

Theme: Post socialist Commons: the Road Ahead

## **Sustainable forest management: Experience from the experiment on common pool resources**

dr. Nevenka Bogataj; Slovenian Institute for Adult Education, Slovenia,

[nevenka.bogataj@acs.si](mailto:nevenka.bogataj@acs.si)

Tine Premrl; Slovenian Forestry Institute, Slovenia,

[tine.premrl@gozdis.si](mailto:tine.premrl@gozdis.si)

prof. dr. Andrej Udovč; Biotechnical Faculty, Slovenia

[andrej.udovc@bf.uni-lj.si](mailto:andrej.udovc@bf.uni-lj.si)

### **ABSTRACT**

Forests cover around 60% of the total surface of Slovenia and so represent the biggest renewable resource which has important economic, environmental and social functions. Irrespective on the type of ownership (80 % of forests in Slovenia are privately owned) there are two particularities in Slovenia, affecting forest management: 1. free access to forests and 2. management has to be performed according to the plan approved by ministry responsible for forestry. In practice this mean that forest owners are limited in using their forest. Maximisation of their profit is not possible if harvesting decisions would lead to overexploitation and would hurt sustainable and close to nature principles of forest management even though this may increase harvesting costs. Social changes, reduced dependency on forest and processes of transition and restitution during last two decades have risen sensitivity of private ownerships rights.

With research we wanted to test how nowadays the forest owners value the existing sustainable forest management and if difference between non-experienced and experienced forest users and owners exists in their behaviour. For this purposes we carried out a web based survey of standpoints in this issue and a behavioural economic experiment in the next step of pilot research. Respondents were selected from the three types of stakeholders: study circle groups, university students and from an agrarian common. The goal of the experiment was to test if the sustainable management is a strategy that the actors find as a long term best practice, or it is respected because of the existing state rules.

Key words: Forests management, Public vs. private goods, economic experiment, Sustainability, Slovenia,

### **INTRODUCTION**

Slovenia belongs to the most forested countries in Europe. 1,169,196 ha of forests cover more than a half of its territory (forestation amounts to 57.7 %). Generally the Slovenian forests are managed according to the general forests management plans prepared by the Slovenian Public Forest service, which is preparing guidelines for forest management irrespective of ownership on the concept of sustainable and multipurpose management. Forest owners as a land owners have right to harvest timber from their forest according to a management plan and sell it on the open market.

Two thirds (67%) of forest owners own less than 1 ha of the forests, and their property covers 9% of the total forest area. In terms of forest areas predominate owners in category 5 to 15 ha covering 31.1% of all forests area, followed by the owners in the size category of 1 to 5 ha with 27.8 %. Only 2 % of Slovenia forest owners own a third (32.2%) of all forests in the

category over 15 ha size (Medved et al, 2010). Among the forest owners there are also members of commons whose property was nationalized in 50s and 60s and returned with restitution process.

Ownership types are not precisely studied by categories which would be comparable through the longer period of time. Among 77% of private forests we find 30% of family farms (Medved et al, 2010), common property regime (estimated to 10% according to unpublished data gathered by Bogataj 2011), individual forest owners, who in fact usually co-own their property with their relatives and other institutional owners (e.g. Church). Evidence about this structure is weak and not easily accessible. Difference between documents and reality is evident. Analysis of the owners structure by gender has not been known until 2009, as the most of interest was focused to the forest owners' safety, equipment, activity and property size. In 2009 Bogataj revealed dominance of female forest owners (Bogataj 2010), while new estimates rose the overall number of forest owners from 300,000 to 477,000 private forest owners, including co-ownership (Medved et al, 2010) and setting this relation into 51.3 % of male forest owners and 48.7% female forest owners. The latter possess less forest area (38.4%). Age structure provides an insight into social change as male owners according to the latest data in average have 58 years, while female average is even higher. According to Bogataj (2010) this is partly due to the no up-to dated land register situation, but mainly due to the fact of inheritance and social changes in the last decades.

One type of forest owners are also commons, a type of property which is collectively owned by commons' members, traditionally originating from nearby settlements and holding ideal shares of property. Obviously this is neither individual nor state property but a special type, present overall Slovenia and particularly interesting for the sake of their overcoming of private role and providing common good on the local level. Therefore we compared them with the other types of forest users, individual forest owners and non-owners. Commons, managed by common rules, are a result of long-term experience in steering between member's rights and duties on one side and the sustainability of a common pool resource, on the other side.

## METHODS

As during the transition and privatisation process private ownerships rights became much more important, we wanted to test their relationship to sustainable forest management. We were interested if non-experienced users and individual forest owners differ from those who experienced common management on the case of the forest. For this purposes we carried out a web based survey among selected study circles of two municipalities (Radeče, Tolmin), students of University of Ljubljana and members of Agrarian Common Ravnik Orlovše.

The text roots in the pilot test analysis within an ongoing research project. A test version of questionnaire consists of twenty-five questions, ten general (identification, region, forest ownership) and fifteen focused on the description and viewpoints of decision-making practice and characterisation of good forestry management practice and a good manager. Data were gathered in the period between January and May 2011. A sample is not representative, so a response rate cannot be given. Altogether 89 respondents provided their echo. The data analysed were the basis for the next step of the pilot experiment.

Economic experiment was aimed to test the actors' decision making behaviour. The main research question was if sustainable forest management is a respondents' strategy or they just respect existing rules set by the government. We set three hypotheses:

H1: Forest management decisions are strategy based and not only consideration of government based rules

H2: Harvest decisions are not independent from community characteristics.

H3: Experience of forest management is a factor to be considered.

#### *Forest Game description*

Forest Game is one of three economic experiment settings referring to common pool renewable resources (forestry, irrigation and fishery) with possible risk of open access situations ([Cardenas et al 2008](#)). We used the variant of the Forest Game with growing stock representing a common resource, measured in m<sup>3</sup>, based on research conducted by Zikos, Kluvankoa-Oravska and Slavikova (2010). In the Forest Game ecological dynamics is represented with regeneration (increment of wood) at a certain rate reflecting a real situation but omitting other forest roles. Communication between players was not welcome in the first game to test individual behaviour uninterrupted by decisions of others. Communication was introduced with limitations in the second game, while in the third game it was encouraged. The experiment was performed twice. Each time more groups were included, each with five participants, at least one from the study circles context regardless the status of forest ownership and the second from the forest owners context. The first case consisted of individual forest owners and students, the second case consisted of forest common representatives, study circle members and students.

The scenario requires that players individually harvest timber from a limited common pool (forest) that regenerates slowly depending on the number of the timber growing stock remaining at the end of each round. The game involves a situation in which people withdraw resources to secure short-term gains without regard for the long-term consequences what leads to situation where individual and social (group) optimum may clash. In this case degradation of common forest can be described as “tragedy of the common” by Hardin (1968).

Parts of the experiment are also question-forms, interviews and discussion with participants, which help to evaluate decisions from the game when players or group of players take harvesting decisions.

#### *Object description*

In the first experiment we included the students of agriculture from Biotechnical Faculty as a group representing non-experienced forest users and private forest owners from study circle as experienced forest users. The students were from different parts of Slovenia, while the forest owners came from the same area, Radeče municipality. In the forest owners group were only men and among students were four women and one man.

The second experiment was run in Vipava valley region. There were three groups, two from the study circle members from the same area, Ajdovščina municipality, mixed with students and a member of Agrarian Common Ravnik Orlovše. All participants were from the nearby settlements and do not intentionally learn about forest, so we regarded them as relatively independent, but living in the same cultural environment. This way participants of the experiment represented a rural population between age fifty and seventy, with the exception of students. There were three men in the commons group and one in the second group, others were women.

Both experiments started with discussion aiming to set a certain trustworthy climate in the group. Participants and experiment leaders got to know each other, they talked about general views about nature, forest, common resources, relations among people and the general developmental situation. They were introduced to the game, game rules were presented and a test game played as an opportunity to clarify rules.

#### *Rules of the game*

Each game consists of three parts, each having 10 rounds and it focuses on growing stock as forest resource. Five players participate in a group. The target of players is to get as many m<sup>3</sup> of wood as possible, as their harvest is reimbursed at the end of the game by a monetary fee that is paid to them. The fee was calculated on the basis of students work hourly rate in the way that each player can win at least the amount of money for time spent. This minimum fee corresponds the value of coffee token (0.25 EUR), so we take this value as value for 1 m<sup>3</sup> of wood.

After every round the remaining amount of growing stock is put on the board. Players are playing a game by different rules. Each individual takes harvesting decisions in every game secretly.

#### *First game – individual decision making*

Players manage a forest with the optimal growing stock 100 m<sup>3</sup>. After each round and at the end of all rounds 10 percent increment of existing growing stock (10m<sup>3</sup>) happens. Players can harvest maximum 5 m<sup>3</sup> per round and they have to leave at least 20 m<sup>3</sup> of growing stock in forest after the end of the first part otherwise they have to pay a fine 0.25 EUR/m<sup>3</sup>. Communication among players is not allowed.

#### *Second game – introduction of a voting decision and inspection*

In the second game a playing rule is voted. Players vote on three different rule options. First option is to allow harvesting to two players in a lottery way, second option is to allow harvesting to two players at the same time by list order, and the third option is to allow harvesting to all players of the group with setting maximum harvesting limit at 2 m<sup>3</sup> per round per player. Breaking the chosen rule is possible, but includes a certain risk of inspection (1 out of 6 – playing dice). In such case the illegal harvesting is confiscated and an additional sanction of 3 m<sup>3</sup> is imposed to the cheating player. After every round 10 percent increment of remaining growing stock of the round happens.

#### *Third game – communication allowed*

In the third part of the game harvesting decision are taken together in the group. There is a set of three rules from the second game or there are no rules as in the first game available with an option to change the rule every third round. Breaking the chosen rule is possible, but includes a certain risk of inspection (1 out of 6 – playing dice). After every round 10 percent increment of remaining growing stock of the round happens.

## RESULTS

As this was a pilot test analysis within an ongoing research project, we can only present and discuss the preliminary results and compare them with the results of similar research.

#### *Inquiry results*

##### General structure and functioning

Rural inhabitants prevail, mostly those, born in the same municipality as they live now (89%). 42% of them are in the age class between 20 and 30 years, gender balanced. Forest owners prevail, but in 58% cases represent only additional income. Approx. in half of cases they self-estimate their situation as independent from their social network (concerning residence, financial matters and time). Forest is used by all regardless the ownership, however such an answer means that free access is provided and recreation enabled to all ( $\chi^2$  0.00). Significant relationships among subsets of the data are rare. Older generation has statistically significantly solved their residential challenge in comparison with younger respondents ( $\chi^2$  0.00).

#### Relationship and communication

Information/knowledge/emotional ties and flow exists and tie local inhabitants. 85% of respondents experienced situations where relationships got priority from material justice. Communication is not crucial for 40% of respondents but they all think that »long term survival is only possible, if we harmonise about resource use«. Young generation is more sensitive to this question than the older one. Co-operation is seen as an element of benefits raising by the most of respondents (64%), among them 43% without doubt, but 20% consider this benefit as limited to individuals or a small group. Only minority consider individual interests as more important than common interests (21.3%). 57.3% absolutely refuse individualistic standpoint and further 21.3% »does not agree« with it. Age based difference is significant ( $\chi^2$  0.074), younger respondents perform more individualistic standpoints.

#### Decision making characteristics

In general respondents co-decide in their households (92%) and at their workplace (75%). In 43% of cases formal rules about decision making procedures do not exist. 66% of respondents make decisions about forest management, significantly more if they are rural inhabitants ( $\chi^2$  0.31). The decisions usually result in negotiations (48% of cases), appreciations (19% of cases) and opposition (11% of cases). Gender based difference is significant ( $\chi^2$  0.10) but intentional redundant questions does not confirm that (e.g. only one man confirmed his individual manner of decision making and not even one that decision making is only his responsibility). In general we can say that decision making patterns differ among generations and does not cause conflicts. However, a subset of youngsters reach decision through conflicts while older people with less difficulties ( $\chi^2$  0.042). Residentially less dependent from others use formal decision making rules and the opposite; those living in larger families (more generations) are inclined to more non-formal decision making processes ( $\chi^2$  0.05).

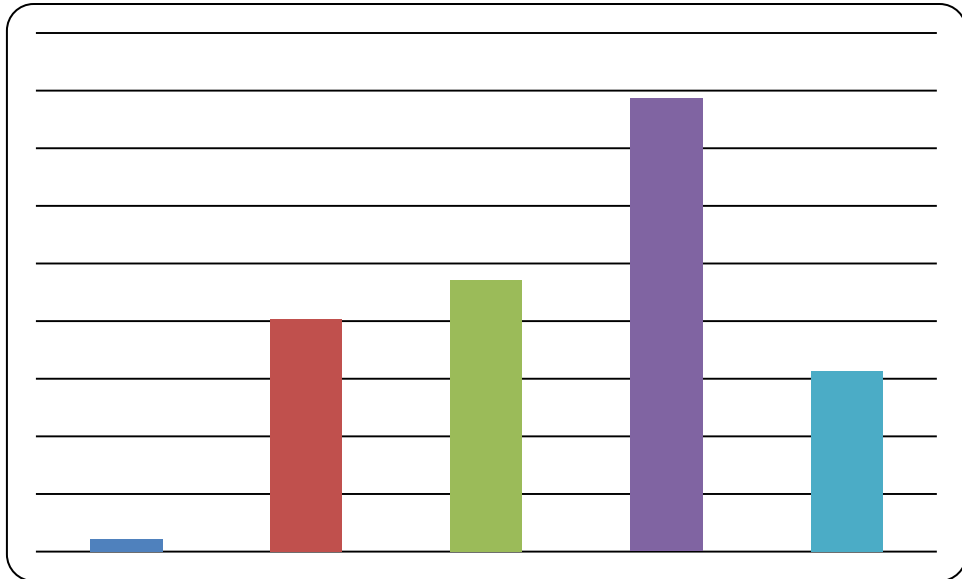


Figure 1: Share of respondents according to their decision making experience

#### Who is »a good manager/master«?

Among four offered possibilities, priority was given to »resource keeping/conservation« (34%), followed by »sustainable benefits« (31%) and »benefits for all« (29%). Earnings seem important characteristic of good master for 5.6% of respondents.

#### *Forest Game results*

##### First game- individual decision making

This game ended with the lowest remaining of growing stock of the “re”-sources comparing to the second and third game in all groups on one side and with the medium groups and individuals' earnings on the other side. The harvested volumes were higher in the second half of the rounds. Results of the first game show us the lowest remaining of growing stock and the medium profit of individuals with one interesting occurrence, harvesting in last 5 rounds was higher than in first ones.

##### Second game – introduction of a voting decision and inspection

In the first experiment the majority voted to accept the third rule (all participants can extract limited volume of stock) and in the second the majority voted to introduce the second rule (three players are allowed to extract according to predefined order). In both cases the inspection was introduced.

The amount of remaining stock was higher than in the other games (the first and the third), while the harvesting amount varied between groups the most.

Cheating occurred in both experiments and in all groups. In first experiment the forest owners cheated more often than students, as in the second experiment cheating occurred twice in commons' group, while in first and second group it was more often. Generally was cheating most often in the group of individual forest owners. Some of the cheaters were harvesting illegally small amounts of wood, while others were harvesting maximum volume of 5 m<sup>3</sup> when cheating. Amount of the profit corresponded with the cheating in the way that bigger cheaters earned more than fair players. Cheaters were caught rarely. Due to low occurrence of the inspector we could not observe if execution of fines reduced the cheating. Generally the forest was not so intensively harvested in the second game as in the first one.

### Third game- communication allowed

The third game introduced the cooperation among players and resulted in the largest harvesting. The remaining of growing stock is still higher comparing to the first game. Considering collaboration this game was played with the consensus among players. They mostly respected it and harvested considering the chosen strategy. Players reached the highest earnings comparing to other games and “profit” was shared equally among all. Also members of other groups in average earned more than in other games.

Results of the third game are an example of good collective action. Communication and more team work led to more equal earnings among players, while players of common held the chosen strategy and had equal earnings. Comparing with Zikos research our results show the highest group earnings in this game, while they found highest earnings in the first game. The resources were generally better maintained (higher remaining) than in the first game in our case. Like them, we also found out that equity between players was achieved to a larger extend.

Table 1: Summary of the game results, example for the second game, Ajdovscina

Observed element/ symbolic characteristic of the setting	Individualistic	Intermediary	Common
Final growing stock	Low	High	Intermediary
Individual profit	High	Varying	The highest
Communication in the group	No	Voting rule	Common decision making
Monitoring of resource use	No	Yes	Yes
Distribution of profits	Unequal	Unequal with less difference	Equal
Free riding, Cheating	Yes	Yes	No

We confirm our expectations set in all three hypotheses: individual decision makers have their own strategy of resource use, their standpoints and managerial behaviour was not directed only to resource use but relationship in the community also and experience played a certain role in this relation. Absence of communication, monitoring and penalties all led to the same direction, a known Hardins tragedy. Regardless experience in forest management (individual forest owners study circle participants, students, forest common shareholders etc.) their standpoints were inclined to long-term care for community and resource at the same time (and in this sequence!). These standpoints, tested in the economic experiment, were generally confirmed, however they open new dilemmas, e.g. generational difference, weaknesses of experiment etc.

## DISCUSSION

Our findings are preliminary. Experience in forest management did not impact standpoints in the inquiry, but proved to be essential in behavioural part of the research. General non-individualistic behaviour is structurally characterised as age differences proved to be

significant. Economic experiment proved very clear trends, consistent with the literature on common pool resource (Cardenas et al 2008, Janssen and Ostrom, 2008, Ostrom 1999).

The highest extraction of wood in the first game symbolises individualistic attitude, providing a process with unsustainable results. Overexploitation danger occurs when communication norms or bottom up raised rules are absent (e.g. rules of resource use or punishments rules of unwanted behaviour). The first game also represents a competition manner, which leads to a different distribution than the rest of game types which incorporate interaction. Distribution of benefits can be regarded as a social characteristic considered as important in the inquiry and so is in the CPR literature and the authors' experience. Last but not least several unwritten rules exist and are followed in Slovenian forest commons, so this kind of experience and sustainability (or democracy?) principles might be considered when we analyse forest ownership or forest management.

The second social characteristic, traced in the economic experiment, is the nature of interactions. They might be:

- a) horizontal e.g. voting for additional rules, common decision making or
- b) vertical, e.g. considering inspection or not.

Both lead to higher growing stock and more equal distribution, which seem desirable and comparable to Zikos et al. 2010 findings. We speculate that experience include knowledge (e.g. professional knowledge) and experiential interaction as the most experienced group in common decision making in the third game, a common, proved to have optimal results among all the groups if we take equal distribution of profits without overexploitation as an optimum. According to our understanding the reason behind is manifold:

1. their regular local communication, which lasts over a century, result in norms of interpersonal relations and resource management at the same time;
2. Regular meetings might also represent a potential of soft but overall monitoring (with low transaction costs!).

These are arguments to confirm that forest management of at least one group, an agrarian common, is a strategy and not a state based rule followed. As there are arguments that most of participants of the experiment share such a manner, so in further research we should test these differences in detail.

The third social characteristic to put attention to is free riding. It maximises individual preference, it is profitable in short run, but dangerous in the middle run yet as it leads to Hardins' situation, symbolised by the first game. Free riding occurred several times: in the first game free riders were individuals who harvested irrespective of growing stock situation what led groups one and two into the situation, where growing stock was harvested over the set limit of 20 m<sup>3</sup>. In the second game free riders were those, who did not respect the rule and they harvested also when it was not allowed.

The fourth social characteristic, visible in the research was existence of vertical flow of information, knowledge, initiatives etc. It can only be told, the local norms are unwritten and stable for more than a century while state written rules change. For location studied these changes were relatively often, every 4 or five decades.

The last social characteristic shown in the economic experiment is, imitation: those, who kept themselves back in harvesting, started harvesting more in rounds, when they realised that somebody is making money on their account.



The results confirm the known that the small owners can maximize their profits in cooperation (i.e. cooperatives...), so it is very contradictory that, due to such small ownership structure, is this model marginal at the moment in Slovenia.

#### *Further research proposals*

It should be tested if both type of regulation, local norms and state based rules, complement each other. A doubt is high when we consider legislative limitation of their managerial existence, but low when practice of forest management is taken into consideration. This might mean that the state level limits certain organisational model, which proves to be a case of good practice at least from the forest management point of view.

#### *Improvement of model shortages*

The basic forest stock roots in previous generations' organisational models and decisions. It can not really be taken as granted what is suggested by a model (and was commented by one of participants!). Individual and common forest owners in fact follow the tradition that forest is regarded as a bank account received from ancestors and will be given to heirs in equal or better condition. This norm is overall present in Slovenia among forest owners and it proves an idea of sustainability in practice, so it deserves particular attention. It illustrated social responsibility of forest owners, who in case of forest common also invest into public infrastructure. Therefore it is hardly considered as a classical profit oriented forest owner but more as a strategically oriented into common good and long-term complex benefits.

A model for experiment therefore has some shortages:

- a starting point is independent despite in reality it brings important message of responsibility and decision making model of previous generations,
- a final state of resource is not valued;
- despite communication model is measured, profit distribution is not given particular weight (but according to our preliminary findings is essential);

Our performance has also shortages, which enlarge the distance between a model and reality:

-a group of five is hardly representative for any conclusion. So results, e.g. exposure of Agrarian Common Ravnik Orlovše for an excellent model, are not grounded enough.

- the price of 0.25€ per unit was defined arbitrary; I has not been tested if decision change when the price changes.

- inspection or monitoring might be tested in higher frequency. In our case it was quickly recognized as a repressive entity (and thus proved experience of undemocratic regime), but when its role was weak, cheating and free riding continued; We consider this as an example of learning, adjusted to circumstances.

- we did not observe intentionally the background of decisions. Therefore we only speculate the reasons for homogenised decisions (dominant individuals, effective communication, knowledge-experience, group structure, etc.) (comp. Zikos et al 2010).

The first game results can be explained at least with three possible explanations:

- With the presumption that the players, who did not harvest so intense at the beginning, started harvesting more, when they realized that some individuals (free riders) are making money on their account. This was also stressed by one of the participants when she realised this situation.
- Awareness of players that forest stock can regenerate.
- Lack of limitation and control.

In this game the main differences between group of common and other groups were in fair play. This fair play can be seen in respecting of rules and agreements. As in Zikos et al 2010 research where results show reduction of group earnings on the account of greater preservation of resource, our results show the same trend as well. Free riders were present in both experiments and gained the highest profit.

## CONCLUSIONS

Resource sustainable oriented logic goes in line with social processes based on regular communication and common decision making. This is confirmed by the general standpoint of inquiry respondents and pilot experimental results and literature (comp. Lidestav et al 2010). The logic of long-term thinking and processes tackle both, resource and (local) society at the same time.

We confirm the following expectations and hypotheses:

1. Respondents of the pilot inquiry and two performances of economic experiment do follow strategies of sustainability in their decision making in forest management and not only follow a state rules; in one case this is also a common strategy which indicates specifics of this form, which characteristics extend specifics of private property into public sphere;
2. Forest management decisions include both, resource AND society, at the same time; as a consequence state based vision of sustainable development should consider more norms on the local levels and continue, upgrade and develop relatively functional vertical relation of forestry with forest owners in this respect.
3. Experience is essential for management behaviour and is less individualistic when older generations are considered. Older generations should therefore be seen as a source of experiential knowledge, norms and sustainable behaviour and not only as a demographic threat.

In general we have confirmed general characteristics of individualistic and “common“ model, with consistent transition from one to another, what is in line with findings in the literature (Zikos et. al 2010, Cardenas et al 2008, Jansen and Ostrom 2008).

However, models tested proved shortages in comparison to reality, which interlaces individual and common practices. It is therefore not a surprise that principles of individual behaviour in managing common pool resources, also found in case of Common Ravnik-Orlovše, is experienced in common decision making. General inclination of our respondents to the common interest in inquiry is present, but actual behaviour heavily depends on circumstances. Cheating and free riding happen and are easily and quickly followed. If inspection is not effective or monitoring absent (e.g. too expensive!), a model does not provide sustainable results. If communication is not provided, is irrational or its level distant from those who bear consequences, the result is unsustainable again. A pilot case, studied, shows that linking of those, who make decisions with those who gain decision results is crucial and also rational. State structures can be supportive (e.g. forestry) or ignorant (e.g. legislative limitation of common management), and not a focus of our study.

Material and non-material motives, earnings and just distribution might compete each other. Our inquiry shows clearly that common good inclination is present as only 5.6% of respondents quote earning as a “good master” characteristic. Attributes given to a “good master” are: resource stability (34% of respondents), sustainable benefit (31% of respondents) and “distribution of benefits “for all” (29% of respondents). Non homogeneous behaviour was

expected and is confirmed. Generally only age based differences can be confirmed and overall finding that most of respondents do not decide independently from their social environment. Personal value and attitude profiles seem obviously associated with cooperation interest (comp. Finley et al 2006, Bogataj 2009). Decisions without conflicts are usually taken, respondents believe into benefits of communication for a long-term survival. Younger participants seem more individualistic than the older, who explicitly refuse such a manner. Specifically Ravnik Orlovše group was more homogenised in its decisions, particularly in the last round which was under the influence of a dominant player.

Some dilemmas about the model used remain and steer research into its development closer to reality:

- As players in our case inherited their resource, forest, they should invest at the beginning of the game a certain value representing a starting growing stock. As one of the participants remarked: “These shares were inherited, so they were a gift, providing us with a starting value”.
- Evaluation of every step should be diversified into evaluation of the starting situation, added value (e.g. increment) and the final situation as forest in every moment should provide public good for all, e.g. ecological functions;
- Both, a forest and a group should be considered a resource with the main goal: reaching balance between benefits from forest and social cohesion of a group/society.
- The value of remaining stock should be defined after further analysis.
- A dilemma about the reasons for homogenised group decision making in case of Ravnik Orlovše indicate at least three possible reasons:
  - a strong leader (personally or professionally?),
  - quality of communication or
  - norms, developed in the long-term period.

All our measures lead to the conclusion that participants of our test were informed and rational, but made decisions (when allowed) dependent on common rules. These rules correspond to local norms and were not always rational or unbreakable – cheating occurred and was traced, communication provided consensus, followed in common more usual than in other groups etc. From this point of view a group from a common Ravnik Orlovše proved itself as promising from the sustainable forest management norms and behaviour. As this organisational form is a functional old autochthon institution, developed through centuries their result is not optimal by chance (comp. Lidestav et al. 2010, Agrawal, Gibson 1999). Therefore it seems important that despite social changes they keep norms of common management, once management of a pasture (therefore called agrarian common), which turned into forest (and therefore called forest common).

Slovenian particularity in comparison to the most of European countries, free access to forests and government based planning, are not considered as limiting factors for the results of our analysis. Our findings prove that balance between individual and common benefits is possible, but not only on the state level. Intermediary bodies, e.g. commons, practice this balance on the local level for centuries, so this organisational model might gain more attention.

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