SESSION 6
Paper (b)

SKOGSARBETEN (LOGGING RESEARCH FOUNDATION)

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SOME SWEDISH LOGGING SYSTEMS

A variety of logging systems are employed in Swedish forestry. This, of course, is because of the varying conditions under which logging is carried out. Thinnings, for instance, which account for a quarter of the annual cut, often require lighter and more compact machines than those used in final felling. In addition, stand conditions, ownership structure and marketing conditions also vary.

The outline given here is not comprehensive, but it does include most of the systems in use today. Within each system there are also a variety of machine options. A large part of this survey is devoted to forest energy systems because of the interest that such systems are attracting in Sweden owing to, among other reasons, the high level of oil prices.

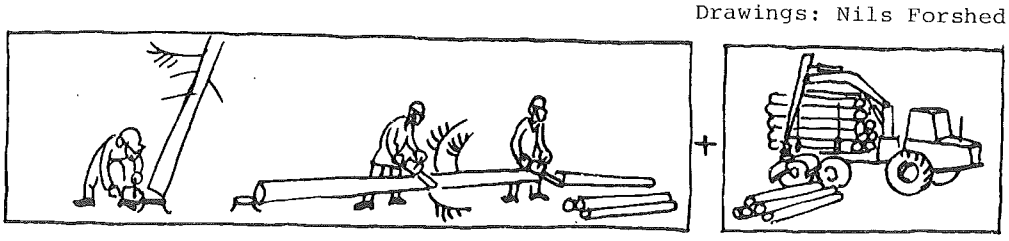
The figures for the percentage of the annual cut accounted for by each system apply to the large-scale forestry sector, which accounts for some 70% of the total cut in Sweden. Most of the remaining logging is carried out using motor-manual methods.

A list of the manufacturers of the various types of machine included in the systems will be found at the end of the booklet.

LOGGING SYSTEMS IN USE TODAY

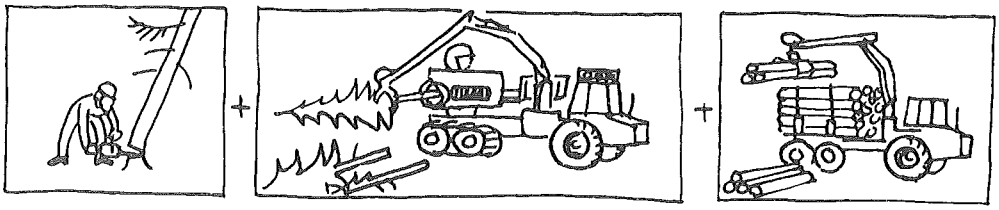
Final Felling

Drawings: Nils Forshed



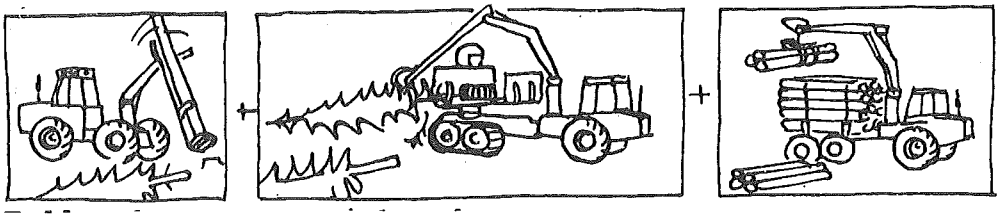
1. Chainsaw + forwarder

   The old, faithful system which, in spite of a continuing fall in usage, is still the most widely used system in the forestry sector. In large-scale forestry, the system accounts for 20-25%.



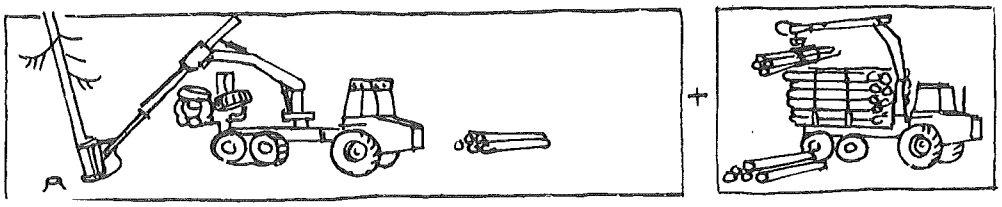
2. Chainsaw + limber-bucker + forwarder

This system is also starting to become somewhat aged, despite the introduction of completely new machines such as the grapple processor. The system is declining and accounts for approx. 20% of the final felling cut.



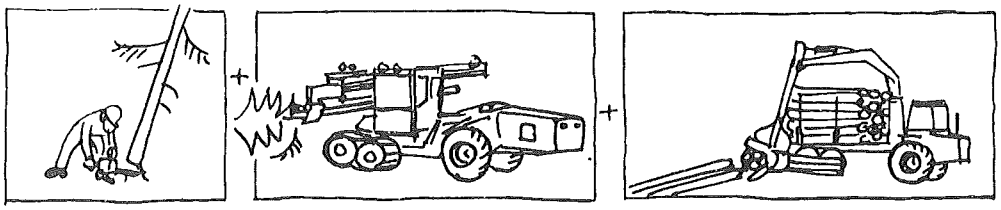
3. Feller-buncher + limber-bucker + forwarder

This has been no more than a transient system. No feller-bunchers are being sold in Sweden today. The system accounts for approx. 25% of the annual cut.



4. Harvester + forwarder

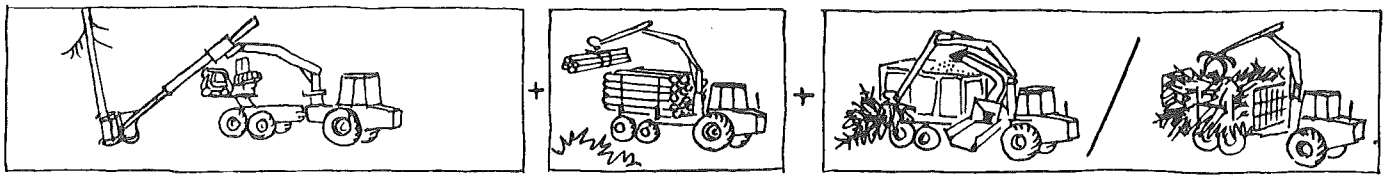
Perhaps the system of the 1980's? Harvesters have quickly secured a large proportion of the market, today accounting for more than 25% of the cut.



5. Chainsaw + limber + grapple-saw forwarder

The Logma limber was in at the beginning of mechanisation in the woods and is still being used today, some fifteen years later. The limber system is now declining, largely because Logma machines are being equipped with bucking units and operating as limber-buckers. This system accounts for approx. 6% of the cut.

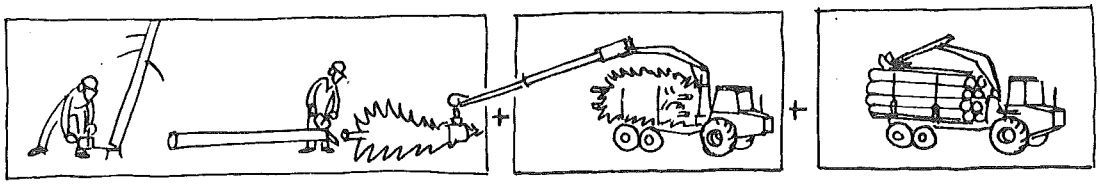
Systems for Utilisation of Forest Energy Wood



6. Shortwood logging* + chip harvester/chip forwarder.

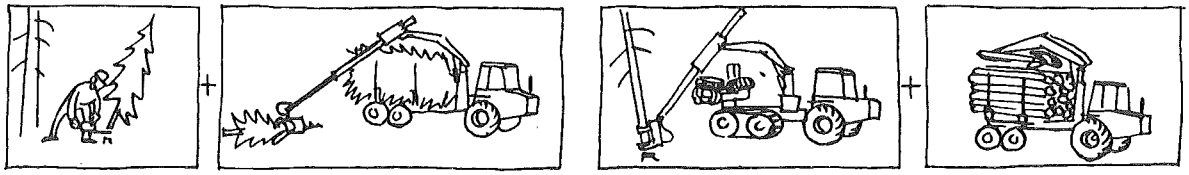
Forest energy wood can be removed in a special operation, without the need to disrupt conventional shortwood logging. The operation is specially suitable for implementation after mechanised processing, where the logging residue is left in piles or windrows. Chipping on the cutover is an advantage to extraction but is less attractive if the chips are to be stored. Slightly modified forwarders can be used to collect the slash.

* Shortwood logging to random lengths of between 3 and 6 metres.



7. Chainsaw + grapple-saw forwarder

A system giving a substantial reduction in the proportion of motor-manual work. The cutters limb and bark only the sawlog sections. Pulpwood bolts are extracted by grapple-saw forwarders for limbing at a terminal or the mill.



8. Chainsaw + harvester + forwarder

This system involves logging in two stages. In the first stage, the cutters fell all pulpwood trees, which are then extracted by a grapple-saw forwarder. This clears the way for the harvester which, operating efficiently as a result, then removes the residual sawlog trees. In less-dense stands, the harvester can also fell the small trees, and forwarding of the unlimbed trees can be performed in conjunction with extraction of the roundwood.

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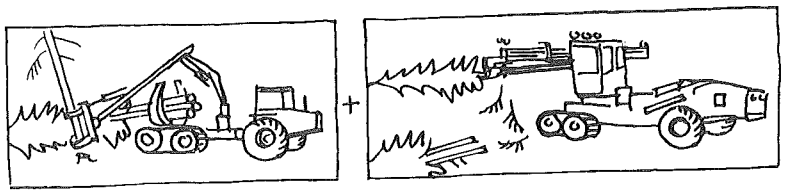
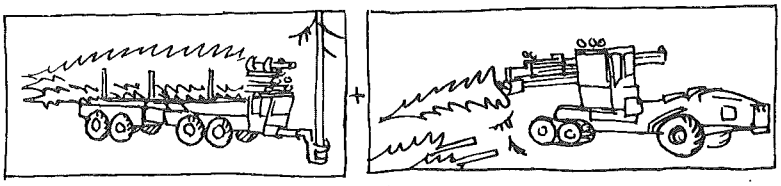
* Shortwood logging to random lengths of between 3 and 6 metres.



9. Feller-skidder + limber

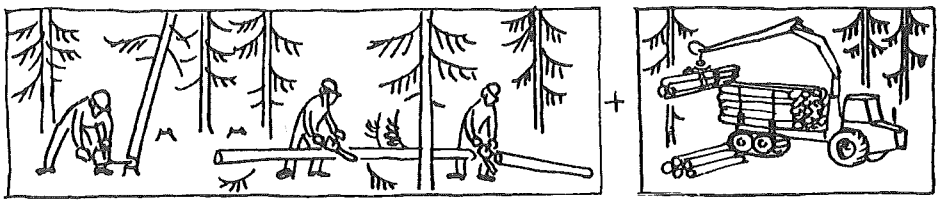
The harvesting of energy wood will probably encourage the reintroduction of the full-tree system. Feller-skidders are already being used. Limbing takes place at the truck road or terminal.



10. Feller-forwarder + limber

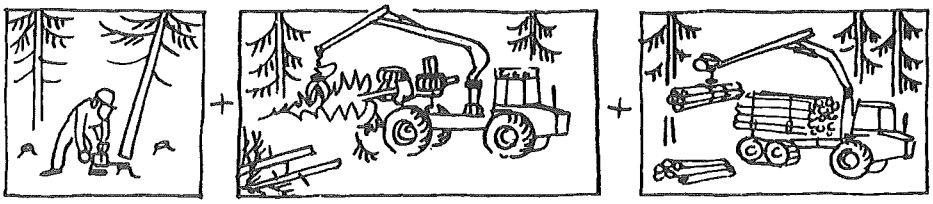
Loads that are forwarded rather than skidded will include more branchwood and less contaminants. A feller-forwarder has already been produced in Canada and at least two designs are on the drawingboard in Sweden.

Thinning



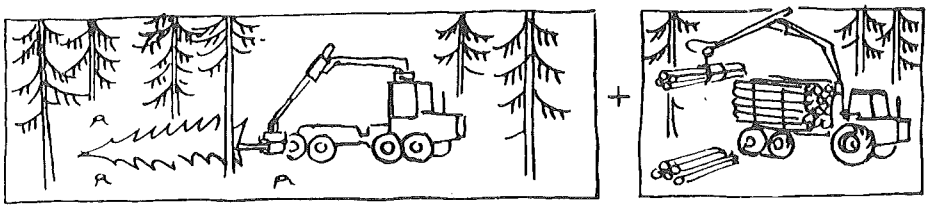
11. Chainsaw + forwarder

This is by far the most widely used system, accounting for more than 60% of the thinning cut in large-scale forestry. However, use of this system is declining rapidly.



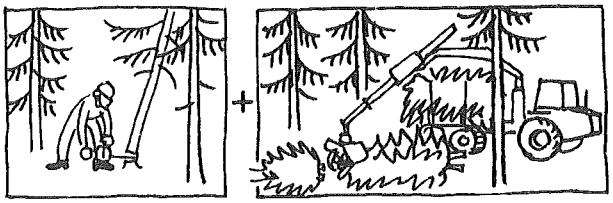
12. Chainsaw + limber-bucker

With the advent of limber-buckers specially designed for thinning, this system has made rapid inroads and now accounts for about one-third of the thinning cut in large-scale forestry.



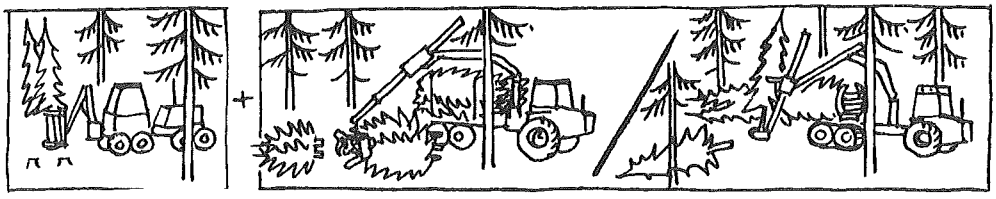
13. Harvester + forwarder

It is clearly difficult to combine felling, limbing and bucking functions on one machine for thinning. Nonetheless, stand-operating and strip-road operating harvesters are being proven.



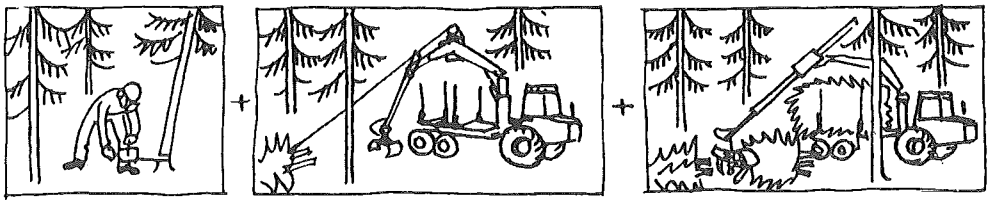
14. Chainsaw + grapple-saw forwarder

This system is being proven in many quarters at present. Larger areas can be covered using the same manpower. Higher productivity combined with greater pulpwood and energy-wood yields are improving the profitability of thinnings.



15. Feller-buncher + grapple-saw forwarder

Two types of machine for felling-bunching are already on the market and several are on the way. The "Oskarshamn" method is suitable for extracting unprocessed trees to the truck road. This method employs a clam-bunk skidder having an extra grapple on the boom to enable bunches of trees to be lifted first close to the machine and then onto the bunk.



16. Chainsaw + winch + grapple-saw forwarder

This last system involves the use of a winch. Winches can obviously be used in most of the systems when difficult terrain conditions or other reasons necessitate bunching from a great distance.