XV WORLD FORESTRY CONGRESS
Building a Green, Healthy and Resilient Future with Forests
2–6 May 2022 | Coex, Seoul, Republic of Korea

New Forestry System

How to Meet Diverse Needs for Woody Material

Sadayama Tsuyoshi[1], Matsumoto Hiroko[2]

[1] *mountain nView, at 2092 Tagaito, Nachi Katsuura-cho, Higashi Muro-gun, Wakayama 649-5462, Japan, mountain.view@zb.ztv.ne.jp*
[2] *mountain View Tokyo office, at 5-24-11 Miyamae, Suginami Ward, Tokyo 168-0081, Japan, matsumoto@nichie.tokyo*

Abstract

• MountainView developed a method of performing Ring Thinning Selective Cutting (Dry Stock System)

• Dry target trees in mountain forest in a standing state to reduce their weights, and supply to recycle lumbers which are taken out through the selective cutting

• Technology to make a ring-shaped cut in a sapwood vessel part by a chainsaw applied with special processing, and to block moisture passing through the vessel by the cutting

• Realize shortening of drying time over the entire process, and enable a short-term training of new entrants

• Reduce transferring cost by cutting fuel cost and reducing weight, and realize improvement in safety

• Keep the remaining standing trees growing, and achieve the continuous increase in the asset value of forest holders

• Promote development of forestry and woody-biomass heat source power generation into a growth industry

• Contribute to decarbonization and a low-carbon society, secure power in the event of disasters, and secure "Society 5.0" based power

• Build a future forestry image of a distributed energy system having an adjustment function of Society 5.0

Keywords: [Biomass; Dry stock system; Energy System; Employment Creation; Sastinable forest manegment]

Introduction, scope and main objectives

In recent years, the backgrounds of utilization of woody material have been diverse and its value has been gathering attention. Particularly, in terms of the relation with the environmental conservation and the Sustainable Development Goals (SDGs), developments in the renewable energy like power generation heat source using wood chips etc., new construction material, such as CLT (Cross Laminated Timber) plywood, and biodegradable material, such as CNF (Cellulose NanoFiber) and PEG (PolyEthylene Glycol) modified lignin, have been progressed and are currently in the implementation stage, as well as cutting of greenhouse gas, securing of biodiversity, a groundwater recharger, a disaster prevention function, and comfortable environment conservation.

Regarding to this situation, there is no doubt that the research and development will be further promoted and implemented in the future.

Therefore, this study proposes a management method and concept of woody material supply in the new forestry system in consideration of the environmental conservation (prevention of forest destruction), the sustainability (appropriate and rational management practices), the stable supply (using a digital technology to allow access to a growth amount and quantitative management), the improvement in safety (risk reduction by [Ring Thinning Method]), and the cost reduction (initial drying of standing trees in mountain forest to reduce the process [Dry Stock System]).

Methodology/approach

Methodology for Ring Thinning Method and Dry Stock System will be introduced, which can achieve a drying process which is essential generally for the use of woody material, the reduction of transferring processes which influences the cost reduction, and a short-term human resource training while securing safety.

Ring Thinning is a practice method to cut a sapwood vessel part of a standing tree by a chainsaw bar (see Fig. 1) applied with special processing (attached with a ring stopper having a kickback prevention function and an excess-cutting prevention function), and block the flow of moisture nutrients to reduce the moisture content of the standing tree and its weight.

This method is named as "Ring Thinning" since the processed standing tree has a ring-shaped processed mark (see Image 1).

Ring Thinning using the ring-stopper chainsaw is developed for the purpose of largely shortening the training period of engineers engaged in the traditional thinning practices, increasing the safety, and greatly increasing the amount of thinning.

A system which reflects the effects of the practices to the neighboring areas and matches it to the economic effects by using a digital management method is "Dry Stock System."

Fig. 1

Image 1

Image 2

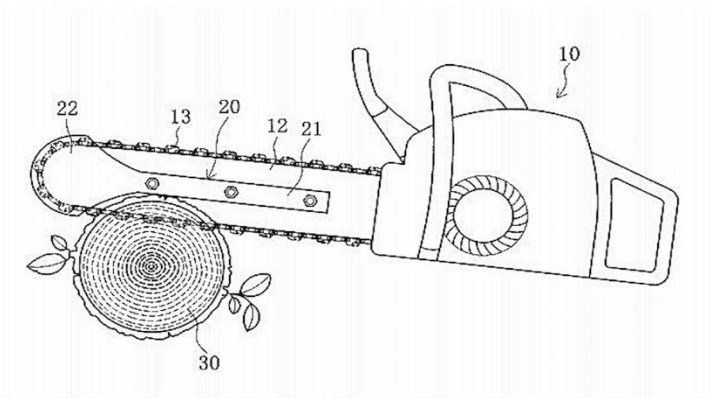
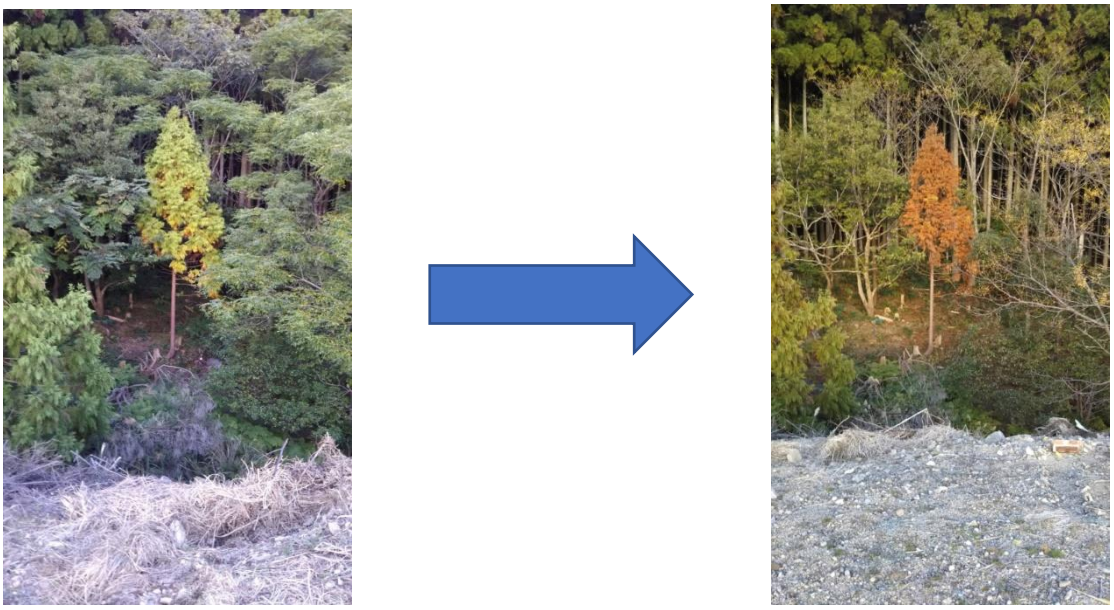


Fig. 1: [Image/figure caption with a description, and source if it has been published in another publication]

source

Fig. 1: [Image/figure caption with a description, and source if it has been published in another publication]



Results

The processed tree is confirmed to have changed in leaf color due to the drying to wither, and then, the drying and thus reduction in weight of the standing tree progress gradually. Processes required thereafter can be omitted and reduced.

This method is different from the conventional cutting-down practices in that the required time is shortened by cutting only around the target tree, and clash risk due to the felling is reduced.

Dry Stock System is a system which is crucial for the 3D digital management of the target tree in the mountain forest (see Image 2) to which Ring Thinning was performed and its initial drying has been progressed, in order to quantitatively grasp the state of the tree and decide the use depending on the application.

The target tree which has been initially dried by Ring Thinning is turned into data together with fixed data (e.g., the tree species and the volume) and the practice record by Dry Stock System, and it is utilized by being matched with woody material needs data.

By drying the practice target tree in standing, this technique can also realize: the prevention by natural disturbance; outflow of the processed tree to the river; the protective effect of mountain surfaces; a significant reduction in cost required for the transfer to a drying site upon the conventional drying processing, the management and the labor for the transfer; and the improvement in safety by the weight reduction.

The point to be emphasized is that Dry Stock System is a management technique by which the future tree management including dominant trees and suppressed trees are determined digitally, and the growth of remaining trees is facilitated and an increase in the accumulated resource is continued by the forest utilization through the selective-cutting while avoiding facile clear-cutting as much as possible.

The consumption rate of renewable resources must not exceed its reproduction rate. (Herman Edward Daly, 2005)

The most beautiful forest is also the most fruitful forest. (Alfred Moller, 1922)

The appropriate, rational, and sustainable conservation management practices in the forest area will enhance the power supply function of the local areas, form the new normal DX society under the COVIT-19 pandemic as well as the sustainable economic environment, and significantly contribute to the conservation of the forest area, as a result, to the conservation of the global environment.

At each point of road facilities which are linked in the mountain forest, a small-scale biomass power generation facility is installed together with a parking facility, and establishment of VPP (Virtual Power Plant) is achieved by constructing a network, and then, the energy infrastructure combined with the energy of the solar power plant and the wind power plant set up near the facility is accomplished.

Structuring the energy infrastructure by utilizing other renewable energy while adjusting and cyclically utilizing the biomass resources which are accumulated and grown in the forest, plays an important role in supplying power for structuring the DX society environment, Society 5.0.

Discussion

In consideration of the future multi-faceted application of woody material, the demand for the forest management system considering the forest conservation, the de-oxidized society, and the sustainable resource asset value is inevitable.

Particularly, needless to say, in addition to "Carbon Keep" (rational and appropriate practice management in the forest) and "Carbon Lock" (utilization of diverse construction material and biodegradable material), utilization of biomass heat source power generation as the renewable energy which is controllable and adjustable, increases in its importance.

With the entrance into the DX society, the securing of local servers and local emergency power energy in the event of disasters is essential.

In the forest practice management and material utilization of the new forestry system, what's notable is that, as for the electric energy (e.g., a sensor, a server, and a communication system) which will continue to increase, in addition to the utilization of the solar and wind power, the biomass power generation having the adjustment function will play a large role in maintaining the stable DX society environment.

This role of adjusting the system will be taken by a small-scale biomass power generation microgrid network system.

Conclusions/ wider implications of findings

Therefore, the DX society and IT related investments will flow to the ESG investment and SDGs related areas (e.g., management and procurement of forest material asset for securing energy) as well as to the investment for the infrastructure improvement, and thus, contributes to the economic capital of the forest area.

It is strongly believed that, utilizing and managing of this investment for the cyclically usable forest material in the regional development, and the forest maintenance management material procurement method, Ring Thinning and Dry Stock System, will realize the sustainable low-carbon society development agenda, and also, the sustainable and rational forestry management concept together with the regional development and the nature conservation management which go with the times, while the decarbonized society, the forest conservation, and the increase in the forest asset value are achieved.

For the future concept of forest, the adjustment function of regional energy is newly added to the forestry management, and it plays a role of a part of the energy infrastructure base of the new DX society, Society 5.0.

Accompanying with this, mechanization and digital transforming including the transfer and transport using a drone etc., are developing and progressing widely also in the forestry with the times.

In addition to the traditional concept of forest, the importance and the convenience of the forest material utilization, as well as its potential for the regional development are strongly believed.

Local areas and developing areas account for a large proportion of areas where forest exists.

In such areas, when economic activities (e.g., energy infrastructure, material supply, and processing) take place combined with the sustainable forest practices, the world forestry is activated and informatized, which significantly contributes to the formation of the decarbonized global environment.

Acknowledgements

We would like to express our sincere gratitude to the late Mr. KUBO, Itsurou, the leader of the forest owners' co-operative association of Nachi Katsuura-cho, Wakayama, for enlightening us of a philosophy of forest and mountain creation, and the late Mr. IWAMOTO, Kashirou, Kihara Zourin Corporation, for providing us with on-site and practical experience for the study and demonstration.

References

Yamada Tatsuhiko, Lignin Network, Center for Advanced Materials, Forestry and Forest Products Research Institute, Forest Research and Management Organization, National Research and Development Agency

Dr. Oskar Bartenstein, CHP biomass power generation system, Spanner Inc.