Hence the forest resilience turns to be an important issue whenever the management is being changed or new biotic or climatic pressures occur. Valente et al. (2015) have identified three pillars of forest sustainability: 1) mitigation of forest threats; 2) forest full-value improvement and 3) stakeholder involvement in forest policy. Inevitably, forest resilience depends not only on abiotic and biotic factors, but also on the socio-economic factors embodied into the management plan and forest policy. When it comes to private forests the relationship between forest management and property rights turns to be more complex. On the one

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Table 1
Management units for Romanian beech forests.

Type of MU	Main ecosystem services and their importance	Horizontal structure and rotation	Recommended minimal area (ha)	Silvicultural system
A	Soil protection, low	Even age/120	600	Uniform
B	Water regulation, soil protection, moderate	Even age/140	600	Group
G	Water regulation, soil protection, biodiversity conservation, high	Uneven age, 50 cm limit dbh (1 or 2 trees per hectare reach the limit dbh).	100–200	Selection
P	Biodiversity conservation, low	Two-story structure, 20–30 yrs. rotation for beech firewood and 80–100 years for sawn-wood (beech and white fir)	100–200 ha	Coppice with standards

hand the forest owner wants profit, on the other hand the professional forester has to obey the forest policy; therefore, new communication means and decision support systems are essential in solving potential conflicts between these two groups of prevailing stakeholders (Mungai et al., 2004; Perçin, 2010).

The forest management planning system, meant to keep up the forest resilience, plays different roles in different countries, according to a series of measures and regulations supporting the implementation of the forest policy. For instance, Brukas and Sallnäs (2012) carried out a comparative study between Sweden and Lithuania and concluded that the management plan is still used as a governing tool in the ex-communist country, while in Sweden its role is rather informative, but not normative. In a way the potential threats coming from the society are handled either by stiffer norms – more familiar for the ex-communist countries – or more awareness, which is acknowledgeable in a well-established democratic system.

Nevertheless, one of the core means of implementing the forest policy is the forest management unit (FMU), which is an effective arena where different stakeholders and institutions may interact with each other and come up with different perspectives over the domestic forest policy (Sahide et al., 2016a); moreover, through the FMU different authorities may exert their power at national, regional and local level and central government may regain its bureaucratic power as Sahide et al. (2016b) have demonstrated. When it comes to international commitments on reducing deforestation, FMU may also play important roles in improving the consistency of local governance and reducing forest degradation, as a case study has recently demonstrated in Indonesia (Kim et al., 2016).

Along with conflict resolution, cooperation is equally important and Kittredge (2005), based on an extensive literature review, has concluded that incentives for getting people associated shall be provided by a sound forest governance. Nonetheless, innovative processes have barely penetrated the forest management planning and Jarský (2015) concluded that, in the Czech Republic at least, innovation has failed to address the latent conflicts between stakeholders, like professional foresters and landowners.

Multiple use forest management depends on a great extent on effective coordination between institution and stakeholders, as Baskent et al. (2009) demonstrated in a case study deployed in Turkey. When desertification and soil erosion became a real threat, as it happened in southern Romania, the landowners may voluntary join into an association (Stringer et al., 2009), which could be regarded as a social reaction to a critical level of ecosystem resilience.

1.1. Socio-economic context and goal of the study

The Romanian forest planning system is based on the sustained yield principle which implies not only quite long rotations (over 100 years) but also strict regulations on silvicultural systems, timber cruising and harvesting operations (Anonymous, 2008; Abrudan, 2012).

In order to provide ecosystem services *and* wood in different ratios all feasible options referring to rotations and silvicultural systems are clustered into few types of FMUs. For instance, the current technical standards recommend, for beech forests, rotation over 100 years and three different silvicultural system, according to how important the ecosystem services are, as Table 1 shows. In addition to these three options we have considered realistic and feasible another FMU type, not yet officially acknowledged but agreed by professional foresters as a solution for NIPF; this new type, labeled with "P" (from *private*), is described in the last row of Table 1.

In our case-study a separate "P" FMU for NIPF has been conceived as a means to make the forest management more flexible, which is an important issue for small forest ownerships (Scherr, 2004). Worth noting in this context, a great deal of literature is focused on forest owners' typology (Bieling, 2004; Mizaraite and Mizaras, 2005; Serbruyns and Luyssaert, 2006) assuming that fewer types of forest policies better match fewer profiles of forest owners. Joint ownership is quite common in Romania (Mantescu and Vasile, 2009) and the existing associations could undertake more responsibilities regarding the forest sustainability in order to come to terms with the forest managers, who have to apply some time consuming silvicultural practices, most of them related to harvesting works.

According to the latest amendments to the Forest Act (Anonymous, 2015) each private forest owner shall agree a managerial contract with a FD in order to have the forest watched against illegal logging and the timber cruising carried out by professional foresters. How this process goes on and to which extent the forest owner may decide when and how much wood can be harvested depend on the forest management plan, which is compulsory for NIPF larger than ten hectares[1] (Anonymous, 2015). If the forest owner does not want a management plan, then she or he may harvest up to 3 m^3/year/ha provided a 10-year contract for forest watching and timber cruising services has been agreed with the FD. If the forest owners do not want to manage their NIPF into a separate FMU, their forests will be managed according to the rules – established for that public forest, all stand being included in one of the three FMUs (A, B, or G) described in the first three rows of Table 1.

A separate forest management plan shall be produced on decennial basis for each FD provided the forest is public and for each property, for individual or joint ownership; a FD may include one or more FMUs, each one having its own cutting budget, annual allowable cut, and harvesting plans, according to the Forest Act (Anonymous, 2008). The forest area (compartments and sub-compartments) allocated to an already existing FMU or, on the contrary, to a new one shall be decided prior to a new forest management plan. The formal document supporting such a decision is the *terms of reference*, which shall be agreed and approved by the FD staff, a representative of the public authority, and, the last but not the least, by the landowner before getting started the field works for the new management plan. The terms of reference for Solca FD new management plan are to be written down in 2016 and the field works planned for 2017.

Considering all these details a new FMU for NIPFs could be seen as an informal institution (Nichiforel, 2010), for the reasons already explained. From a silvicultural point of view, if a new MU is created, the FD staff must cooperate more with the forest owners because the coppice with standards requires more professionalism and discernment in selecting the sprouts to be harvested as fuelwood.

[1] For smaller NIPF forest management planning is not compulsory but the amount of timber harvested annually cannot exceed 3 m^3/ha.

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