

І. ТЕХНІКА ТА ТЕХНОЛОГІЇ ЛІСОВОГО ГОСПОДАРСТВА

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MODERN FOREST OPERATIONS MANAGEMENT

Forest operations management has changed rapidly during the last 10 years. Information and communication technology (ICT) is widely used in wood procurement management nowadays. Large worldwide operating forest industry companies have developed systems of their own to manage the forest operations, which may vary from country to country. Many of the smaller companies are introducing these systems as well. The necessary condition for the use of these systems is a well developed communication infrastructure of the country.

The basic data of the forests is continuously gathered and monitored through inventories both national, provincial, company and private woodlot owner's levels. The data is available in digital form which allows use of modern GIS/GPS systems. The data is based on satellite and aerial images as well as field surveys, so called multi source data.

Operational harvesting plans are based on this data. Maps and other relevant marked stand's information are shown on the screen of a on-board computer of a harvesting machine. The harvester optimizes the utilization of stems according to bucking-to-order scheme send wirelessly to the machine. Environmental aspects are monitored through on-line follow-up of the location of the machine alarming the operator of the hazards of exceeding the cutting area borders, protection zones etc. Forwarding follows many times immediately after logging, and the location information of the piles is send to the database. The performance record of the machine is stored in the memory automatically

After logging the information is sent to company's district office, which organize the optimal long distance transportation schedules based on this data. The truck fleet can be monitored on-line with GPS and rescheduled easily. There are several vendors for these systems in Finland.

These systems have intensified the use wood procurement resources and cut the costs of operations considerably. Another advantage is that environmental risks of traditional activity, harvesting, can be minimized and thus increase the acceptance of direct commercial use of forests.

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Сучасні системи лісозаготівлі

Системи лісозаготівлі швидко змінились впродовж останніх десяти років. Сьогодні в лісозаготівельному виробництві широко використовуються інформаційні і комунікаційні технології. Великі світові компанії лісової галузі розробили власні методи ведення лісозаготівельної діяльності, які можуть різнитися в різних країнах. Багато малих компаній також впроваджують ці методи. Необхідною умовою використання цих рекомендацій є добре розвинена комунікаційна інфраструктура країни.

Базова інформація про ліси постійно збирається і перевіряється за даними інвентаризацій на національному, локальному, виробничому і приватному рівнях власників лісових масивів. Дані наведені в цифровому форматі, що дає змогу використовувати сучасні інформаційні системи GIS і GPS. Вони базуються на результатах аеро- і супутникових зйомок, а також польових досліджень.

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Сучасні лісозаготівельні процеси організовуються з інформації цифрового формату. Карти та інші дані виводяться на екран бортового комп'ютера заготівельної машини. Оператор оптимізує використання стовбурів відповідно до схеми розпилу на сортименти, переданої машині радіозв'язком. Машина контролює стан довкілля з допомогою онлайнової системи спостереження за місцевістю, сигналізуючи оператору про небезпеку порушення площ вирубування, захисних зон. Транспортування здійснюється відразу ж після лісозаготівлі і інформація про місцезнаходження штабелів надсилається у базу даних. Запис показників продуктивності машини автоматично накопичується в пам'яті комп'ютера. Після заготівлі інформація надсилається у дільничний відділ компанії, який, виходячи з цих даних, розробляє оптимальні графіки транспортування на великі віддалі. Швидкість руху лісотransпортного засобу можна контролювати за GPS в онлайн-режимі. У Фінляндії існує кілька користувачів таких систем.

Ці системи інтенсифікують і значно зменшують витрати на використання технічних засобів лісозаготівлі, а також зводять до мінімуму шкідливий вплив лісозаготівлі на довкілля.

Modern Forest Operations

In modern wood procurement information and communication technology (ICT) plays an essential role. The tools provided by the ICT are geographic information systems (GIS), global positioning systems (GPS), world wide web (WWW), mobile phone or cellular phone networks such as NMT, GSM and UMTS to mention a few.

Activities of woodland division of a forest industry company or an independent wood procurement organization may consist of many tasks that have an effect directly or indirectly on the outcome of the operations and thus need to be taken into consideration when managing these activities.

Wood procurement is basically a logistic process which can be managed with the above mentioned tools. A proper and strong management requires measurement of the efficiency of the organization. This means that planning of activities as well as monitoring is needed on every level of management. Planning can be strategic, tactical or operative.

Management structure can be hierarchic, functional, matrix or team-work type organization. The modern solution seems to be in most cases functional, team work based organization. When dealing with its interest groups different levels of partnership may be applied by the companies. This varies from purely owned operations to complete outsourcing.

In the following forest operations are dealt without the sustaining activities i.e. as wood procurement activity. This restricts public organizations working, say, on afforestation or road construction outside the scope of the presentation.

The wood supply chain forms the framework for the forest operations management. There are basic activities and auxiliary activities. Auxiliary activities are needed to help carry out the actual forest operation more cost efficiently. Such an activity is wood measurement, for instance.

There are basically four independent actors in the wood supply activity. They are forest owners, forest industry, contractors and public authorities as well as organizations of citizens. Typical harvesting is carried out using shortwood or cut-to-length (CTL) systems in the Nordic countries. Of course, similar type of structures can be found in any wood supply systems in different countries.

The forest operations management starts with an annual strategic wood procurement plan based on pre-orders of the mills drawn from market development estimates for products. From that information a tentative wood purchase plan as well as preliminary transportation plan is being developed. These plans allocate the volumes of different assortments needed to the procurement districts and calculate the other resources required to carry out the task. At this stage just a small portion of the stands to be cut is known, most likely only the geographic area where they are supposed to come. This is due to the fact that the raw material needs to be bought from the free timber market in the form of pre-marked stands. Only a small portion comes from companies own forests.

In the countries where the state owns the forests and sell harvesting concessions the approach might be different as regards planning.

As time goes by these plans are revised quarterly to the tactical plans. At this stage the stands have been bought and the information is available. In the sales contract the forest owner and wood buyer agree upon the length of period during which the harvesting must be completed.

In the next step monthly and weekly operative plans are developed including the harvesting and transportation schedules for the stands to be harvested.

Wood purchase

Buying of timber from free market is the most important activity in conditions where the public supply of timber is insignificant. In a team based organization this activity is carried out by a specialist who knows the local conditions very well. In the wood procurement team there is also a substitute who can do the task if the specialist is not available at that moment. The information on the stand characteristics from sales contract is transferred into the information system of the company for further planning activities. The reliability of this information is crucial, because all the following management measures are based on this.

Forest owners' forest management plans are very important source of information for this purpose. However, they are confidential and controlled by the forest owner.

Own forests are a minor source of wood for Nordic companies but world wide this is rather common. However, companies have long term forest management plans for their own forests. These utilize nowadays modern planning tools such as GIS. From this data source the actual harvesting schedules can be defined and executed. Companies tend to use their own forest resource to balance the timber flow. One typical trend today is to outsource the forest property and forestry to separate companies due to the low return on investment expected from traditional forestry. Owing the forests would decrease the return on investment figures of the actual forest industry business.

Planning and management of operations

The raw material flows from the forest to the mills and management information basically to the reverse direction.

Strategic planning is carried out both at company's woodland division and district levels. Tactical planning concerns basically logistics, how to get the raw

material most efficiently to the mills. These plans are made at districts' level except for imported wood which is handled at woodland department level. These plans are up-dated quarterly. Operative plans consist of the actual instructions by whom, how and when the operations must be completed.

Once the company has got the authority to cut the stand owing to sales contract, and the information is passed to the planning system, the operations management i.e. harvesting and transportation plans are prepared. These include the assortment to be made, the destinations for them, schedules of the actions and other necessary plans such as precautions for the environmental risks. These are then adjusted to the other stands' information purchased from the same area to optimize the use of resources available. The plans are then converted to day-to-day instructions for the contractors available for the task.

Monitoring of the operations produces daily and weekly reports of the progress of operations. If something goes wrong, the team can quickly interfere in the situation by smoothly adjusting instructions.

Harvesting of the stands is almost completely mechanized with harvesters and feller-bunchers in company operations in the Nordic countries. To some extent chain saws are used especially in thinnings and special wood logging as well as self-sufficient forest owners' harvesting. Regardless of the level of mechanization, shortwood system is applied.

Off-road transportation is carried out by forwarders, which carry the load to the road side. Skidding is very exceptional operation in the Nordic countries. The companies have outsourced their forest operations to contractors almost to 100 %.

Role of information and ICT

Modern wood procurement relies heavily on quick and reliable transfer of information. Tools are GIS, GPS, mobile phones, text messages and wireless communication. There is a lot of information technology in a modern harvesting machine. They are equipped with an on-board computer that in addition to wood measurement functions also monitors the state of the machine operation itself.

From the operations management point of view the correct wood measurement and cross-cutting instructions are essential. At this point a wrong decision might destroy the value of the timber. This is because a customer oriented approach is used. Bucking instructions for individual trees are defined by the bucking-to-value tables or bucking to order tables from the saw mill or plywood mill using the logs. These tables are transferred to harvesting machines wirelessly almost daily, according to the need of the customer. Because of the variety of assortments and sometimes large need for special wood, a group control system for the management of a fleet of harvesters is developed.

Production and productivity figures can be followed continuously as well as the location of machine through GPS. Once the location of the next harvesting site and the stand characteristics in addition to the assortments to be made are known the contractors work independently. They only report daily to the team's office the state of the work and the finishing of the site. This information is used to define the transportation readiness of the assortments. Coordinates of the piles are also available for the route optimization routines of transport scheduling programs.

A well functioning mobile communication network is a must for efficient data transfer between the harvesting equipment and supervision of the work.

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ОРГАНИЗАЦИЯ КОМПЛЕКСНЫХ ЛЕСНЫХ ПРЕДПРИЯТИЙ МНОГОЦЕЛЕВОГО НАЗНАЧЕНИЯ

Проведен анализ воспроизводства лесных ресурсов и использования древесины в России. Раскрыты научные основы организации комплексных лесных предприятий и критических технологий переработки и воспроизводства лесных ресурсов. Предложено разработанные основные концепции комплексных критических технологий по переработке и воспроизводству лесных ресурсов.

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Organization of complex forest enterprise of multi-target value

The analysis of reproduction of forest resources and use of wood in Russia is conducted. Scientific bases of organization of complex forest enterprises and critical technologies of processing and reproduction of forest resources are exposed. The developed basic conceptions of complex critical technologies are offered on processing and reproduction of forest resources.

По состоянию на 1959 год в СССР было сосредоточено больше трети мировых запасов древесины, в том числе 66 % хвойных пород. Насчитывалось свыше 50 млрд. спелой и перестойной древесины, из них 80 % сосредоточено в Сибири и на Дальнем Востоке. В промышленно развитых районах Центра, Юга и Запада России спелые и перестойные древостои занимали лишь 2,4 %.

Ежегодный прирост древесины (годовая лесосека) в эксплуатационной части лесопокрытой площади, принадлежащей только России, в 60-е годы достигла 700 млн. м³ в год, а объемы вырубок леса в те времена достигли максимума и составили по СССР 393,2 млн. м³, в том числе по России 353,2 млн. м³, т.е. 88 %. Остальные 12 % леса рубались в республиках СССР: Украина – 5...6 %, Белоруссия – меньше 3 %, остальные 4 % рубались в оставшихся 12-ти республиках СССР.