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COMMERCIAL THINNING WITH AN URUS I-UNI SKYLINE TOWER YARDER IN CHILE

Introduction

Bosques Arauco S.A., a large forest company in Chile, derives approximately 500,000 m^3 annually from commercial thinning of radiata pine plantations. Much of Bosques Arauco S.A.'s holdings are on moderate to steep slopes. Skyline systems have been used for the last 10 years, and have been strongly developed in the last 5 years. The volume of the thinning program is distributed among skyline towers (16%), skidders (16%), agricultural tractors (20%), and oxen (48%). In June, 1995, a FERIC researcher attending a Chilean forestry conference observed three, 4-year-old Urus I-Uni yarders commercially thinning a 8-year old radiata pine stand on steep slopes on a tree farm near Arauco, Chile (Figure 1). Approximately 60-70 Urus yarders are currently operating in Chile.

Machine Description

The Urus I-Uni (Figure 2) is a mobile 7-m tower mounted on a trailer with a 3-point hitch. It is commonly used for uphill yarding but it is equipped with 3 drums, and was observed on an experimental site, yarding downhill. The total weight of the unit including cables is 2 500 kg. The Urus I-Uni is manufactured in South Africa by Hinteregger S.A. (Pty) Ltd. The tower is hydraulically raised and lowered by a cylinder on the base of the tower. A 4-cylinder, 54-kW Deutz diesel engine with an Allison automatic transmission, is mounted on the trailer, and drives the 3 drums. The skyline drum has a capacity of 320 m of 16 mm diameter cable, the mainline holds 330 m of 10mm cable and the haulback drum can hold 660m of 8 mm line. The haulback speeds range from 2.1-6.4 m/sec, depending on the number of drum gears used. The maximum load capacity is 1 500 kg. The purchase price of the trailer-mounted yarder is $Cdn 80 000 (fob Vancouver). A power-take-off tractor-driven version is available for $40 000. A Stuefer HSK 2000 carriage, manufactured in Austria, was observed in the uphill yarding operations.

Thinning Regime

Radiata pine is usually managed on a 20-25 year rotation for production of clear sawlogs. Thinning regimes are co-ordinated to realize the maximum value from pruning treatments. Typically, Bosques Arauco S.A. will plant 1 100 seedlings/ha. Tending starts at age 5 and 6-m of height when 600 trees/ha are pruned to a 3-m height. A year later, at 9-m height, a second pruning to 4.5 m is carried out and immediately followed by the first commercial thinning to 600 trees/ha. A third pruning is done at age 7 to achieve a minimum clear height of 5.2 m, and a fourth pruning may be applied on better sites. At age 10, or 16-m of height, a second thinning brings the final density to 300 trees/ha.

The thinning operation viewed by FERIC was not representative of normal thinning regimes. The original management objective was for pulp production because of operability problems on the steep slopes (50-70%). Favourable economic and technological developments shifted the stand management objective to production of

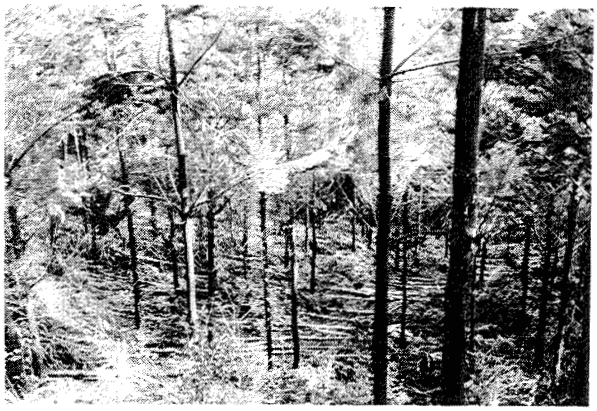

Figure 1. Thinned radiata pine stand near Arauco, Chile.

Figure 2. Urus I-Uni skyline tower yarder.

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clear timber. The planting density was 1200 trees/ha. At age 8, average stand volume was 91 m^3/ha, with an average height of 15.7 m. It was thinned to 500 stems/ha, removing 50 m^3/ha. The average volume of whole-tree pieces was 0.09 m^3.

Observations

Two yarders were observed yarding uphill, and a third was observed yarding downhill. The crew for each yarder, consisted of 4 chainsaw operators (fallers and buckers), 3 chokermen and one yarder operator. Falling was done with stem alignment parallel to the contour and trees were yarded approximately 20 m to the yarding corridor. Corridors were at 40-60 m spacing with an average width of less than 3 m. Stems were delimbed at the stump by the fallers, and when delimbing was incomplete due to crossed tops, the remaining branches were removed at the landing with axes. Tree-length logs, averaging 6 m in length were transported with self-loading trucks.

The skyline used 2-3 intermediate supports, depending on terrain, with an average corridor length of 218 m (maximum 300 m). Rigging for uphill yarding took about one hour to install and downhill yarding took 2-3 hours. During uphill yarding, the Stuefer HSK 2000 carriage was gravity fed and automatically clamped in place, releasing the chokers. The carriage clamps were released when the mainline pulled the chokers into the carriage, then the load was pulled up to the landing. The carriage was not locked in place during downhill yarding, which increased the damage to residual trees. The yarder operator and chokersetters communicated verbally with radios.

Damage levels did not exceed 3% of all residual trees. Damage was considered significant and counted if cambium was exposed on 25% of the bole circumference. Low damage levels were largely credited to good worker training and experience (4-5 years).

Table 1. Thinning Production Costs with the Urus I-Uni Yarder.[a]

	$US/$m^3$
Yarder operating costs	0.6
Crew salary	5.5
Support staff, supervision salary	2.0
Chainsaw costs	0.9
Equipment (safety, cables, etc)	1.1
Transportation	3.0
Maintenance	0.4
Insurance	0.1
Tax	1.5
Total production cost	15.1

[a] Personal communication, Humberto Aicón, Bosques Arauco S.A., Arauco, Chile, June 1995.

Productivity of the observed Urus I-Uni was 4.9 m^3/h, yarding 42 stems/h with a 6-hour productive day. Cycle time varied from 7.20 min/cycle with 5 chokers to 10.1 min/cycle with 7 chokers. Each chainsaw operator produced 1.2 m^3/productive hour and spent 5.8 min processing each stem. The tour host indicated that for conventional thinning regimes, the Urus I-Uni may have a productivity of 6.5 m^3/h, yarding 18 stems/h with a volume of 0.36 m^3/stem.

Harvesting and transportation cost delivered to the mill, was $US 15/$m^3$ (Table 1). However, it is difficult to make cost comparisons with North America due to differences in standards of living in Latin America. Monthly salaries varied from $US 350 for a chokersetter, $380-400 for a chainsaw operator, and $580 for a yarder operator.

Summary

Bosques Arauco S.A. has well-developed thinning techniques using small tower yarders such as the Urus I-Uni, on steep slopes. Worker skill and training contributed to a low rate of residual damage (< 3%). The small piece size (0.09 m^3) affected the observed productivity (4.9 m^3/h) achieved with the yarder. It is difficult to make cost comparisons with North America due to differences in standards of living in Latin America.

Information

The information contained in this report is based on limited field observations and is only published to disseminate information to FERIC member companies. It is not intended as an endorsement or approval by FERIC of any product or service to the exclusion of others that may be suitable. More information may be obtained from:

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