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Comparative analysis of strategic forest management planning of North-Western Russia and Sweden

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Abstract

In Sweden strategic forest management planning is traditionally conducted to optimize decisions about sustainable harvest levels while taking into consideration legislation and policy issues (Andersson, 2005).

In North-Western Russia, however, 10-year strategic plan is considered as a basis of forest management in state forests, embracing all the decisions about forestry activities needed. The most important point in making strategic plans is derivation of annual allowable cut.

The aim of this paper is to dissect particular aspects of forest management planning of North-Western Russia and Sweden, i.e. level structure, decision-making and drivers behind forest management decisions, thus giving the insight into differences these countries' planning procedures make.

This is to be revealed by describing their planning approaches touching upon data gathering, usage of computerized support systems, technical calculations of cutting levels; and by analyzing and comparing their planning levels, processes of decision-making as well as drivers behind decisions taken in order to get a broad overview of key points influencing decision-making in forestry.

In order to get an insight into forest management planning of Russia and Sweden two regions are looked at: North-Western Russia and Götaland region (Sweden) which is within operational area of Swedish State-owned forest company Sveaskog.

Russian planning practice is somewhat rigid and a bit overloaded with technical calculations and it is not always convenient to compile so much information at a single level.

Market mechanisms proved to be crucial for profitability of forestry in Sweden. Having laid foundations for market economy, Russia still ought to put far more emphasis on developing forest market mechanisms in order to put them into real action. In no way can Forest Management Planning Package be applicable in Russia now. Assurance of stable timber supply over time is believed to be beneficial in Russia.

A striking difference between the two countries is in decision making – not only is a process of taking decisions various, but also concept of decision itself as well as role of decision-maker in planning make a great difference. Swedish decision-maker is given a wider space for taking an action.

Keywords: forest management planning, comparative analysis, decision-making, planning level, annual allowable cut, forest management planning package, profitability, timber supply.

1. Introduction

Sustainability and long-term economic thinking have been key concepts in forestry of Sweden long before sustainability became a buzz word for environmentalists, politicians and forestry practitioners in Russian Federation. Swedish foresters have been working towards sustainable forest management for more than 100 years, although, for many years the focus was, as it is now in Russia, on trees and timber production. On the other hand, it is true that both ecological and social considerations mostly have been part of the picture.

In Sweden strategic forest management planning is traditionally conducted to optimize decisions about sustainable harvest levels while taking into consideration legislation and policy issues. Within the frame of strategic plan the purpose of tactical planning is to schedule harvest operations to specific areas in the immediate few years and on a finer time scale than in the strategic plan (Andersson, 2005).

For a long time, Swedish forest management planning had to be confined to the use of simple, intuitive and manual models. However, powerful computers, improved measurement techniques and advanced sampling theory have made it possible to utilize more complex and realistic models (Jonsson, 1993).

In North-Western Russia, however, 10-year strategic plan is considered as a basis of forest management in state forests, embracing all the decisions about forestry activities needed. The most important point in making strategic plans is derivation of annual allowable cut.

However, the methods of calculating allowable cutting levels are in many cases old-fashioned and result in unrealistically high figures. And despite that, hardly ever harvest equal to the annual growth is used.

What kinds of forest management planning methods do both countries use? How do they differ? What are their benefits and drawbacks? All these questions are topical both in Russia and abroad now and first steps are to be taken to clear up this fuzzy picture.

The aim of this paper is to dissect particular aspects of forest management planning of North-Western Russia and Sweden, i.e. level structure, decision-making and drivers behind forest management decisions and, based on foregoing, discuss what aspects of Swedish forest management planning could be useful for Russian forestry.

2. Materials and methods

This study was launched to explore the difference between forest management planning processes of both countries in terms of making management decisions, drivers behind them and planning levels.

This is to be revealed by describing their planning approaches touching upon data gathering, usage of computerized support systems, technical calculations of cutting levels; and by analyzing and comparing their planning levels, processes of decision-making as well as drivers behind decisions taken in order to get a broad overview of key points influencing decision-making in forestry.

Hence, on gaining broad descriptive picture of technical features of planning process, three issues are extracted, dissected and compared between the countries:

- Planning levels,
- Decision-making process,
- Drivers behind forest management decisions.

Usage of results generated by support systems will be emphasized.

In order to get an insight into forest management planning of Russia and Sweden two regions are looked at: North-Western Russia and Götaland region (Sweden) which is within operational area of Swedish State-owned forest company Sveaskog.

2.1 Forest management planning in North-Western Russia

Boreal forest of North-Western Russia presents an intensively managed forest landscape of scientific interest which is managed by local state forestry enterprises. Forest management planning is being carried out for each state forestry enterprise by North-Western State Forest Inventory Enterprise. No forestry operations are permitted without an adopted 10-year forest management plan.

Determination of annual allowable cut (AAC) is the major task for forest management planning. Annual allowable cut is an allowed cutting area level calculated based on inventory data for certain forest management section within forestry enterprise. Annual allowable cut is calculated in area terms and then converted in cubic meters. Annual allowable cut for a forest enterprise is a sum of annual allowable cuts for management sections within this enterprise.

Annual allowable cut is calculated for each separate management section which consists of a set of forested and unforested forest lands scattered over management part but aggregated by dominant tree species, site index and the same management regime. Management part is a certain part of territory of forest fund which differs from others in terms of value of forest, management regime and intensity of forestry (Tetyukhin, Berezin et al. 2003). In fact, management part is referred to as group of forest.

Grouping of forest fund (totality of forested and unforested lands) was initiated to divide forests into categories with different consideration. The first group of forest that amounts to 21% includes protective forests as well as those designated for ecological conservancy. The second group stands for catering for the needs of industry and maintaining ecological functions of forests, occupying only 6% of forest fund territory. Such regions are usually densely-populated and have developed transport network. The third group accounts for vast forested areas with exploitative consideration and amounts to 73% of forest fund territory.

According to the Forest Code 2007 annual allowable cut must secure:

1. sustainability of forest use,
2. improvement of age structure of forests (even timber flow over time),
3. stability of commercial cuttings during 20-30 years,
4. rational and timely utilization of mature timber,
5. maintenance of protective functions of forests (Tetyukhin, Berezin et al. 2003).

There are different forest inventory methods used in North-Western Russia depending on forest inventory class which defines resolution of data captured. Standwise inventory, considering each stand within the compartment, is used only if very valuable forest is inventoried. This method is very consuming in terms of both time and funds, that is why it is used in exceptional cases. The most common way of forest inventory is sample plots allocated within the compartment. Samples can be squares, strips or circles.

According to Tetyukhin, Berezin et al. (2003), in order to be capable of making technical calculations of annual allowable cut determination following materials are needed:

-Age class distribution,

-Cutting age and rotation period,
-Volume per hectare of mature and overmature stands,
-Areas occupied by dead stands and volumes of dead timber,
-Areas and volumes excluded from calculation of AAC.

As it is stated in Tetyukhin, Berezin et al. (2003), in North-Western Russia AAC is derived on the basis of calculations made by Win PLP "LUGIS" program using different formulas:

1. Cutting area by harvest period (normal AAC) - forested area of management section divided by cutting age.
2. First-age cutting area - area of overmature, mature and premature stands of management section divided by number of years of 2 age classes (coniferous – 20-year age class, deciduous – 10-year age class).
3. Second-age cutting area - area of overmature, mature, premature stands plus area of one older class age of middle-aged stands divided by number of years of 3 age classes.
4. Integral cutting area

using 20-year age classes (for coniferous):

$$L= (0.2F_m+0.6F_{1sr}+F_{2sr}+1.4F_{pr}+1.8F_{sp})\ 0.01$$

using 10-year age classes (for deciduous):

$$L= (0.4F_m+1.2F_{1sr}+2.0F_{2sr}+2.8F_{pr}+3.6F_{sp})\ 0.01$$

F_m denotes total area of young stands,
F_{1sr} denotes area of first age class of middle-aged stands,
F_{2sr} denotes area of second age class of middle-aged stands,
F_{pr} denotes area of premature stands,
F_{sp} denotes area of mature and overmature stands.

5. Cutting area by maturity - area of mature and overmature stands divided by number of years of 1 age class.

Annual allowable cut might be equal to one of calculated cutting areas depending on a range of circumstances (economic recession, dramatic changes in consumption of unprocessed timber by industry) and the practical rules for choosing right AAC. But, in each case AAC must prevent forest from excessive accumulation of mature and overmature

stands as well as depletion of exploitable forest and suppression of protective functions, and at the same time cater for the timber needs of forest industry.

There are practical rules for choosing right AAC stated in Tetyukhin, Berezin et al. (2003):

1. Cutting area by harvest period, if age class distribution is normal (even). Only area of age classes within cutting age should be considered.
2. Cutting area by maturity, if there are few mature and overmature stands.
3. Second-age cutting area, if vast areas of mature and overmature stands are accumulated. In softwoods with similar conditions second by area is not preferable as it will lead to decrease in quantity of merchantable logs.
4. Within the first group of forests where commercial cuttings are allowed AAC is often negligible. AAC should not exceed mean annual increment (MAI). This restriction is a kind of control. AAC should not be lower than area of damaged, dead or infected stands that must be removed.
5. Forests of the second group lack mature stands and there are not enough forest resources for forest industry. Cutting area by maturity is adopted.

Adoption of AAC for a forestry enterprise takes place during second forest inventory meeting when it is approved by regional administration, forest inventory enterprise and forestry enterprise chief representatives. Decisions taken during second forest inventory meeting are to be implemented within the planned 10-year period.

2.2 Forest management planning in Sveaskog Götaland

Strategic forest management planning in Sveaskog Götaland is based upon using Forest Management Planning Package (FMPP). This planning system lends support to a selection of management activities that reflects great responsibility for both the present and the future. Long-term forecasts of the outcome of different options of action are therefore a natural component of strategic management planning (Jonsson, 1993).

Two search processes - definition of yield potential and assessment of the value of these outcomes - are both necessary to the formulation of specific goals for the guidance of forest management (Jonsson, 1993).

In Swedish forest management and Sveaskog's management in particular, as stated in Jonsson (1993), the goal is to achieve the highest possible sustained yield. Net present value is a general yield measure.

According to Jonsson (1993), timber production process can be divided into two sub-processes:

- the primary production process, having resources for silviculture as input and trees mature for harvesting as output;
- the secondary production process, having mature trees as input, as well as resources for logging transportation, storage and sales. The output is timber products at permanent processing facilities.

The FMPP builds on the schematic assumption that the design of the secondary production process is given and fixed when the trees are delivered from the primary production process (Jonsson, 1993).

Strategic decisions of Sveaskog call for support data that, above all, must give a correct picture of the possibilities offered by the holding as a whole. In Jonsson (1993), the different requirements in the supporting data for strategic decisions are met by a survey procedure that is divided into two phases.

Phase 1: A total, fast and inexpensive description of the entire holding, divided into appropriate compartments:

- partitioning of the forest holding into compartments and the formalization of the compartment structure on a map;
- description of the forest in every compartment and the formalization of this description in a compartment register.

Phase 2: A detailed, objective measurement of a sample of compartments:

- stratified PPS-sampling of compartments for circular-plot survey;
- systematic sampling of circular plots within each sampled compartment.

At Sveaskog's planning department work starts with creating a compartment register. The second phase consists of a sample of compartments that are inventoried. All individual trees on the sample plots are recorded.

In the context of the FMPP, a compartment register, which stratified sample compartment is chosen from, consists of data generated by subjective methods of inventory. These data are translated into measurement values with stated precision, based on objective measurements of a small sample from this register (Jonsson, 1993).

Only the measured sample plots from the sampled compartments are used in FMPP. These are taken to represent non-measured parts of sampled compartments, as well as compartments not measured at all. If

sample is allocated in an efficient way and is sufficiently large, the resulting picture of the real forest holding is an approximation that is useful for strategic analyses (Jonsson, 1993).

The FMPP has been designed to predict growth by utilizing information with the highest degree of resolution. The development of efficient measuring instruments has made this approach practically feasible (Jonsson, 1981, 1991).

The individual-tree concept allows for computations to be traced and assessed for feasibility at all steps. Computer printouts can be requested showing growth during the forecasting period for: single trees, single plots, single compartments, forest holdings (Jonsson, 1993).

According to Jonsson (1993), the basis of FMPP is a workable objective function, which is a compromise between basis economic principles of net present value maximization and sustainable development.

Application of the FMPP is an iterative search process, in which the results prompt re-evaluation of the assumptions, which in turn will lead to new results, and so on. In the end, this search process leads to a treatment option close to the optimal one (Jonsson, 1993).

The task of the model is to find optimal treatment regime so that utility is maximized. In Jonsson (1993), the optimal treatment option H is estimated by maximizing utility:

$$U = \sum_{p=1}^{\infty} e^{-r\,t_p} \times c \times \left\{ \sum_{i=1}^{m} q_i \sum_{j=1}^{n} \sum_{x=1}^{k} a_{xp} \times f(x, t_{p,} H_i, I_{i,j,t_p}) \right\}^{b};$$

where

i denotes compartment,

m denotes number of sampled compartments,

j denotes plot,

n_i denotes number of sample plots within sampled compartment i,

q_i denotes projection factor for sample plots within compartment i. Projection factor is crucial for representing the whole forest holding based on sample plots' data.

A special algorithm has been developed (Jacobsson, 1986) for the solution of this non-linear optimization problem.

The main output from the solution algorithm is the optimal treatment option H* for the compartments in the sample. Sveaskog's operative planning, however, requires that we make inferences from the optimal treatment of the sampled compartments to all individual compartments in the forest holding. The choice of treatment option in this

case has to be supported by the information produced by phase-1 survey, which covered all stands. The aim is to deviate as little as possible from those treatment options which would have been chosen if all compartments had been subject to a survey in phase 2. Weighting procedure brings the result as close as possible to the result that would have been produced if phase-2 data had been available for all compartments (Jonsson, 1993).

3. Analytical part. Results

3.1 Level structure

a) Levels of planning procedure

Irrespective of the support tools used, an intuitively reasonable way to manage planning of a complex system such as forestry and adapt the planning to the organizational structure is to divide the planning into different phases. Planning and decision-making in Swedish forestry is traditionally performed in a hierarchical structure, where information is passed from the top down and the decisions taken are based on the information available at each level (Andersson, 2005).

At a national level "HUGIN" generates possible alternatives of management measures. Examples of information supplied from this level of planning are net revenues and the levels of harvest in final felling and thinning (Söderholm, 2002). Information about potential cut goes from "HUGIN" to forest companies in terms of volumes that could be harvested regardless of species and allocation of areas designated for harvesting. Data are aspatial. "HUGIN" has no link to stands. Taking notice of potential cut figures "Sveaskog" runs Forest Management Planning Package. The potential cut generated by "HUGIN" on the national scale is not decisive factor for taking a certain action. But the situation is different when it comes to "HUGIN" simulations carried out for Sveaskog on purpose – they are certainly a base for planning.

In contrast, Russian forest management planning is based on a different approach. AAC is calculated for each management section within forestry enterprise. Sum of AACs calculated for each section gives AAC for the forestry enterprise. Adopted AAC is the central point of 10-year strategic management plan. All forestry actions are jointly planned to avoid suboptimal solutions. This plan contains all forestry operations needed during the next 10 years, including harvest volumes, spatial data, etc. Planned and adopted account of management decisions from forestry enterprises is summed up at regional and national levels. Taking into account that all aspects of forestry-related decisions are incorporated at a single strategic/tactical level, it might be considered as monolithic or all-embracing approach. Using this approach, all information is available to both strategic and tactical levels simultaneously. The main disadvantage is that too much information is supplied at a single level.

Alongside with forest management planning at an enterprise level, Russia has so-called "State Forest Account" (SFA) – annual account of qualitative and quantitative characteristics of forest resources at a country level. It is the main source of generalized and systematized information

about Russia's forests used at a national level. It is being done by forestry employees by means of information renewal in forest management plans as well as inventory data and if it is needed by inventories, and then summed up at Russia's level. Thus, SFA has a controlling rather than planning function.

So, Sweden has more level-wise approach (HUGIN simulation at a country level and "HUGIN" and FMPP simulations at an enterprise level) whereas Russia is basically concentrated on a single level but, for far-sighted decisions at a national level as well as for controlling, nevertheless, takes notice of changes in forest state and dynamics applying SFA.

b) Data consistency

In Russian case, strategic and tactical issues are handled at the same time. This approach induces neither spatial nor temporal discrepancies (Andersson, 2005).

A problem that may arise when planning is divided into levels is that solutions at one level may be inconsistent with the results of another level, and thus their meaning could be doubted (Weintraub and Davis, 1996). When moving from the strategic plan to the tactical plan, three sources of inconsistencies are often present: spatial discrepancies, temporal discrepancies and discrepancies due to different level of constraint (Andersson, 2005).

In Sweden, for example, where objective methods for data acquisition for strategic planning are traditionally used (Eriksson and Lämås, 2003), temporal rather than spatial discrepancies are the main issue (Andersson, 2005).

3.2 Decision-making

a) Structure and sequence of strategic planning phases and involvement of decision-maker in planning procedure

In Sweden strategic planning simulations about harvest volume are made at a national level with the support of computerized forest simulation system "HUGIN".

Keeping an eye on volumes of needed harvest from "HUGIN", State-owned forest company "Sveaskog" takes decisions about harvest areas, volumes and species, preferably within the given scope.

In order to attain sustainable harvest levels, Sveaskog runs Forest Management Planning Package. Forest management planning procedure using FMPP consists of following stages:

- Goal formulation,
- Inventory,
- Forecasting,
- Optimization,
- Implementation.

Goal formulation is the first stage. It is actually done by decision maker and reflects what he wants to achieve implementing forestry operations.

In Russia, however, neither preferences nor goals are set beforehand. Process starts with forest inventory and is followed by calculations from which AAC is determined using various formulas. One can name the process of getting different outcomes from formulas by forecasting. But it is not followed by optimization as there is no given scope within which outcome has to be optimized. Decision-maker in this process is just to choose the right option which will ensure long-term stability of wood supply to industries, sustainability of forest ecosystem and so forth. The implementation of the decision is the last phase.

b) Variation in goal formulation process for specific forest enterprise

In fact, goals concerning certain forest enterprise are in compliance with goals set for country's forestry. Strategic goals for national forestry in general and forestry enterprises in particular set by Russian Federal Forestry Agency according to the new Forest Code 2007 are:

1. sustainability of forest use,
2. even timber flow over time,
3. stability of commercial cuttings during forthcoming 20-30 years,
4. rational and timely utilization of mature timber,
5. maintenance of protective functions of forests.

Decision-maker must ensure that they will be accomplished by the chosen AAC.

Looking at the Swedish National Forest Policy, it is plain the process of developing forest-sector objectives with a strong emphasis on stakeholder involvement satisfies many of the requirements of national forest programmes. But the objectives do not allocate responsibility or indicate which measures need to be taken. Thus, the forest-sector objectives may be seen as an important component of a national forest programme for Sweden.

Strategic goals are set by decision-maker for certain company.

c) Essence of forest management planning process and its use in decision-making

Application of the FMPP is an iterative search process, in which the results prompt re-evaluation of the assumptions, which in turn will lead to new results, and so on. In the end, this search process leads to a treatment option close to the optimal one (Jonsson, 1993). In Russia, derivation of AAC is confined to single mere mathematical calculation that could be repeated in case any inconsistencies are discovered. This tradition for calculating the AAC originates from the Soviet era with inherent command-and-control economy. Having introduced market economy, Russian forest management still follows the old rules.

Hence, Swedish forest management planning process is rather a process of illustration of different alternatives of reaching goals set beforehand by decision-maker whereas Russian forest management planning is a strictly-regulated process of AAC derivation - neither preferences nor goals are set in advance.

d) Factors and mechanisms influencing decision-making

Adoption of AAC takes place during second forest inventory meeting held at a regional level. Accepting 10-year plan for a certain forestry enterprise, intensity of forestry operations carried out during the last 10 years' period as well as age class distribution must be allowed for. Adopted AAC can be equal to one of the presumptive AAC calculated on the basis of formulas or slightly changed due to economic situation in the region. AAC shall not be changed considerably because of market situation. Decisions taken during second forest inventory meeting are to be implemented within the planned 10-year period.

Although calculations made by FMPP are based on interest rates, expected future prices on timber, costs of logging and transportation, they just show some of the possible ways of attaining the goal. Since the major goal of the company is high profitability, Sveaskog's market department, constantly keeping a watchful eye on timber price development, is entitled to shift harvesting plan in favour of certain species depending on current timber market demand.

Over the last year, spruce, for instance, was over-harvested on a national level compared to the potential cut level generated by "HUGIN". This is to say that prices on spruce timber were relatively high and that is why it was recommended cutting more spruce to gain higher revenues.

That's to say that there is a direct influence of market situation on decisions taken to set certain species harvesting levels. Hence, decision-making in Sveaskog's forest management is very flexible and absolutely market-driven. In Russia, it is rigid and driven by Soviet Union tradition – to allow cutting as much as possible.

Thus, often the planned harvest level (AAC) cannot be realized, resulting not only in economic but also ecological problems. Attempts to realize the overestimated AAC often lead to logging of old-growth forests, as the volume of growing stock per hectare is the greatest there.

Another decision-making factor in Sweden is risk. Natural hazards and their influence on forest production as well as economy has led to decision-makers' efforts trying to implement risk management in practical forest management (Hollenstein, 1997).

Sufficient notice is taken of risk factor in Russian forest management planning. Primary purpose of fire management is to prevent forests from fire by initiating different activities: creation of mixed stands that are not prone to fires, severances, etc. But neither wind throw risk management nor fire management implemented strongly affects AAC.

e) Concept of decision

Ultimately, decisions concerning harvest levels are taken at a company/enterprise level in both countries. But the concept of decision itself is perceived in different ways. In Russia, it is rather a rigid procedure of AAC adoption, whereas in Sweden, it is a matter of choice of right management alternative which is in obedience to decision-maker's preferences/goals. In view of this, Swedish decision-maker is given a wide range of possible options generated by decision support system while Russian one is obliged to follow very narrow practical rules.

f) Role of decision-maker in planning process

Looking at the range of advanced software for forestry needs, role of decision-maker in Russia could be questioned. While Swedish decision-maker is involved in planning activities from the very beginning (setting goals) and analyses possible alternatives, generated by decision support system, by looking at it from different prospectives, above all, market demand; commitment of Russian one is confined to undertaking responsibility for choosing right option following the strict rules. In this regard Russian decision-making team might be successfully substituted for computer program.

g) Reconsideration of harvest level decision

No matter what economy will require in the future, AAC cannot be reconsidered during the future 10 years unless catastrophes causing tremendous effects happen. In Sweden FMPP might be run repeatedly giving thus new alternatives of attaining the goal. Possible reasons for rerunning FMPP might be rapidly changing market conditions or goals, natural calamities, etc.

3.3 Drivers behind different forest management planning decisions.

a) Profitability

In Sweden decisions taken in forest management are aimed at achieving goals set by decision-maker in advance. Goals to achieve are in compliance with national forest programme. Goals for both forest production and forest environment carry equal weight at a national level. Under Russian conditions, forest management decisions are totally focused on sustainable forest resource use, even flow timber over time and full inexhaustible utilization of forest resources – all requirements stated by the State.

Operational targets of Swedish forest company "Sveaskog" include, above all, profitability and sustainable development. The market total return requirement for forestry operations is at least 7% (nominal and before tax). The ordinary dividend should in the long-term correspond to at least 50% of profit after tax (www.sveaskog.se).

Profitability of Russian forestry enterprises is very low. This situation is interlinked with timber price list. The price of wood in Russia is extremely low compared to EU countries. As a consequence, low prices cause problems, because they also mean low budgets for introducing sustainable forestry and for forest protection and preservation. In the absence of federal and state funding, local forest service supervisors have to rely entirely on stumpage fees and fines paid by logging companies. Furthermore, for sanitary fellings and thinning there is no stumpage fee at all. This has led to a situation where sanitary fellings and thinning are commonly used as a tool for economic exploitation.

b) Assurance of stable timber supply over time

All economical calculations made by planning models including FMPP use a sort of assumptions about future prices. And this is often based on a long-term timber price trend. Prognoses made on the basis of assumptions are always a risk even if they are based on a long-term trend.

Generally speaking, there is 2% decrease in timber prices yearly. So far, it has been compensated by advanced technologies and high efficiency of harvesting, logging and transportation (and other forestry operations). The trends toward customer-oriented management and just-in-time thinking also require planning process to be more effective (Karlsson, 2002).

In Russia, insufficient notice is taken of timber prices and market needs while making forest management decisions. No future price consideration is observed. Adoption of AAC, can, by hook or by crook, be slightly influenced by market needs. But, by and large, it is not the core of forest management decisions. Far from it. Much greater emphasis is put on silvicultural consideration and biological potential of forests to grow as well as timely utilization of mature forest. AAC should secure stability of timber supply over time regardless of economic situation.

Although profitability of Russian forestry enterprises can be doubted, aim of achieving stable flow of timber is beneficial when it comes to issues of timber supply in the future.

4. Discussion

The aim of the thesis is to explore the difference between forest management planning processes of both countries in terms of decision-making process, drivers behind management decisions and planning levels implemented by analyzing and comparing some levels of planning and usage of information generated by support systems in decision-making.

The classical method of comparative analysis applied in the study is regarded as the most informative one alongside with the fact that it provides broad pictures of planning processes with their similarities as well as advantages and disadvantages. However, with regard to this study, usefulness and applicability of comparative analysis could be questioned to some extent since countries studied differ geographically, culturally and socially, to say nothing of historic development and economic advance. Hence, forest management planning has developed in totally different ways. In Sweden forest management development was urged by the development of country's economy in general and economic thinking in forestry in particular. Whereas in Russia development of forest management was suppressed by planned economy, and since that, management is aimed at maximal production stipulated by biological growth.

Due to foregoing differences two aspects of planning were chosen: levels and decisions. All the results obtained in this paper indicate that there are certain differences between approaches used in both countries and decision-making. Particularly, one may notice that Russian planning practice is a bit overloaded with technical calculations and it is not always easy to compile so much information at a single level. On the other hand, it does not induce discrepancies at all. A striking difference is in decision making – not only is a process of taking decisions various, but also concept of decision itself as well as role of decision-maker in planning make a great difference. Despite that, similarities found during research stage are also entitled to be named by "results" as not only differences make up the outcome of the research.

The question of applicability of Forest Management Planning Package and the whole Swedish planning practice in Russia seems to be both interesting and challenging. For this to take place, as results show, several prerequisites must exist:

- forest management planning should include economic thinking i.e. consider economic situation, timber supply and demand, timber prices and process of pricing, forest markets;

- the foregoing should be enforced by changes in legislative basis of forest management;
- inventories should be carried out using statistical methods;
- introduction of growth models based on computerized simulation is strongly needed;
- forest inventory precision and forest inventory division into districts should be elaborated;
- adequate information about domestic and international forest markets should be freely available.

While forest management planning including the determination of cutting volumes has traditionally been monopolized by the State, the new forest code that is in force since the 1st of January 2007 introduces new rules where right of making management plans is given to licensed bodies including those applying foreign planning techniques. This is, perhaps, the first long-awaited step to introduce market-driven forest management planning in Russia.

Russian specialists formulate the main problems of Russian forest management as follows: Russian forests are largely under-utilized and do not create enough revenues for the state. After 10 years of existence, forest legislation is regarded as out-dated and no longer supporting enough the development of market relations in forestry. Even existing market mechanisms are not fully utilized in timber market and short forest leasing periods hinder new investments (Arkhipov and Lyubimov, 2003; Vasin, 2003). Prevailing administrative structures mix management and business functions which result in inefficient forest management (Petrov, 2004).

Having introduced market economy, Russia still lack appropriate market-driven forest management. Over the last two decades the lack of coherent national policy encompassing the development of forestry and forest industries has been characteristic. The absence of clearly formulated policy has hindered and further complicated the debate and the on-going processes attempting to modernize the Russian forest sector and the drafting of the new Forest Code in particular (Torniainen, 2005).

Due to the lack of market mechanisms, government financing was determined, apart from political connections, by the amount of production factors acquired, rather than by production cost or quality of the output, resulting in inefficient and extravagant use of resources. The lack of a demand factor also contributed to the irrelevant pricing of products. These structures turned out to be largely unviable when Russia laid the foundations for market economy (Sutela, 2003).

The new Forest Code signed by the upper house of Parliament and the President and a unified national forestry policy, with more responsibility given to regional governments, is expected to set up a legislative base for the forestry and provide economic consideration while implementing forest management plans. The adoption of market mechanisms in the allocation of forests is one of the main goals of the new law. The current market situation is conducive to the shift to more economy-oriented forestry.

According to Olsson (2006), domestic demand for the timber has been on the upswing, and foreign demand is also strong, particularly from neighbouring China in the South-East, Central Asia in the South and Finland and Sweden in the North-West – Finland and Sweden together account for the vast majority of shipments to Europe. Baltic states, such as Estonia, have also increased their import levels, however this trend may be temporary as timber prices are on the rise. Demand is strongest for unprocessed timber, although newsprint, pulp and plywood have also found strong markets and sources suggest that demand for other, higher-value segments would probably exist as well.

Inaccessibility of information about the forest markets (both in Russia and abroad) is a legacy from Soviet times when information necessary for running the forest sector was available and of use only to certain actors, primarily those working with economic planning. The problem has both a technical side (how to compile or find existing relevant information and make it accessible to users) and a competence side (how to make actors for whom such information is of use - typically enterprise managers - realize their needs and develop skills to use it) (Olsson, 2006).

In this study particular aspects of planning practice including decision-making are dissected and compared giving an insight into two forest management planning systems. The question of possible use of Forest Management Planning Package in Russia is discussed and policy and legislation issues are looked at from different prospectives.

The objectives of this study set were successfully reached giving, perhaps, even more space for investigation and thus rekindling a desire for future explorations. Several components of planning of these countries have not yet been fully touched upon. Data acquisition methods, data processing methods and their possible improvement as well as new models' performance providing indispensable support data for decision-making are of a great interest for further research.

5. Conclusions

As results of the thesis show, Russian planning practice is somewhat rigid and a bit overloaded with technical calculations and it is not always convenient to compile so much information at a single level.

Market mechanisms proved to be crucial for profitability of forestry in Sweden. Having laid foundations for market economy, Russia still ought to put far more emphasis on developing forest market mechanisms in order to put them into real action. In no way can Forest Management Planning Package be applicable in Russia now.

Instead, assurance of stable timber supply over time is believed to be beneficial in Russia.

A striking difference between the two countries is in decision making – not only is a process of taking decisions various, but also concept of decision itself as well as role of decision-maker in planning make a great difference. Swedish decision-maker is given a wider space for taking an action.

Further research might be very promising as there is always place for perfection especially when it comes to international comparative research.

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