

The Koehring Feller-Forwarder, Model KFF

The recently introduced Koehring Feller-Forwarder (model KFF) was designed to fell and collect full trees in a large capacity bunk, for forwarding to roadside. Such a machine holds the possibility of reducing the combined costs of felling, forwarding, and road construction through two mechanisms:

- *A combined feller-forwarder reduces the handling of the harvested full trees, and may therefore lead to reduced unit costs of wood delivered to roadside, compared to the sum of costs incurred by two single-purpose machines (feller-buncher and skidder).
- *Maximum load capacities approaching 10 cunits may permit an economical increase in forwarding distances, thus reducing unit road-construction costs.

Moreover, the large capacity of the Koehring KFF provides a more attractive situation for the operator, by enabling him to work in a comfortable cab for a smaller number of turns, in clearing a given area.

To assess the degree to which the Koehring Feller-Forwarder achieves these potential advantages, FERIC studied a pre-production model in February 1976, on the limits of Great Northern Paper Co., Millinocket, Maine, U.S.A. Two operators, each with only a month's experience, were using the machine to fell and forward full trees for short distances, from a fully stocked stand of balsam fir (*Abies balsamea* (L.) Mill.) and white spruce (*Picea glauca* (Moench) Voss).

During the 4-day period of observation, terminal times averaged 45 min per turn, and travel time only 8 min. Over the average forwarding distance of 400 ft (122 m), travel speeds empty and loaded were 150 and 90 ft (46 and 27 m) per min, respectively. Thus, for the average volume per load of 6.9 ct (19.5 m³), productivity equaled 7.9 ct (22.4 m³) per productive machine hour (PMH).

Since so much of the total time per turn was devoted to gathering a load, collection time per tree was recorded and analyzed. With an average volume per tree of 9.2 ft³ (0.26 m³), average collection time per tree was 65 cmin (0.65 min), for a productivity of 92 trees per PMH. Felling-and-loading (43 cmin per tree), the most time consuming element of the collection cycle, was significantly influenced by the number of trees accumulated in the head, the volume per tree, and operator differences.



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The most important feature of the felling head is the accumulator, which permits higher productivity with small trees than conventional single-tree felling heads. This advantage will naturally be greatest in dense stands of small trees. During the study, the operator used the accumulator to harvest more than one tree for 40% of the sample. When two or three trees were accumulated together, the average collection time per tree decreased by 7.2 and 14.6 cmin respectively, reflecting the high potential increase in productivity for such multi-stem felling heads.

The effect of volume per tree on total collection time was relatively small. However, there was a 30% (21 cmin/tree) difference between the two operators.

The Koehring Feller-Forwarder studied had a purchase price of \$180,000. Realistic cost projections, based on both favourable and unfavourable estimates of other cost factors, ranged from \$6.36 to \$11.01 per cunit (\$2.23 to \$3.85 per m³) for felling and forwarding full trees to roadside.

The high capacity of the KFF may permit wider road spacing in areas where

road-construction costs are high. Optimum road spacing is found by equating variable forwarding cost to road-construction cost. In the example given in this report, travel speeds (112 ft/min (34 m/min)) were those observed for the pre-production model. If production models achieve higher forwarding speeds and if ground conditions are favourable, increased speeds and wider road spacing may be expected.

The Feller-Forwarder employs the same chassis as the Koehring Short-Wood Harvester. Two major modifications are planned for production models of the KFF, expected to be marketed in the near future.

1. Optional larger tires (43.5 x 39 in (1100 x 990 mm)), to increase load capacity by improving flotation and/or traction under soft ground conditions.
2. A larger engine to increase power from 215 hp (160 kW) to 255 hp (190 kW), which may permit higher forwarding speeds.

The Koehring Feller-Forwarder has a good potential to attain economical levels of performance and availability.

Further details of this study appear in FERIC Technical Report 7, entitled "Evaluation of Koehring Feller-Forwarder, Model KFF", by R. Legault. If you would like a copy of this report, please complete and return the enclosed reply card.