



THE PERFECT CUT

CTL
THE CUT-TO-LENGTH METHOD

CTL IN A NUTSHELL

The popularity of the cut-to-length (CTL) method of harvesting is booming. Today, two thirds of the world's mechanized industrial timber harvesting is done by CTL machinery. Nearly all new timber harvesting projects and tree plantations throughout the world are based on CTL solutions.

In the CTL method, timber is processed in the forest according to its intended use. The first unit in this two-machine operation is the agile CTL harvester that fells, delimits, measures, optimizes and bucks the trunks into graded logs ordered by the client. The harvester is followed by a forwarder that transports each timber grade to its pile on the roadside. From the roadside, each timber grade is transported directly to its destination: logs to sawmills and pulpwood to pulp mills.

The automation system of an advanced CTL harvester maximizes yield and minimizes waste. These diverse machines are at home in challenging conditions and excel in all harvesting needs – regardless of the weather, season, or terrain.

Unlike other mechanized timber harvesting methods, CTL enables responsible and high-quality forest management through selective thinning.

50 YEARS OF CTL SUCCESS

At Ponsse, we've worked together with our customers for the past 50 years developing the world's best forest machinery. The world's best forest machine – and the services that support it – is not only the most powerful, versatile and reliable option. It is a robust combination that enables sustainable forest management around the world.

Since our foundation in 1970, we've been guided by our respect for the environment and an ongoing strive towards sustainable development. That is why, for the past fifty years, we've dedicated ourselves exclusively to the manufacture, sale, service and development of efficient and environmentally friendly cut-to-length machines.

With this guide we wish to give you a better understanding of sustainable, high-quality CTL harvesting. After you finish reading the guide, you will see why we have trusted this method for half a century – and why we believe it is the technology of the future.



Juho Nummela, President and CEO, Ponsse Plc

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PONSSE

EFFICIENT AND RELIABLE

The rapidly growing CTL, cut-to-length method, has established its position as the global market leader in industrial timber harvesting. The key to the method's success lies in machinery that is efficient, adaptable, environmentally friendly, and provides superior comfort for the user.

WORLD LEADER

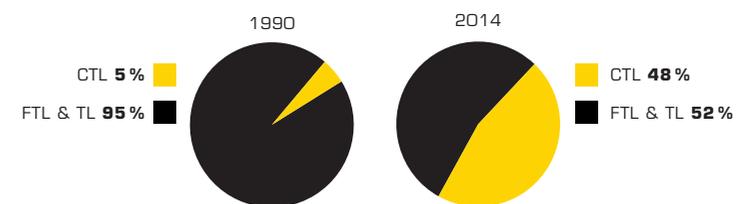
The CTL method is known as the Nordic harvesting method. Now, the method is rapidly growing in popularity around the world.

Only two decades ago, CTL was still fairly unknown in many parts of the world. In recent years, this efficient and sustainable method has risen to the top and is now the global market leader in industrial timber harvesting.

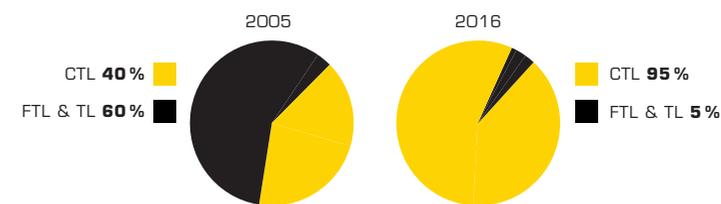
Today, two thirds of the world's mechanized industrial timber harvesting is done by CTL machinery. Within the EU, the CTL method is used for over 70 percent of both mechanized and manual timber harvesting.

Nearly all new timber harvesting projects around the world are now based on CTL solutions.

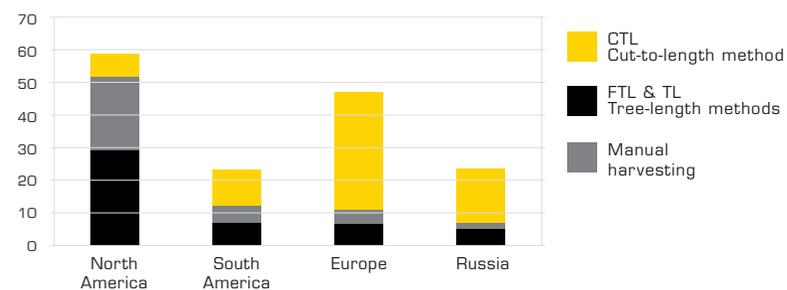
POPULARITY OF THE CTL METHOD IN CANADA, 1990-2014



CTL FOREST MACHINERY IMPORTS TO RUSSIA, 2005-2016



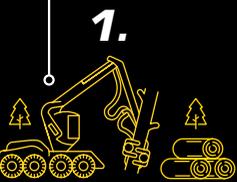
GLOBAL SHARE OF CTL HARVESTING, 2018



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CUT THE FUSS. GROW STEADILY.

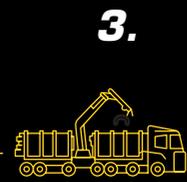
By communicating with the client, the harvester can separate all the required timber grades in one go during felling.



1.
The harvester fells the trunk and processes it into timber grades.



2.
The forwarder transports each timber grade to its pile on the roadside.



3.
A logging truck transports the timber grades to their relevant processing plants.



READY FOR USE

In the CTL method, timber is bucked into graded logs in the forest according to their intended use. This allows a high value yield and an efficient logistical chain.

Timber grades refer to the different types of logs bucked from one felled trunk. These can include saw logs, veneer logs, small-dimension logs, pulpwood, and wood for producing bioenergy. The harvester separates all the required grades in one go during felling. The bucking is based on the true needs of the end client. The measuring instruments in a modern harvester guarantee that the cutting is precise, and the valuable raw material is used as efficiently as possible.

In the CTL method, the machine team consists of two units: a harvester and a forwarder. The harvester fells, delimits, measures, optimizes and bucks the trunks into timber grades ordered by the client.

The forwarder transports each timber grade to its pile on the roadside. A logging truck then transports the logs to their relevant processing plants.

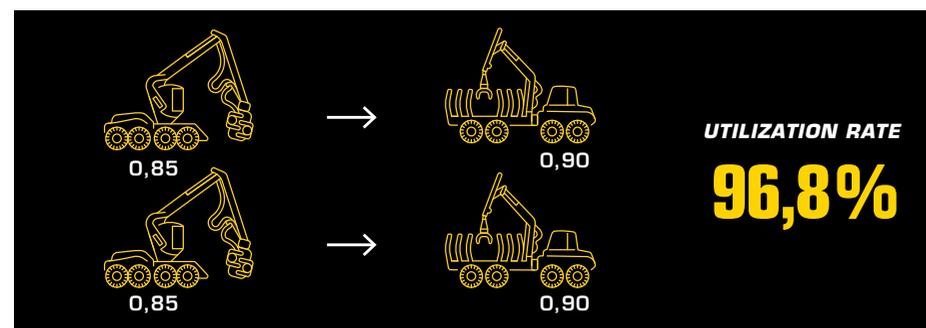
PROCESSING WHOLE TRUNKS

Where the CTL method is not yet used for mechanized timber harvesting, the tree-length method is the prevalent harvesting system. In the tree-length method, the machine team consists of at least four units. First, a feller-buncher fells and bunches the trunks. A skidder then pulls the felled trunks to a roadside landing. At the landing, there are typically one or two processors to buck the trunk into one or two timber grades for transportation. There might also be a delimeter, which removes the limbs from the trunk to prepare it for transportation. Trunks that are too long are cut to the desired length by a slasher. A separate loader is often needed to load the trunks.

In the tree-length method, the skidder pulls whole trees to the roadside landing. After the trunks have been processed, the landing will have an accumulation of limbs and tops which have to be collected and used for bioenergy or burned on site. The limbs and tops around the landing create a major forest fire risk.

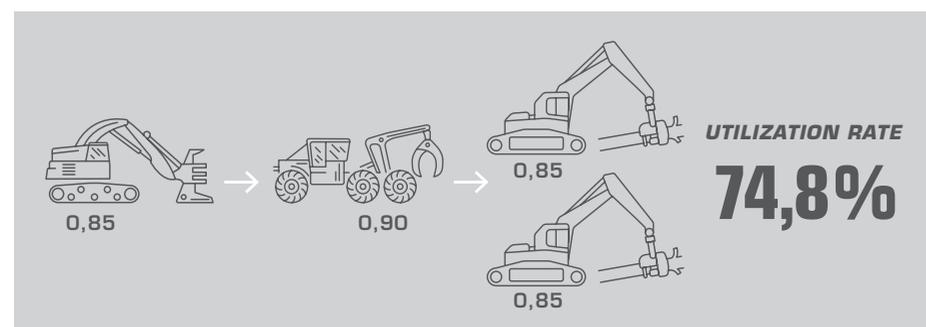
In the CTL method, limbs and tops are left on the forest floor to provide nutrients for the next generation of trees. The tree-length method removes this valuable source of nutrients or, in the worst-case scenario, burns it into ashes.

CTL EQUALS RELIABILITY

**CUT THE FUSS.
GROW STEADILY.****WITH CTL, STANDSTILLS ARE RARE**

The productivity of two CTL teams is equal to that of one tree-length method team.

If one of the harvesters stops, the other team can still continue to operate.

THE TREE-LENGTH METHOD IS NOT AS RELIABLE

In the tree-length method, timber harvesting is efficient but risky.

If the feller-buncher stops, the entire operation grinds to a halt.

PRACTICAL AND BALANCED

The CTL method allows for more even and reliable harvesting operations. The fewer machines are involved, the easier it is to coordinate them into a seamless team. Moreover, when the productivity rates between the different machines are in balance, the productivity of the whole operation is higher.

The technical utilization rate of two CTL teams is higher than that of a corresponding tree-length team.

The total productivity of two CTL method teams, each consisting of a harvester and a forwarder, is equal to that of one tree-length method team. The reliability of the CTL harvesting method is increased even more by using several machine teams. Unlike in the tree-length method, an interruption in one of the CTL machines does not bring the entire harvesting operation into a halt. If one of the CTL harvesters stops, the other team can still continue to operate.

In the tree-length method, an interruption in the feller-buncher freezes the entire operation. Problems with the skidder stop one or two processors, which can cause a dramatic drop in yearly productivity.

WORKING ALL YEAR ROUND

CTL machinery is designed to be multifunctional: the same machines can be used for different types of harvesting, from first thinning to regeneration felling. Due to the versatile nature of the machinery in the CTL method, the prevailing harvesting conditions have a significantly smaller impact on productivity. From steep slopes to soft ground – CTL machines work reliably and efficiently.

The CTL forwarder retains its high productivity even at long distances. This ensures high total productivity even when the transportation distance in the forest is long.

Compared to the tree-length method, the machine team in the CTL method is easier to manage. This improves reliability and results in significantly better operative efficiency throughout the year.

The technical utilization rate of two CTL teams is higher than that of a corresponding tree-length team.

CTL EQUALS EFFICIENCY

**CUT THE EXTRA STEPS.
GROW PRODUCTIVELY.**

EFFICIENT AND RELIABLE

ALL IN ONE

The CTL method eliminates overlap and unnecessary steps in the timber harvesting and processing chain. The method was developed to make the most of the valuable raw material, to cut down the costs of harvesting, and to ensure even and high harvesting productivity throughout the year.

In the CTL method, trunks are automatically marked for optimal bucking before the first log is cut. By minimizing the trunk processing stages, the two-machine CTL team can perform tasks that require three to four different machines in the tree-length method.

The modern harvester receives details of the required timber grades automatically and in real time from the client. This is why the harvester always produces precise and high-quality timber. The trunk is optimally used and there is little waste. The harvester processes the trunk into graded logs in the forest – right at the stump.

The CTL method leaves the nutrient-rich leaves, needles, limbs, and tops in the forest. When delimiting and bucking are done at a roadside landing, the landing area has to be bigger and the areas require cleaning up after trunks have been processed.

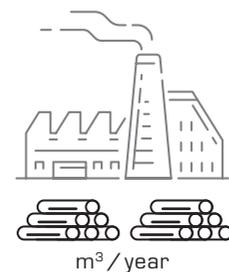
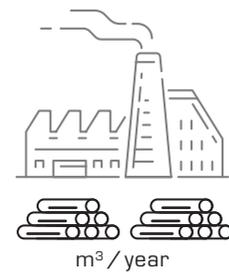
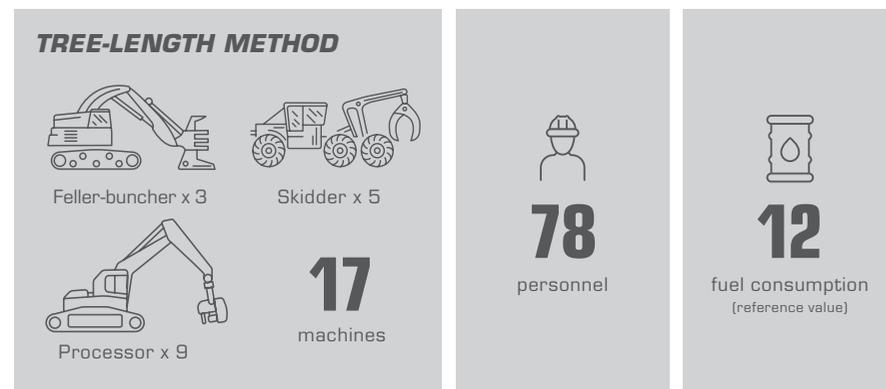
The modern harvester receives details of the required timber grades automatically and in real time from the client. This is why the harvester always produces precise and high-quality timber.

As it measures the first log, the harvester marks the whole trunk for optimal bucking.

CTL EQUALS EFFICIENCY

**CUT THE EXTRA STEPS.
GROW PRODUCTIVELY.**

**COMPARED TO THE TREE-LENGTH METHOD,
CTL HARVESTING IS MORE COST-EFFECTIVE**



FROM FOREST TO ROADSIDE TO MILL

The cost advantages of the CTL method are not limited to more efficient timber harvesting and processing. Further savings are achieved when timber moves from the roadside to the mill – through logistics, product quality, and optimal use of storage areas.

The CTL machine team is cost-effective because it only needs two productive and efficient machines to process the trunks. Less fuel is required for every harvested cubic meter than in the four-machine tree-length method.

In the CTL method, the sturdiest logs are transported directly from the roadside to the sawmill, veneer logs to the veneer mill, pulpwood to the paper or pulp mill, and material suitable for bioenergy to the energy plant.

In the tree-length method, trunks are usually first transported to a sawmill or intermediate storage location. At the sawmill, the trunks are unloaded and bucked for sawing. The logs are processed into various grades that are again loaded for transportation to the relevant mills and plants. The timber goes through several processing cycles, each resulting in more costs.

When logs are transported directly from the forest to their final destinations, without requiring any intermediate storage or being transported back and forth, you save both fuel and time.

In the CTL-method, further savings are achieved when timber moves from the roadside to the mill – through logistics, product quality, and optimal use of storage areas.

1. By communicating with the client, the CTL harvester estimates the quantity and the quality of the trunks needed to fill the client's order.

2. The harvester calculates the optimal way to buck each trunk into logs. Through careful and deliberate processing, the harvester uses as much of the valuable raw material as possible.

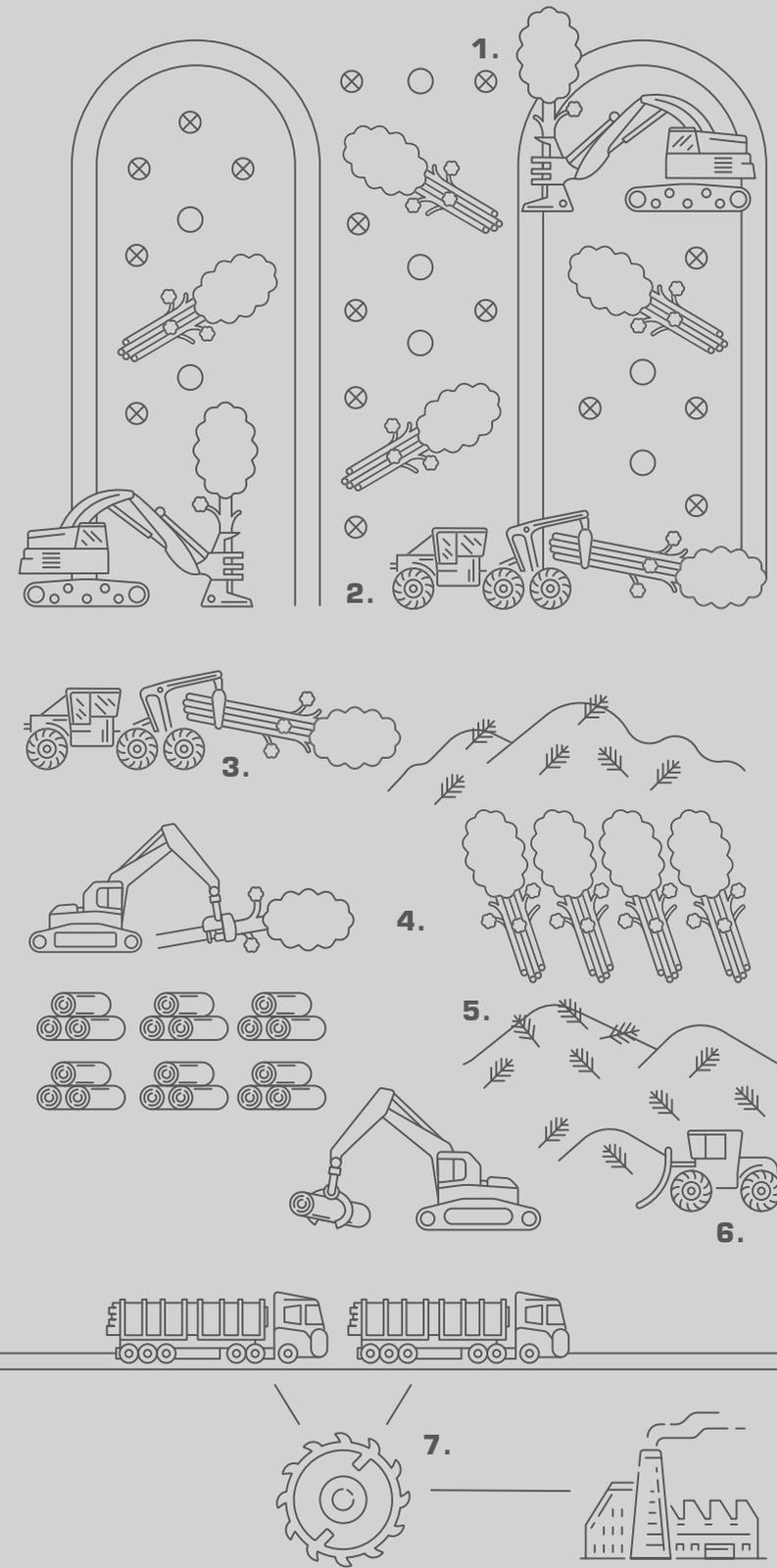
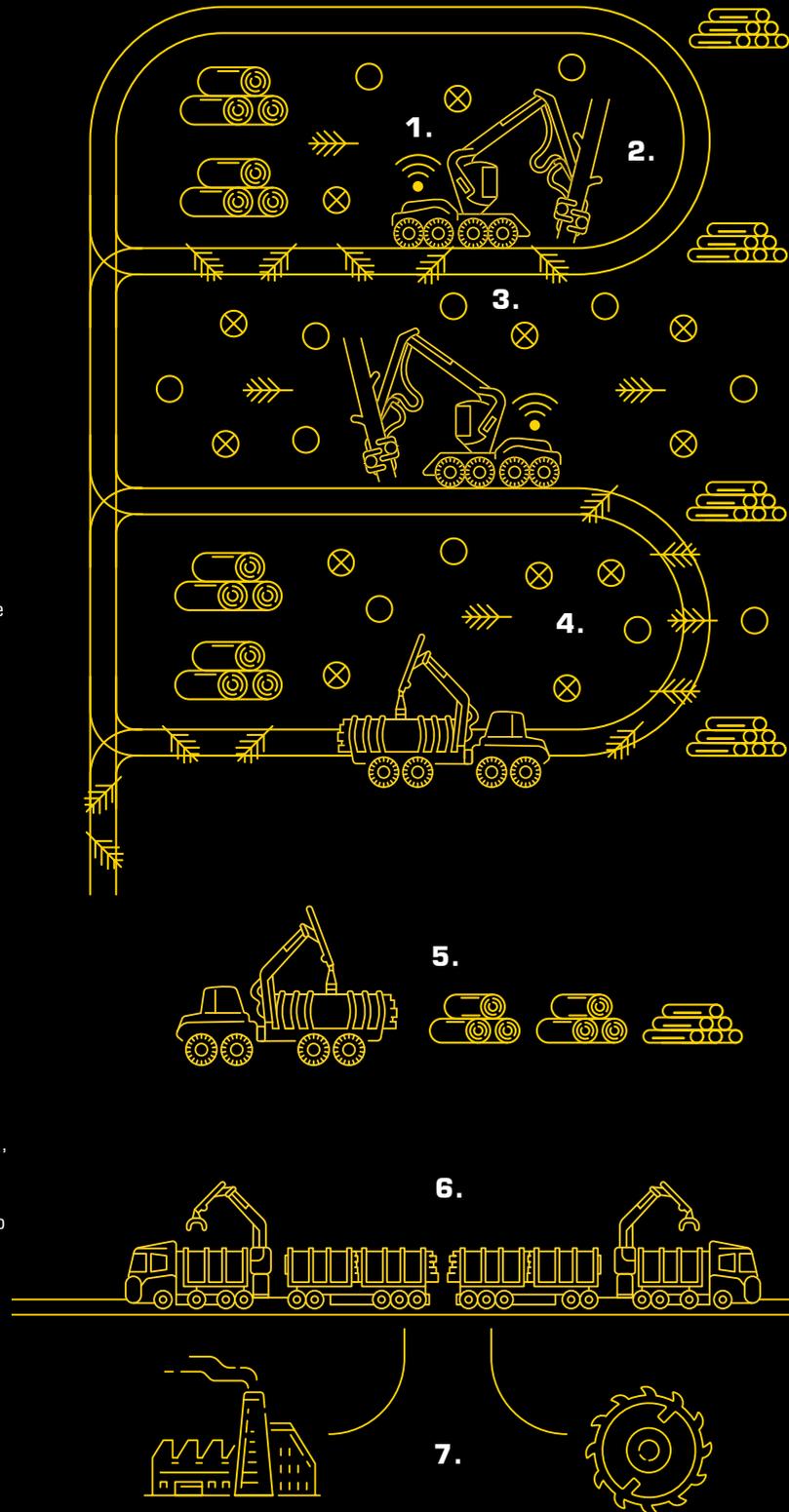
3. As it moves in the forest, the harvester covers its trail with delimited branches and tops. This decreases surface pressure and reduces soil damage.

4. The CTL method leaves the nutrient-rich leaves, needles, limbs, and tops in the forest for the next generation of trees to use. Part of this slash can also be gathered for bioenergy use.

5. The forwarder transports each timber grade to its pile on the roadside. The two-part CTL machine team is consistent, fuel-efficient and easier to manage.

6. Each timber grade is transported directly to its destination: logs to sawmills, veneer logs to the veneer mill and pulpwood to the paper or pulp mill.

7. In the CTL method, logs destined, for example, for a sawmill, can be sorted in delivery batches. At the sawmill, the logs are sorted by diameter and grade, which enables the batch to be processed by greater line speed and shorter distance between two logs on the sawmill line.



1. The feller-buncher fells each trunk with a circular saw, which often causes splits in the valuable first log. The method also damages around five centimeters (two inches) of wood fiber around the cutting point.

2. The skidder pulls the felled trees to the roadside landing, dragging them across the forest floor. This damages the soil and diminishes the quality of the raw material.

3. The skidder's back-and-forth movement compacts the soil and increases the risk of erosion.

4. The tree-length method requires a large roadside landing, where the processor delimits and bucks the trunks.

5. The limbs and tops around the landing create a major forest fire risk.

6. After the trunks are processed, the landing area needs to be cleared. Often, this is done through burning, which releases a significant amount of carbon-dioxide into the atmosphere.

7. In the tree-length method, trunks are first transported to a sawmill where they are unloaded and bucked for sawing. The timber used in, for example, bioenergy or pulp production, needs to be loaded again and moved to its correct destination.



CTL IN CONIFEROUS FORESTS

The CTL method optimizes each tree trunk to meet the needs of the end client. The client, usually a mill, sends specifications of its raw material needs detailing grade, length, and quality requirements.

CUT TO ORDER

The CTL harvester optimizes each trunk based on the specifications in the client's order and bucks the trunk into these predetermined lengths. This allows you to get more out of the material both in terms of quality and quantity.

The CTL method allows for even the smallest piece of special wood to be extracted and transported to a mill in a cost-effective way. Special wood includes certain log qualities, veneer logs and poles, for example.

CAREFUL CUTTING REDUCES WASTE

The way a trunk is bucked affects the quality of the final product. The CTL harvester's thin chain cuts each trunk precisely, with minimal damage to the tree.

In the tree-length method, the trunk is cut by a circular saw. This, together with handling several trees simultaneously, causes splits in the valuable first log. Split first logs are a considerable quality issue in the sawmill industry. The bucking method used in tree-length harvesting also destroys around five centimeters (two inches) of wood fiber around the cutting point. This means that valuable material is lost with every cut.

The technically advanced CTL harvester minimizes damage to the trunk. A CTL harvester calculates the best cutting point and uses as much of the raw material as possible. The careful and deliberate handling of the trunk reduces the number of splits in first logs.

As it moves in the forest, the CTL harvester covers its trail with delimbed branches and tops. This decreases surface pressure and reduces soil damage. At best, the cover can be up to a meter (three feet) thick.

CTL PRODUCES VALUE

CUT MISTAKES. GROW WITH QUALITY.

PRECISE PRICE ESTIMATE FOR EACH TRUNK

In the blink of an eye, the harvester's automation system optimizes each trunk so that its processing value is as high as possible.

THE RIGHT DESTINATION FOR EACH LOG

When the required timber grades have been calculated, the logs are cut and placed directly onto their correct piles. The harvester records the location of each pile and the number and volume of logs in each pile automatically.

The CTL method allows the logs to be sorted in delivery batches based on timber grade. At the sawmill, the logs are sorted by diameter and grade, which enables the batch to be processed by greater line speed and shorter distance between two logs on the sawmill line. Again, you save time, money, and nerves!

1cm / 1/2"

The harvester measures the base of each trunk and compares the results with species-specific averages as well as other trunks previously felled in the forest. Based on these comparisons, the harvester forms an accurate prognosis of the length and diameter of the trunk – in one-centimeter (less than half an inch!) intervals throughout the length of the tree.

THE QUALITY OF THE TIMBER AND DIMENSIONS OF THE TRUNK

The harvester calculates the value of each tree individually. The advanced measuring instrument provides an accurate prediction of the trunk's form and diameter throughout the entire trunk.

THE BEST WAY TO BUCK THE TRUNK INTO LOGS

Based on the requirements and measurements taken from the trunks, the harvester calculates the quantity and value of timber available from each trunk. Simultaneously, the harvester determines the best possible way to buck the trunks, so that the end user's individual timber needs are fulfilled.

CTL ENABLES SELECTIVE THINNING

**CUT THE MESS.
GROW WITH PRECISION.**

WELL-MANAGED GROWS BETTER

The quality of trees and the rate at which they grow have a significant impact on the profitability of forest management. Well-timed and well-executed thinning can improve both the growing rate and quality.

Well-timed thinning encourages diameter growth. When thinning is carried out in line with good forestry practices, it reduces root competition and improves the availability of nutrients and water.

The increase in light strengthens needles and leaves. The 'green gold' of a well-managed forest grows faster and better.

MANAGE YOUR FORESTS, MANAGE YOUR RISKS

Because the CTL method processes each tree individually, the operator can apply a variety of thinning models in a flexible way. The crane of an agile CTL harvester can reach up to 11 meters (36 feet). Thanks to the high-reaching crane and a compact harvester head, CTL machines can perform selective thinning.

Selective thinning means that an overgrown forest is thinned so that the best trees are left to grow in line with forest management recommendations. This will increase the value of the forest, and later thinning or regeneration felling will produce better quality timber.

When thinning is carried out correctly, it prevents trees from growing thin and helps to keep their tops big and healthy. A healthy forest significantly reduces the risk of damage from snow, storms, insects, and fire. In practice, selective thinning cannot be carried out within the tree-length method.

SUSTAINABLE CONTINUOUS COVER FORESTRY – MADE POSSIBLE BY CTL

So-called continuous cover forestry is possible when using the flexible CTL harvesting method. In continuous cover forestry, trees in a forest are constantly being felled but the entire forest is never cleared all at once. The objective is for as many of the harvested trees as possible to produce sturdy and valuable logs.

MORE VALUE

In traditional forest management, northern forests are usually thinned twice during their 80-year growth cycle. During the first thinning, the trees are around 30–40 years old, and the final product is often only pulpwood or energy wood.

In continuous cover forestry, timber is harvested more frequently, in around 15–20-year cycles. The aim is to harvest both log size and thinning size trunks.

SUITABLE FOR WELL-REGENERATING FORESTS

Continuous cover forestry is suitable for forests with healthy and high-quality trees and where regeneration is easy and reliable. Planting is not part of continuous cover forestry. The absorption of carbon by trees and the soil is maximized.

A continuous cover forest is never clear-felled, which means that strip roads for the harvesting machinery must be cleared. In a continuous cover forest, a team comprising an agile CTL harvester and a forwarder is the only way to get mechanized harvesting done.

***The 'green gold'
of a well-managed forest
grows faster and better.***

**CUT HAZARDS.
GROW WITH CARE.**

90%

In recent years, mechanized CTL harvesting has become more common in steep slopes.

It is estimated that over 90 percent of all manual harvesting done by cable yarding on slopes could be efficiently and safely replaced by a mechanized CTL alternative.

Winch-assisted CTL machines can even harvest on slopes that are difficult to walk on.



AGILE CTL MACHINERY COPES WITH SLOPE

CTL machinery has low surface pressure and it is balanced in an optimal way. This makes the machines particularly well-suited to challenging harvesting conditions such as soft peat slopes.

The steeper the slope, the safer, more efficient, and more environmentally friendly option CTL is compared to the tree-length alternative.

When working on slopes, the greatest challenge for the tree-length method is the uneven terrain on which the felled trees have to be transported in the forest. First, the felled trees must be moved from the slope to a more even terrain so that a skidder can transport them to the next stage. In practice, this is done with a shovel logger which follows the feller-buncher and moves one or two logs at a time for the skidder to reach. Cable yarder solutions are sometimes needed to transport trees on extremely steep slopes.

POWERFUL AND SAFE

Handling heavy loads smoothly on steep slopes requires a powerful forwarder and a crane pillar with a big tilt angle. An agile CTL machine team handles steep slope harvesting with no problems. The compact and cost-effective two-machine team is enough to get the job done.

When working on extremely steep slopes, CTL machines can be equipped with specially designed winches which improve safety and help prevent soil damage significantly.

EFFICIENT, SAFE, AND MECHANIZED

Manual harvesting methods have traditionally been preferred for steep slope harvesting. Manual slope harvesting uses various winch and cable line systems as aids.

Compared to mechanized harvesting, manual forestry is extremely strenuous and dangerous. In some countries, nearly three percent of loggers are injured or killed each year while carrying out manual forestry.

In Finland, nearly all timber harvesting is mechanized. The forest industry has, on average, one casualty in a decade.



CTL IN TREE PLANTATIONS

The CTL machine team is flexible, which means that the size of the stand or transportation distance does not affect the productivity of the entire team as strongly as they would in the tree-length method.

STRAIGHTFORWARD CTL: SECURING UPTIME

When work is well planned, a CTL machine team drives down costs on all fronts.

The simple and efficient CTL method gains a significant cost advantage from the good compatibility of the machinery: the harvester's work rate goes seamlessly together with that of the forwarder. While the harvester advances felling, delimiting, optimizing and bucking trees, the forwarder transports the various timber grades to the roadside.

The productivity of the entire CTL team remains balanced and high even when harvesting conditions change and so the valuable raw material is always delivered quickly and cost-effectively to the processing plant. With CTL, you burn less fuel and work more efficiently.

ONE SKIDDER - OR MORE?

Conditions are ideal for the tree-length method when the transportation distance in the forest is short, the soil is dry and terrain even. These conditions allow the heavy feller-buncher to move efficiently around a tree plantation felling six or seven trees in one go. A skidder then picks up the bunch of trunks created by the feller-buncher and transports them to the roadside landing.

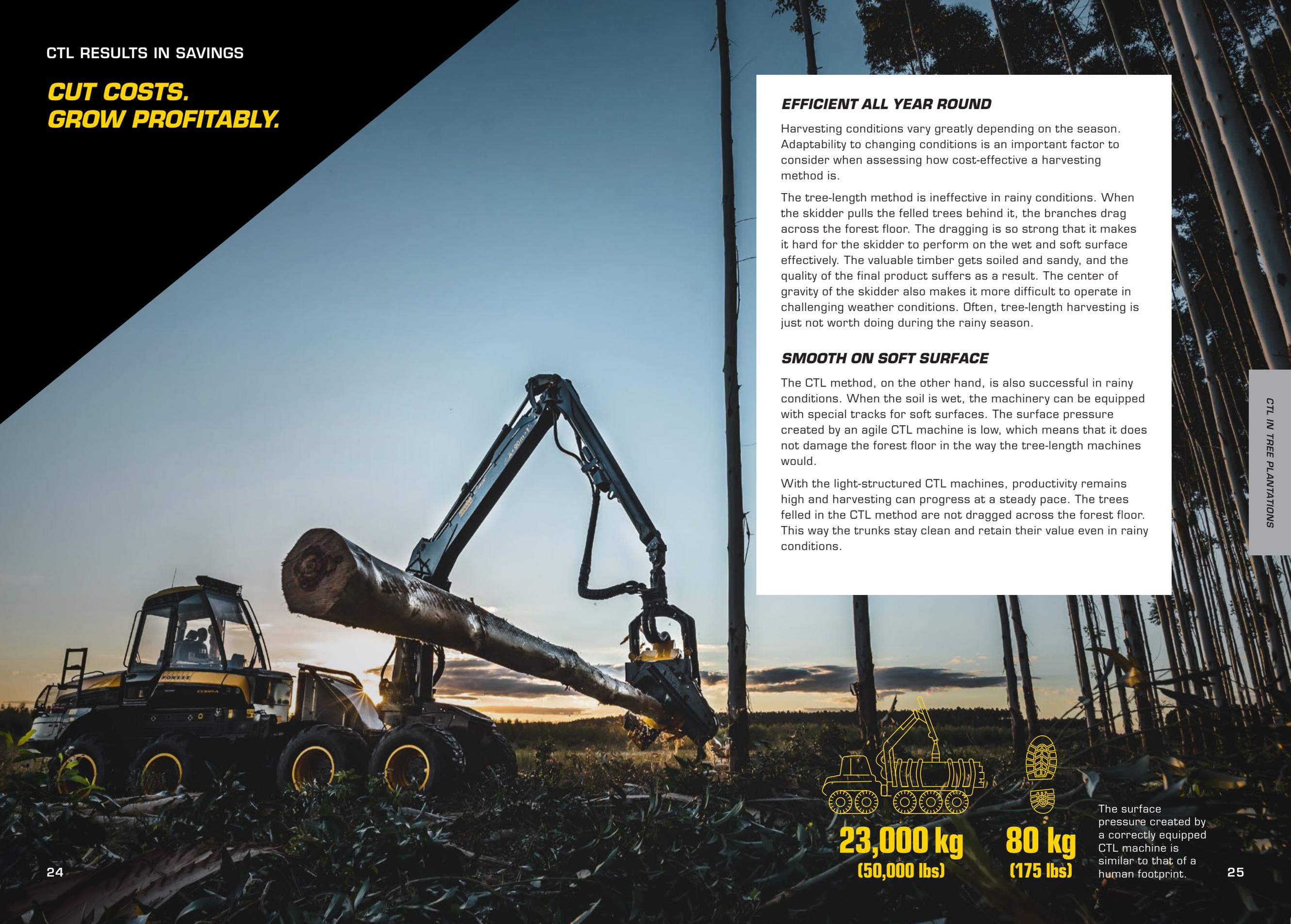
The feller-buncher is only worth operating at full capacity. When the transportation distance in the forest is short, one skidder is enough to handle the felled trees. However, when the feller-buncher moves further away from the road, the skidder can no longer keep up. Soon, you need another skidder. And then a third one. As the work goes on, trying to juggle all these machines becomes exceedingly complicated.

The cost-effectiveness of the tree-length method also depends on the size of the load the skidder can transport in one go. If there is too much or too little timber per harvested hectare, the feller-buncher will have difficulties creating suitably sized bunches. The machinery is not used in an optimal way and time and money are wasted.

70 %

The bark of the eucalyptus tree contains around 70 percent of the tree's calcium. In the CTL method, the nutrient-rich, high-calcium bark can be left on the forest floor, which reduces the need for fertilizers.

**CUT COSTS.
GROW PROFITABLY.**



EFFICIENT ALL YEAR ROUND

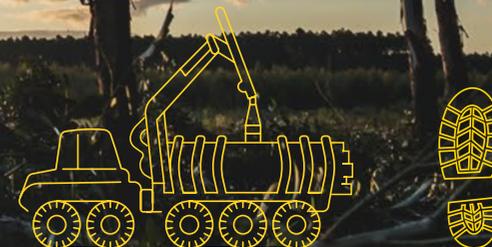
Harvesting conditions vary greatly depending on the season. Adaptability to changing conditions is an important factor to consider when assessing how cost-effective a harvesting method is.

The tree-length method is ineffective in rainy conditions. When the skidder pulls the felled trees behind it, the branches drag across the forest floor. The dragging is so strong that it makes it hard for the skidder to perform on the wet and soft surface effectively. The valuable timber gets soiled and sandy, and the quality of the final product suffers as a result. The center of gravity of the skidder also makes it more difficult to operate in challenging weather conditions. Often, tree-length harvesting is just not worth doing during the rainy season.

SMOOTH ON SOFT SURFACE

The CTL method, on the other hand, is also successful in rainy conditions. When the soil is wet, the machinery can be equipped with special tracks for soft surfaces. The surface pressure created by an agile CTL machine is low, which means that it does not damage the forest floor in the way the tree-length machines would.

With the light-structured CTL machines, productivity remains high and harvesting can progress at a steady pace. The trees felled in the CTL method are not dragged across the forest floor. This way the trunks stay clean and retain their value even in rainy conditions.



23,000 kg
(50,000 lbs)

80 kg
(175 lbs)

The surface pressure created by a correctly equipped CTL machine is similar to that of a human footprint.

**CUT THE STRAIN.
GROW FASTER.**

25 %



According to forecasts by the Intergovernmental Panel on Climate Change (IPCC), annual rainfall in the south-eastern parts of South America may increase by up to 25 percent by the end of the century. In the CTL method, harvesting remains cost-efficient – even in rainy conditions.

CTL – PERFECT FOR RAINY REGIONS

Climate change is often seen as a challenge that will face future generations. However, it is already having a significant impact on harvesting costs today. Rainfall will increase in many places, and the tree-length method will be faced with even more challenges. The flexible CTL method guarantees efficient harvesting even on soft surfaces.

**SOIL CONSERVATION
IS AN INVESTMENT IN THE FUTURE**

During one growth cycle, traditional harvesting methods may be able to compete with CTL in terms of cost-effectiveness, at least when weather conditions are ideal. But what about the next cycle – and the next?

In the tree-length method, the skidder drags the felled trees to the side of the road. This dragging damages the soil and exposes it to erosion, especially on slopes.

Compared to a CTL forwarder, a skidder in the tree-length method drives two to three times the distance around the forest. The skidder creates a high surface pressure and its back-and-forth movement compacts the soil and weakens the forest's ability to grow.

REASONABLE LOAD

A CTL machine moves easily around any forest regardless of challenging conditions, weather, or terrain. A harvester with a balanced weight distribution spreads delimbed branches and tops around as it moves in the forest.

Covering the trail with slash distributes the load created by the machinery more evenly. The lighter load reduces soil damage and the risk of erosion significantly.

EVEN QUALITY

Timber produced in eucalyptus plantations in southern forests is primarily used as pulpwood. The felled trees must be debarked. Any remaining bark will weaken the quality of the pulpwood and pulp. If the bark comes off easily, harvesting is efficient and high quality. However, if the bark is difficult to remove, the quality of the final product will suffer – and so will the cost-effectiveness of the entire production chain.

The tree-length method drags the felled eucalyptus tree trunks to the roadside landing to be debarked. The trunks may sit there waiting for two to three days. As timber dries, the bark sticks on harder and its removal becomes increasingly difficult. More bark remains on the timber and the quality of the pulpwood suffers.

The concentration of removed bark around the landing is a huge fire hazard, especially in dry weather. If the bark is not collected for bioenergy use, the cost of disposing of the bark increases the total cost of harvesting.

In the CTL method, trees can be debarked at the stump. This is when the bark comes off the easiest. The resulting pulpwood is higher in quality and value.

LESS FERTILIZERS WITH CTL

Calcium is one of the growing tree's nutrients and calcium deficiency slows growth significantly. Thanks to the CTL method, the nutrient-rich, high-calcium bark can be left on the forest floor, which reduces the need for fertilizers.

Bark on the forest floor also prevents ground vegetation from growing, which means that the prevention measures of ground vegetation will decrease before planting new trees.

THE FUTURE OF FORESTRY

The type of forest management that seems to produce the greatest financial gain today may jeopardize the forest's value tomorrow. The best results are achieved through good planning and long-term forest management. It is our job to make sure that our forests will be the same source of wellbeing for generations to come as they have been for us.

SUSTAINABLE SOURCE OF WELLBEING

Sustainable forestry practices retain the forest's biodiversity, productivity, vigor, and ability to regenerate. Sustainable harvesting does not only consider environmental impacts but also aims to ensure the economic profitability of the forest. A well-managed forest remains productive growth cycle after growth cycle.

Regular thinning is at the center of sustainable forest management: it improves the forest's growth rate and promotes diameter growth. Usually, one or two thinnings are carried out over the 60–80-year growth cycle of a coniferous forest.

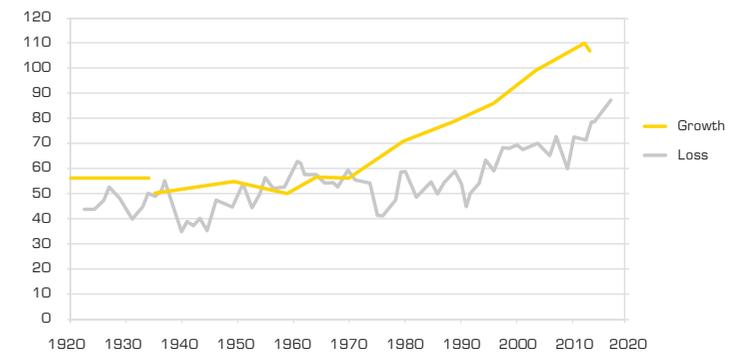
THINNING BRINGS ADDED VALUE

When a forest becomes too thick, the trees have to compete for light and nutrients. This stifles the diameter growth of the trunks while height growth accelerates. The resulting trees are thinner and thus particularly vulnerable against heavy snow and storms. Regular thinning allows the remaining trees to grow thick, healthy and high in quality.

The crane of an agile CTL harvester can reach up to 11 meters (36 feet) which enables thinning in line with sustainable forestry practices. The tree-length method is poorly suited for thinning as the method damages both the remaining trees and the soil.

Regular thinning promotes the overall growth of forests. Finland's forest resources have seen much more growth than loss. Today, the annual growth of forests exceeds the number of trees felled and lost naturally by around 20 million cubic meters.

THE DEVELOPMENT OF FINLAND'S FOREST RESOURCES



© Natural Resources Institute Finland

**CUT WISELY.
GROW RESPONSIBLY.**



THE LUNGS OF THE PLANET BREATHE CARBON

Forests reduce the amount of carbon dioxide in the atmosphere and slow down the acceleration of the greenhouse effect. That is why forests are called carbon sinks.

The climate debate is dominated by the idea that virgin forests are best for the climate, but this is not always the case.

The ability of forests to capture and absorb carbon dioxide is crucial to the climate. Trees bind carbon dioxide from the atmosphere to make sugars, such as glucose. Trees use about half of the glucose for energy to live and the other half for growth. While a small amount of growth drops onto the soil in the form of needles, twigs and pieces of bark, most of it binds fairly permanently in trunks, branches and roots. Carbon dioxide removed from the atmosphere is stored in wood until trees burn or decay.

Both virgin and commercial forests play important roles in the fight against climate change. When left in its natural state, a forest acts as a carbon sink for a few decades, but then the net growth goes down to zero and the forest changes from a carbon sink to a carbon storage. A well-managed commercial forest serves as both a carbon sink and a carbon storage.

In other words, fully-grown trees in a virgin forest retain the carbon they bind but do not bind new carbon dioxide as effectively as young, growing trees.

In sustainable forest management, the proportion of growing trees is kept as high as possible. In terms of carbon sequestration, solutions must always be found that are sustainable in the long term.

ADDED VALUE TO THE ENVIRONMENT AND THE FOREST OWNER

Regardless of forest management practices, every full-grown tree was a small seedling in its time. Good forestry practices guarantee the forest's biodiversity as well as the best production of timber, i.e. growing seedlings into trees.

The best growth is achieved when the age structure in a woodlot is optimal and the trees have sufficient space to grow. When the annual growth falls below the average growth, it is time to regenerate the forest.

Trees in a sustainably managed forest are more valuable – both to the environment and to the forest owner. Mechanized, sustainable and ecological harvesting can only be carried out using the CTL method.

OLD FORESTS UNDER THREAT

When a forest is allowed to grow for too long, growth slows down and the trees become exposed to many problems. Unhealthy trees attract insects and parasitic fungi as these often attack the old, weak, or damaged trees first.

As the pest population grows, even healthy trees are at risk. For example, the European spruce bark beetle loves to attack the most valuable trees – those that have been growing in the forest for decades. Insects can destroy whole sections of a forest creating a sizable dent in the forest owner's wallet. The price per cubic meter of timber withered by pests can drop by several dozen percent.

Regular thinning of the forest keeps it healthy and efficiently wards off pests and wood-decay fungi.

***Fully-grown trees in a virgin forest
retain the carbon they bind
but do not bind new carbon dioxide
as effectively as young,
growing trees.***

**CUT THE EXCESS.
GROW THE GREEN WAY.**

CTL – BETTER FOR THE ENVIRONMENT

IN THE FOREST

The risk of fire is lower in a well-managed forest than in one left in its natural state. For example, wildfires on the west coast of Canada emit two or three times more carbon dioxide than fossil fuels. Due to widespread wildfires, each year the almost 400 million hectares of forests in Canada release more carbon dioxide than they bind.



*In the CTL method,
the largest possible share of timber
can be processed into valuable
and durable logs.*



ON THE ROAD

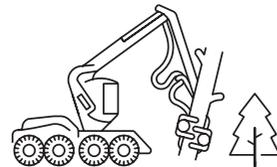
The climate impact of harvesting does not stop at the roadside. In the CTL method, trees are bucked into graded logs at the stump and then transported directly to the right destination: logs to the sawmill, pulpwood to the pulp mill, and energy wood to the power plant. This reduces the total transportation distances both in the forest and on the road.



AND IN FURTHER PROCESSING

When felled trees are processed into long-lasting products, the carbon dioxide bound in those trees releases into the atmosphere more slowly. Durable wood products, such as timber buildings and wooden furniture, can be considered as types of small carbon storages. When a larger share of felled trees is used in these products, the amount of CO₂ in the atmosphere decreases. In the CTL method, the largest possible share of timber can be processed into valuable and durable logs and then into products that store carbon longer.

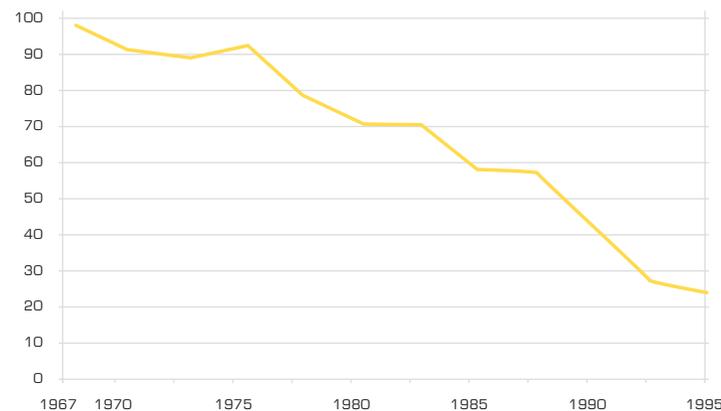
**CUT THE RISKS.
GROW SAFELY.**



60%

In Sweden, for example, improvements in safety have gone hand in hand with the spreading of mechanized harvesting methods. From 1970 to 1990, the number of accidents in the Swedish forest industry fell by more than 60 percent, and the number keeps going down.

ACCIDENT FREQUENCY RATE IN SWEDISH FORESTRY, 1967-1995



© Axelsson, S.-A. (1998) The mechanization of logging occupations in Sweden and its effects on occupational safety and health.

SHORTCUT TO SAFETY

The forestry sector employs almost 14 million people worldwide. In many regions, harvesting takes place in terrain, where it is not always even possible to move around on foot. Despite improvements in working conditions, health and safety, accidents are regrettably common. An estimated 170,000 forest workers are injured or killed every year. Harvesting is still considered a tough and dangerous job.

Replacing manual harvesting with mechanized methods is by far the most effective way to reduce accidents and to improve the safety of workers.

The link between mechanization and safer harvesting has been recognized all over the world, from Brazil to Canada, from New Zealand to the United States. Safety is improved when workers are no longer exposed to the elements but work in the machine's protected and air-conditioned cabin. This also makes work more satisfying.

**CTL FOR SAFER HARVESTING -
EVEN IN STEEP SLOPES**

A large number of fatal accidents in the forest sector happen when manual harvesting is carried out on slopes. Technical advancements in mechanized harvesting machinery have reduced the number of accidents even during steep slope harvesting.

The agile CTL method is much more efficient and safer on slopes than the tree-length method. CTL machines are designed to consider the different terrains and stands and, especially, health and safety concerns. The machines are well-balanced, and they have a low center of gravity. They are unlikely to tip over even on the steepest of slopes.

Safety – and savings – are the features that affect insurance companies' attitudes towards the CTL method. On the west coast of the United States, in areas with variable terrain, premiums for the tree-length method are up to seven times higher than for the CTL method.

Safety is improved when workers are no longer exposed to the elements but work in the machine's protected and air-conditioned cabin. This also makes work more satisfying.

CTL ENDORSEMENT

"Thanks to their stability, CTL machines work superbly in steep slopes."

- SYNNE HENRIKSEN,
RINGERIKE SKOGSDRIFT

INDEPENDENT AND VARIED WORK

Norwegian **Synne Henriksen** was only 14, when she first stepped into the cabin of a forest machine. It was love at first sight, and it didn't take long before a career in forestry swept her off her feet.

As a forest machine operator for Ringerike Skogsdrift, Henriksen operates both a harvester and a forwarder. She values her work for its independence and variability.

– Operating a harvester is more fun, but I appreciate getting to work with a forwarder, too. It makes my days more varied and helps me improve my skills in more ways than one.

Working in areas with variable terrain, the operator and the machine must pull together seamlessly.

– Thanks to their stability, CTL machines work superbly in steep slopes. The crane of the harvester is placed in the middle of the machine, above the rotating cabin. My position is always optimal, and I can work on larger areas without having to change machines.

Ever since she was little, Henriksen has had a passion for forestry. If it were not for a career in the field, what might she do?

– If this hadn't played out, I think I'd work in civil engineering driving a loader. But it goes without saying that this is much better!



CTL ENDORSEMENT

*“Landowners love CTL!
It is the wave of the
future of logging.”*

*- BILL SANDERS,
SANDERS TIMBER*

CTL - HELPING FORESTS REGENERATE

In 2016, Alabama-based Sanders Timber added versatile and cost-efficient CTL machines to its fleet of traditional, tree-length logging machinery. Spurring the decision were the adaptability of the machines to challenging logging conditions and the quality of the timber they produce.

The owner of Sanders Timber, **Bill Sanders**, is pleased with the addition.

- We use CTL harvesters to fell and delimb trees in the forest. By having the branches and tops remain in the forest, we do away with cleaning costs. The method produces less strain on the soil and helps the forest regenerate. Landowners love CTL!

A STRONG PERFORMER IN CHALLENGING CONDITIONS

For Sanders Timber, the best wood is found in the most difficult locations. A large chunk of the company's logging is carried out on uneven terrain or on wet and soft surfaces - in conditions where traditional tree-length machines fail.

- As our primary product, we cut top grade hardwood logs. These days, the applicable trees are mostly found in challenging conditions. CTL machinery is not often used to fell trunks this heavy and long, but the machines deal with them beautifully. I think many loggers are unaware of just how well-suited these machines are for southern hardwood forests.

THE NEW DARLING OF SAWMILLS

In the southern part of the United States, the tree-length method still beats CTL in popularity. However, lower equipment, payroll and insurance costs are closing the gap quickly. With CTL becoming more and more cost-efficient, Sanders believes the method will eventually replace tree-length logging altogether.

- Sawmills are beginning to see the benefits of CTL. Take our neighbors in Georgia as an example: some of the mills there have already started to demand CTL wood only. It is the wave of the future of logging.

CTL ENDORSEMENT

"The conditions for logging are challenging. We've cleared a unique market niche for ourselves."

- JOSH MARSHALL,
MARSHALL FORESTRY

VERSATILE FORESTRY FOR CHANGING DEMAND

Two years ago, Washington State's Marshall Forestry made the switch from traditional tree-length logging to the versatile CTL method. Preceding the shift was a long-standing shortage of workforce: year by year, the number of available skilled workers kept decreasing.

– In the tree-length method, logging operations require a minimum of eight to ten workers. By transitioning to CTL, we can scale our operations flexibly and react to the demands of the market, says **Josh Marshall** of Marshall Forestry.

The transition was effortless: when the new machinery arrived, the keys were handed to four of Marshall's best operators – and the show went on.

BIGGER MARGINS, FEWER COMPETITORS

The transition to CTL has made Marshall Forestry's operations more profitable: employees are more productive, and the resulting timber is higher in quality. Less competition means better margins for Marshall.

– The conditions for logging are challenging and most of our operations are carried out in steep slopes. As the only logger in the area, our CTL machines are tethered and thus superbly suited to these difficult conditions. We've cleared a unique market niche for ourselves.

DEMAND FOR CTL WOOD BOOMING

With many years under their belts, experienced loggers are used to traditional methods and the jump to CTL can seem daunting. Nevertheless, the market is only moving forward.

– As sawmills are becoming more advanced, we're seeing rapid growth in the demand for high-quality CTL wood, Marshall concludes.

**CUT DOWN THE BURDEN.
GROW YOUR SKILLS.**

**THE MODERN FORESTRY
PROFESSIONAL**

Compared to conventional tree-length method machinery, CTL harvesters are sophisticated and versatile. In the CTL method, one machine performs the functions of two tree-length method machines: The harvester both cuts down trees and processes the felled trunks into graded logs.

Wearing two hats also means that the harvester operator needs to have more skills: To work as a CTL machine operator is more valuable, efficient, safer, and more satisfying. Having highly skilled operators has been proven to increase productivity in harvesting operations.



**PONSSE ACADEMY OFFERS
CTL TRAINING ACROSS THE GLOBE**

Ponsse's extensive, state-of-the-art training network offers training in the sustainable and efficient CTL harvesting method across the world. In addition to training for operators and mechanics, the advanced programs include training in harvesting process management, productive harvesting methods, and thinning operations.

Ponsse Academy's programs benefit not only those working in harvesting but also forest owners and teachers in local educational institutions. Training periods range from short training sessions lasting a few days to month-long comprehensive training programs.

PERSONALIZED TRAINING WITH A SIMULATOR

In regions where Ponsse Academy does not yet provide personal training, employees can be trained in the basics of CTL harvesting using diverse simulators. The PONSSE Simulator can be used for training employees in all the different stages of the entire machine team.

The harvester simulator can be used for practicing actual logging operations as well as learning how to operate the machine's control and measuring systems. The forwarder simulator allows the user to experiment with driving, loading and crane operations under realistic conditions. Different exercises can be tailored to suit the students' skill levels.

Simulator training is an inexpensive way to ensure adequate amount of practice before training in forest environments.



**A NEW AGE OF LEARNING:
PONSSE ACADEMY
IN ST. PETERSBURG**

Ponsse Academy's new training and service center in St. Petersburg offers hands-on training. In addition to expert lectures, operators can practice working on purpose-built test tracks. Training for mechanics is organized in service facilities that can accommodate several forestry machines at the same time.

50 YEARS OF CTL HARVESTING

Founded by forest machine entrepreneur **Einari Vidgrén**, Ponsse has been a trailblazer in sustainable and efficient CTL harvesting throughout its history.

The family business, which grew from a farmer's son's dream into an international export company, has its roots deep in the Finnish countryside. Since it was founded in 1970, the company's values have guided Ponsse employees to honest work, respect for people and the environment, and a desire to develop the company's operations and the community.

With its experience of manufacturing more than 15,000 forest machines, Ponsse is, now in 2020, a pioneer in efficient and sustainable CTL harvesting solutions.

Ponsse operates in more than 40 markets. 78 percent of our net sales come from exports. Our operations are still guided by the wishes and needs of forest machine entrepreneurs.

PONSSE'S VALUES

EINARI VIDGRÉN, 1943–2010

CUSTOMER ORIENTATION

"Practice is the best teacher. And the best specialists are machine operators. It's worthwhile paying close attention to what they say and keeping their words well in mind."

INTEGRITY

"If you want to succeed in this business, you need to have honest and trustworthy relationships in both directions. Dishonesty takes you nowhere."

PONSSE SPIRIT

"As we're all part of the same company, everyone can call me Einari."

INNOVATION

"Let's make it ourselves. It must grapple a tree like a bear, and the log must pass through with good speed."

THE FUTURE OF FORESTRY

The CTL machine team performs harvesting operations efficiently by eliminating unnecessary overlaps and intermediate steps. The automated optimization of raw material use maximizes value yield and minimizes waste.

The high machine utilization rate and the streamlined machine team guarantee year-round operations. Compared to competing harvesting methods, the CTL method stands out with its superior reliability.

The diverse CTL machines are at home in challenging conditions and effective both in thinning and at tree plantations – regardless of the weather, season, or terrain. The robust machines are safe to operate even on rough terrain.

Unlike other mechanized timber harvesting methods, CTL allows responsible and high-quality forest management through selective thinning. Well-executed thinning keeps the forest healthy and increases the amount of carbon dioxide it absorbs.

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PONSSE

Reliable,
cost-efficient,
versatile,
sustainable.

CTL – The Future
of Forestry

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