Financing biodiversity in private forests The METSO programme in Finland

by Markku OLLIKAINEN

Payments for ecosystem services could be a mean to increase the maintenance and provision of ecosystem services, which otherwise would provide a too low return to forest landowners. This paper examines the recent experience from applying bidding sytems for forest biodiversity, in Finland. The Finnish Metso programme is an example of voluntary bidding systems, which are mediated by the government and are capable to encourage participation of conservation-minded forest landowners.

Background

Conserving forest biodiversity is an urgent task in boreal commercial private forests, which have been subject to intensive forest management. The most typical forest management regime in boreal forests is even-aged management, which reinforces the problem. Biodiversity is threatened in multiple ways. *Old growth* forest land area has decreased and become increasingly *fragmented patches* which can weaken forest's ability to sustain old growth species. Habitats suited to old growth species (decaying wood, brooks etc.) are severely reduced. The number of threatened and red-listed forest species has increased dramatically. *Genetic diversity* decreases along with diminishing old growth forests, which is a potentially growing problem when climate change continues and original boreal forests need to adapt to warmer climate.

All these problems are present in Finnish forestry, especially in Southern Finland. To stop the decline in the biodiversity of forest habitats and species in Southern Finland, the Finnish government

launched the Forest Biodiversity Programme for Southern Finland (METSO) for years 2003-2016. METSO is a comprehensive program with means for temporary conservation and permanent protection. METSO introduced new voluntary instruments to forest conservation: trading in nature values and tendering (TNV), with a pilot project in 2003-2007; nature management areas; and landowners' co-operation network for biodiversity conservation. It retains many old typical instruments such as preservation of state owned forests and restoration and nature management of preserved habitats.

The most interesting part of the new METSO program is the pilot *Trading in Nature Values*. For the first time in the history of forestry, a country has applied a tendering system to conserve biodiversity and pays the landowners for maintaining forest biodiversity. All in all, the TNV pilot represents a new payment for ecosystem services in forestry. Because of the importance of the pilot, the Finnish government decided that for the two first years the data of the signed agreement be open for research. Information is available on habitat type (herb-rich, mesic, and xeric forest types), ecological characteristics, stand area, stand age, stand volume, timber value (TIV), year of the contract, and actual conservation payments paid to landowners for the 10-year contract. This paper condenses some results from the performance of the TVN in METSO program (for more details, see JUUTINEN *et al* 2009, JUUTINEN and OLLIKAINEN 2010, and JUUTINEN *et al* 2011).

Description of the TNV Pilot

The TNV pilot program was carried out in 2003-2007 in southwestern Finland. The region lies mainly in the southern boreal zone. About 65% of total area is under forest cover and subject to commercial forestry. Less than 1% of the forest area in the region is strictly protected. The ecologically most valuable sites in the region are the old semi-natural stands, which have not been subject to forest management for several decades.

The TNV program was based on 10-year contracts between private non-industrial landowners and the government. Landowners were called to submit their stands with associated bids to the program. To this end, an individual landowner submitted a specific declaration, which included the description of the ecological characteristics of the offered stand. Drawing on the declaration form, the government assessed preliminarily whether each offered stand was valuable enough for conservation or not. The process ceased if the preliminary assessment showed that the stand was not ecologically valuable and no agreement was made. For promising stands, a forestry expert from the Forestry Centre made a field inventory using a pre-determined valuation mechanism.

This conservation value included different ecological characteristics of the stand (e.g. large broadleaved trees and pines, dead or burned trees, threatened species, luxurious vegetation, natural water conditions, distance to existing nature protection areas, size of the area, and landscape values) and their imputed prices. The prices were set by expert guidelines. The value included also costs of delayed harvesting — defined as the present value of the lost harvest revenue — calculated by using a 1% interest rate for the value of standing timber. After the valuation was complete, the government and the landowner negotiated about the compensation payment and the required protection activities. The conservation value was revealed to landowners before negotiations. The contract specified biodiversity services and the rental payment for them; harvesting was prohibited during the contract period.

The annual budget for TNV was about 400.000 euros and 158 biodiversity conservation contracts were signed during 2003-2007. A contract typically included several stands, but the value of each stand was assessed separately. Some landowners preferred to make separate contracts for each stand. The number of landowners who offered stands to the program was 356. The acceptance rate of bids was about 44 %. The main reason for the rejection of the bids was the low ecological quality of supplied stands but in some cases there was disagreement on the compensation, the rental payment to the landowner.

The TNV pilot program can be analyzed either as a tendering or a bargaining system. Although TNV was not conducted entirely by the book (of green auction), it has many features of tendering, such as several landowners were offering their stands and bids to the

program simultaneously. Therefore, the theory of green auctions is a natural framework to study the performance of the TNV pilot.

Tendering/bidding system as a payment for ecosystem services

Tendering systems are shown to be a more efficient way of allocating conservation than the fix flat payment systems most often applied in environmental policies (LATACZ-LOHMAN and VAN DER HAMSVOORT 1998). Flat rate policies provide to agents with low conservation costs high information rents — defined as the difference between the payment and actual conservation costs. By creating competition between landowners tendering systems make landowners partially reveal their conservation costs. This reduces but does not entirely eliminate the information rents of environmental policies.

Using arbitrary numbers reflecting, though, roughly those of the TNV pilot, Figure 1 illustrates how a tendering/bidding system differs from the conventional flat rate policy. The vertical axis denotes the conservation costs of and payments to landowners and the horizontal axis denotes stands, ordered from the cheapest to the most expensive according to their conservation costs. The flat rate (for ten years) is set at a level 2000 euros.ha^{-1} and paid to all stands offered in the conservation program. The lower convex curve indicates the true conservation costs. The last stand offered to a program under a flat rate policy is stand n°71, which has conservation costs just equal to the payment. The 71 stands consume the conservation budget, 400 000 assuming the size of each is slightly less than 3 hectares, Stands to the left from stand n°71 receive information rent roughly 53 643.3 euros.ha^{-1} and is graphically described as the sum of areas A+B.

The upper curve in Figure 1 indicates the bids in the tendering/bidding system - ordered, again, from the lowest to the highest bids. Landowners are paid according to their bids and once stand n°84 is enrolled, the conservation budget is consumed. A higher number of stands is enrolled, because the information rent to landowners is decreased by area A. The information rent in this tendering example is 23 224 euros.ha^{-1} and it means 30 419 euros reduction in information rents (area A) relative to the flat rate policy. Using this saving (denoted by area C, which equals area A) allows the authorities to expand conservation by 13 stands. By creating competition between the landowners, the tendering/bidding system leads to a higher environmental quality and an improved use of conservation budget. More importantly, as a voluntary payment system, in which landowners freely submit their bids, tendering increases interest and motivation for conservation.

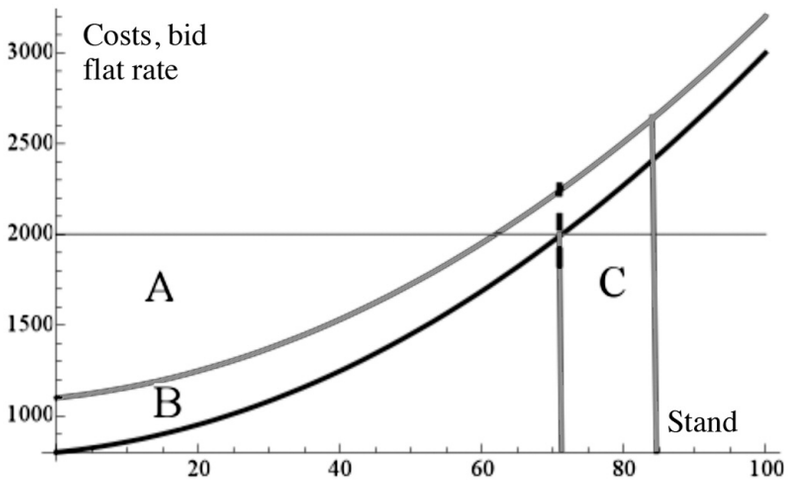

Figure 1:
Flat rate policy versus tendering/bidding system in conservation

Analysis of the TNV pilot programme

Table 1 represents actual data from the TNV pilot on the mean values of the stand ages and volumes; as well as biodiversity scores and the bids. Drawing on reported forest data from the pilot, JUUTINEN and OLLIKAINEN (2010) estimated conservation costs and used the estimates to determine the information rents. Table 1 is revealing in many ways. In general, the enrolled stands are fairly old, and the timber volumes reflect growing conditions in Southern Finland. Interestingly, the youngest stands receive the highest rents, as they are not mature for harvesting and thereby entail no costs from participating in the program.

Forest type (age class)	Enrolled stands	Stand age yr	Stand volume m³/ha	Biodiv. score	Bids, €/ha	Costs €/ha	Inforents €/ha
Herb-rich (87-160)	17	111	280	0.48	2 125	1 893	232
Herb-rich (56-80)	13	68	230	0.48	1 838	937	901
Herb-rich (41-50)	5	45	227	0.53	1 620	60	1 560
Mesic (102-170)	12	123	242	0.42	1 908	1 673	235
Mesic (70-95)	15	83	218	0.40	1 654	943	712
Mesic (50-61)	3	57	115	0.24	1 177	248	929
Dryish (150-178)	4	165	155	0.42	1 355	1 039	316
Dryish (98-110)	3	103	82	0.25	567	611	-44
All	72	95	226	0.43	1 757	1 189	568

Table 1: The number of enrolled stands and their average characteristics in the Finnish Trading in Natural Values Program

Source: Juutinen and Ollikainen (2010)

An important observation is the high number of old growth stands in herb-rich and mesic forest types. They account for 41% of all conserved stands. Moreover, information rents for these stands are very low. In fact, with one exception (Dryish 98-110), these stands receive the lowest rents. The high number of the enrolled old stands on the ecologically most valuable forest habitat types indicates strong conservation motives by the landowners. These landowners clearly derive welfare from forest amenities, in addition to harvest revenue. They apply rotation ages that are longer than the commercial ages. Therefore, these landowners reduce their bids to improve the chance of becoming selected in the program.

The outcome of the TNV can be compared with results of a hypothetical forest biodiversity auction simulation (JUUTINEN and OLLIKAINEN 2010). The simulation model assumes all forest landowners maximize the net present value of harvest revenue.

Forest type (age class)	Enrolled stands	Diversity score	Bids, €/ha	Costs €/ha	Rents €/ha
Herb-rich (100)	7	0,80	3183	1629	1554
Herb-rich (60)	7	0,73	2914	576	2338
Herb-rich (40)	5	0.70	2804	-326	3129
Mesic (120)	15	0.76	3027	1501	1526
Mesic (70)	17	0.75	3009	440	2569
Mesic (55)	7	0,71	2831	-44	2874
Dryish (140)	6	0,72	2866	662	2204
Dryish (85)	3	0,69	2779	129	2651
All	67	0,74	2964	714	2250

Table 2: Biodiversity auction: the number of enrolled stands and their average characteristics by forest types. (Conservation budget 200 000 €) *Source: Juutinen and Ollikainen (2010).*

Results from the simulation are reported in Table 2. The first thing to note is that the amount of old growth stands in the ecologically and economically valuable herb-rich forest types is lower than in the actual data. Now old stands are selected in the ecologically less valuable and cheaper mesic stands. The number of stands enrolled by the same budget is lower than in the actual data (67 versus 72). This partly explains why the average biodiversity score is higher in Table 2 than in Table 1.

A comparison of Table 1 and 2 reveals that the average bid in the auction simulation is 2964 euros, while the actual average bid was 1757 euros, giving a saving of 1207 euros in the actual TNV pilot. The information rents in the simulation model are 2964 euros; thus, much higher than the estimated information rents in the actual case (568 euros). These findings reinforce the impression that TNV pilot with tendering features invites conservation-minded landowners to submit their stands to the program.

This conclusion can be further strengthened when one distinguishes between net present value maximizing and conservation-minded landowner types (the former approximated by the Faustmann model and the latter by the Hartman model). Using the commercial rotation age, JUUTINEN *et al.* (2011) demonstrate that for the Faustmann landowners, the actual information rent is on average 1000 euros over the 10 year period making roughly 55% of the total payment made to landowners. For Hartman landowners the picture looks very different. Now each individual landowner resorts to a rotation age based on their personal amenity

valuation. When only costs from delayed harvest are accounted for, Hartman landowners receive extremely low and even negative information rents. The average information rent is only 152 euros and makes just 3% of the total payments. The Finnish TNV pilot really provided conservation-minded landowners a platform to conserve biodiversity. Equally importantly, for Faustmann landowners the TNV offered an alternative to immediate harvesting and rational landowners clearly used this opportunity whenever it was the more profitable option.

Conclusions

The Finnish pilot Trading in Nature Values on forest biodiversity conservation provides an interesting, innovative and successful application of a new payment instrument to finance the provision of forest ecosystem services. The TNV provided landowners with conservation motives a good opportunity to participate in the biodiversity conservation. It was equally significant that the landowners' participation was active and they valued the chosen voluntary participation and payment method. Furthermore, awareness on the importance of forest biodiversity increased thanks to the pilot.

A mid-term evaluation of the whole METSO program in 2010 regarded the TNV and the whole program highly successful. The TNV pilot was extended from Satakunta region to the whole of Southern Finland. Unfortunately, however, the rules of TNV have been changed. Now only very narrowly determined conservation costs are compensated to landowners. This has much reduced the use of the TNV system. The reason for this obvious drawback is to my understanding two-fold. First, the European Union criticized Finland for using a system, which compensates for benefits and does not focusing solely on the compliance costs. Second, the TNV pilot required active cooperation between officials in forestry and environmental organizations belonging to two different ministries. Obviously official on both organizations preferred a system, where cooperation was not needed.

I regard this new development as a fatal drawback. Creative thinking is needed to reintroduce and restore the true tendering-based character of the TNV program despite EU's and officials negative attitudes.

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Summary

Financing biodiversity in private forests: The METSO programme

The Millenium Ecosystem Assessment defines ecosystem services generally as the benefits people obtain from the ecosystems. The provision of ecosystem services falls short of achieving the socially desirable level, thanks to such reasons as undefined property rights, capital market imperfections and externalities. Payments for ecosystem services (PES) provide a means to overcome externality problems and increase the maintenance and provision of ecosystem services, which otherwise would provide a too low return to landowners in comparison to what they can obtain from land conversion to ordinary business purposes. PES consists of a set of voluntary financial instruments and arrangements between ecosystem service providers and benefiters, sometimes through a mediator, like the government. PES can and also have been used to promote the provision of biodiversity benefits, carbon sequestration, and water services among others.
This paper examines the recent experience from applying bidding sytems for forest biodiversity. The Finnish Metso programme is discussed as an example of voluntary bidding systems, which are mediated by the government and are capable to encourage participation of conservation-minded forest landowners.

Keywords : externalities, payments for ecosystem services, bidding systems

Résumé

Le Millenium Ecosystem Assessment définit généralement les services écosystémiques comme les bénéfices reçus par les populations à partir des écosystèmes. La fourniture de services écosystémiques est loin d'atteindre le niveau socialement souhaitable, à cause de lacunes telles que les droits de propriété non définis, les imperfections du marché des capitaux et les externalités. Les paiements pour services écosystémiques (PSE) proposent un moyen de surmonter les problèmes d'externalité et d'augmenter la pérennité et la fourniture de services écosystémiques, qui autrement auraient un rendement trop faible pour les propriétaires en comparaison de ce qu'ils peuvent obtenir auprès de la conversion des terres à des fins de transactions commerciales ordinaires. Le PSE est composé d'un ensemble d'instruments volontaires et arrangements financiers entre les fournisseurs de services écosystémiques et les bénéficiaires, parfois par le biais d'un médiateur, comme le gouvernement. Le PSE a été utilisé pour promouvoir la fourniture de bénéfices pour la biodiversité, la séquestration du carbone et la ressource en eau, entre autres.
Cet article présente plus particulièrement l'expérience récente de l'application du système d'appel d'offres pour la biodiversité des forêts en Finlande. Le programme finlandais METSO est discuté comme un exemple de systèmes d'enchères volontaires, qui sont coordonnés par le gouvernement et sont capables d'encourager la participation des propriétaires forestiers soucieux de la conservation.

Mots-clé : externalités, paiements pour services écosystémiques, systèmes d'enchères.