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Internationalization of Logset Oy

Bonita Russell and Cory Isaacs wrote this case solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

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In September 2015, PascalRéty, vice-president of sales for Logset Oy (Logset)—a privately held specialized forest machine manufacturing firm in Koivulahti, Finland—was reviewing the latest sales estimates for the year. The forecast for 2015 was €30 million.[[1]](#footnote-1) Sales had plummeted in 2009, but since then, they had been steadily increasing year over year and were now almost back to where they had been in 2007. With sales on the rebound, Réty wondered if it was time for Logset to rethink its strategy for Canada, an undeniably appealing market with 42 per cent of its land mass covered by forest.

Nordic manufacturers such as Logset had been struggling to establish themselves in North America since the 1980s, with mixed results. While other manufacturers chose to focus on the much larger American market, Logset had focused its efforts on the Canadian market. Quebec and Ontario represented about 10 per cent of Logset’s annual turnover; however, despite 15 years’ effort, there had been no appreciable increase in company sales or significant interest among potential customers in Atlantic or Western Canada. The need to push forward into new markets was important to Logset, as it had been in a break-even and/or slightly profitable position for over 10 years. For Logset, profitability depended not only on remaining competitive, but also on staying ahead of the competition with innovative product developments. For a small firm, maintaining this position was a challenge.

Despite low profitability, Logset had managed to, as Réty put it, “Stay on top of its class with the full product range.” Logset had registered as an exhibitor for the upcoming Canadian Woodlands Forum in Maple Ridge, British Columbia. This event could be the opportunity the firm needed to make inroads into the Western Canadian market for specialized forestry equipment.

Company Background

Logset was founded in 1992 by Gustav Frantzén, Seppo Koskinen, and Kristian Stén, who acquired the forest machine business assets of Oy Norcar Ab (Norcar) when the estate of Norcar was forced into receivership. The sales agreement gave Logset access to Norcar’s spare part and trade-in machine inventory, allowing Logset to maintain the distribution network with refurbished machines and spare parts. To become a manufacturer, rather than just a re-seller, Logset needed functional harvester technology. In 1996, the firm entered into a cooperative agreement with Jukka Kivipelto and Kari Mikkilä at Oy Fomac International FI Ltd. (Fomac) to develop both a new line of forwarders (F Series) and its first harvester (the Logset 8H Titan clear-cut harvester). In 2002, Logset formally merged with Fomac. In 2005, Logset’s owners sold 70 per cent of the company to a group of Finnish investors, represented by Primaca Partners. In 2006, Logset became part of the PiloMac group, and in 2012, the two firms merged under the name Logset Oy.

By 2015, Logset’s product line included seven forwarders, six harvesters, and seven harvester heads (see Exhibit 1). Its distribution network covered 20 countries, and Logset machines were operating in more than 25 countries.

COMPANY approach to Internationalizing

Logset’s mission was to provide logging professionals with forest machines that were reliable, productive, and functional. It had adopted a functional organizational structure. The sales department was divided into two geographic units: Finland Area and International (see Exhibit 2). From its Finnish location, Logset provided equipment and spare parts, as well as direct customer support to customers in Europe and to dealers elsewhere. The firm’s strengths were its build-to-order business model, dealer network, and highly personalized customer service.

Logset’s approach to internationalizing was to establish one exclusive importer/distributor arrangement per market (see Exhibit 3). The importers/distributors were typically independent agents who bought the machines outright and then resold them to the end customer. The firm provided training and after-sales product/technical service support to both dealers and customers.[[2]](#footnote-2)

In the 1990s, Logset began to internationalize with exports to Russia. Although Russia remained an important market for the firm, sanctions imposed by the European Union on the sale of logging equipment to Russia in 2015 temporarily halted exports. Along with Russia, Germany became an important focus for Logset and had a 10 per cent market share—in a market where the top three brands held more than 50 per cent. Entry into France followed in 1995. Sales were slow in the beginning, but by 2015, France was Logset’s largest market outside of Finland.

In spite of Norcar’s long-standing relationships with its Swedish dealers, it was not until 2005 that Logset was able to deliver its first machine to a Swedish customer. In 2010, Logset began expanding into South America with sales to Chile, Brazil, and French Guyana. In 2015, a customer in Australia received the largest forwarder ever made by the firm, a Logset 12F with a 20-tonne capacity. By 2015, international sales represented 80 per cent of total revenue (see Exhibit 4).

The challenges Logset faced differed by region. In Europe, where the comfort of the operator was the principal concern, the firm mostly sold replacement machines. In North America, where safety was the main concern, the firm’s machines were too small to safely remove large trees. In Brazil and Russia, where timber was still being felled by hand and hauled out by horses, persuading operators to mechanize was the biggest hurdle.

Forestry in Canada

Canada’s forestry industry, like many other industries, was undergoing structural change due to (a) changing consumer preferences, particularly for print materials; (b) new markets in Asia for forest products; and (c) technologies that reduced carbon emissions and energy use.[[3]](#footnote-3) In 2013, Canada held 9 per cent of the world’s total forest resources and 24 per cent of the world’s total boreal forest.[[4]](#footnote-4) Forty-five per cent of Canada’s land mass (417.6 million hectares) was forested, 56 per cent was considered commercial forest (234.5 million hectares), and less than 0.5 per cent was harvested each year.[[5]](#footnote-5) The forested areas managed for timber production were 94 per cent publicly owned,[[6]](#footnote-6) and primarily located in the Boreal Shield, Atlantic Maritime, Montane Cordillera, and Pacific Maritime ecozones.[[7]](#footnote-7) Canada’s forest resources were expected to remain stable, as losses to deforestation were at 0.02 per cent.[[8]](#footnote-8) At the same time, climate change was affecting Canada’s forests: the northern tree line was moving further north, and aspen were being lost along the southern edge of the boreal forest.[[9]](#footnote-9)

The annual allowable cut was regulated by the governments in the provinces with commercial forest resources, but the amount harvested was often less than the allowable cut. The amount harvested had been declining since 2006, due to reduced demand for newsprint, reduced demand for lumber in the U.S. housing market, and the global economic downturn. In 2012, 148 million cubic metres—out of an allowable annual cut of 277 million cubic metres—were harvested. In addition, all areas harvested on provincial lands had to be regenerated by re-planting and/or seeding.[[10]](#footnote-10)

The principal harvesting methods used in the forestry industry were clearcut or shelterwood for stands of trees of roughly the same age, and single-tree selection for uneven-aged stands of trees.[[11]](#footnote-11) The trees could be sectioned in one of five ways: cut-to-length, tree length, full length, whole tree, or complete tree (see Exhibit 5). Of these methods, tree length was historically the preferred method; however, as the cut areas became smaller and more distributed, the cut-to-length method was attracting increased attention.

The tree-felling methods were typically separated into three categories: (a) hand felling with a chainsaw and a cable skidder; (b) a feller buncher with a grapple skidder, delimber, and slasher; and (c) a cut-to-length harvester with a forwarder. Hand felling was best suited for large-diameter trees or precision logging. Feller buncher logging, which made use of a mechanized harvester head, was well suited for harvesting large volumes of low-grade wood for pulp or chip markets. Finally, the harvester used in cut-to-length logging did the work of three machines (feller buncher, delimber, and slasher); coupled with a forwarder, it caused less environmental damage and could operate on softer ground, which extended the logging season.[[12]](#footnote-12)

THE Forestry Equipment Industry

World demand for forestry equipment was expected to increase 4.5 per cent annually to US$9.3 billion[[13]](#footnote-13) in 2019, but primarily in developing countries.[[14]](#footnote-14) In the developed markets, where Canada and the United States accounted for almost one-third of global demand, growth was expected to be more modest (2–3 per cent annually), be driven by improving economic conditions, and have a continuing focus on using technology to reduce operating costs and increase outputs.[[15]](#footnote-15) Technological improvements to ground-based logging systems (rendering them suitable for steep terrain) and the development of autonomous machines were two key equipment trends.[[16]](#footnote-16) Other trends included the use of wireless communications and global positioning systems to monitor and manage equipment.[[17]](#footnote-17)

Forestry equipment was a sub-classification of the “construction and forestry machinery”industry classification,[[18]](#footnote-18) as equipment suitable for the construction industry (i.e., road-building equipment) was often used in forestry operations, and certain types of construction equipment could be modified to serve specific forestry operations; for example, a harvester head could be attached to an excavator, thereby extending the utility of the base equipment.[[19]](#footnote-19) Not surprisingly, the top five global construction equipment manufacturers (Caterpillar Inc., Komatsu Limited, Hitachi, Ltd., Volvo Construction Equipment, and Terex Corporation) offered a full range of standardized equipment for road building, along with specialized machinery for harvesting, extracting, and loading operations. Hence, they were formidable competitors for firms focused only on harvesting equipment. Equipment designed solely for harvesting, extracting, and loading operations was developed initially in Sweden and Finland, and the leading manufacturers of such equipment were still the Nordic firms—Ponsse OYJ (Ponsee), Rottne Industri AB, Eco Log Sweden AB, Gremo AB, and Logset. Of these, Ponsse was the largest, with sales of over 700 specialized machines per year (see Exhibit 6).

There was little to differentiate the products of one manufacturer from another, although the Nordic equipment was preferred because the machines were technologically more advanced, lighter, and more economical to operate. Nonetheless, all of the manufacturers tended to focus their design efforts on improving (a) reliability to reduce the number of breakdowns and the cost of maintenance, (b) engine efficiency to reduce fuel consumption, and (c) operator training to allow for troubleshooting in the forest. Two new developments were being pursued: equipment for mechanized re-seeding (scarifiers, planting machines, silviculture and biomass heads, and felling heads) and tethered or winch-assisted logging systems for steep slope logging.[[20]](#footnote-20)

Suppliers to the industry were numerous, as most of the components were standard off-the shelf items (e.g., tires, tracks, diesel engines, drives, and control systems). However, the installed computer system that handled all of the machine operations, including management reporting, was a custom application.[[21]](#footnote-21)

Buyers had little control over price, but they did have choices. Buyer considerations included increasing production, reducing fuel consumption, durability, and ease of operation. Ease of operation was a consideration because of a shortage of skilled operators.[[22]](#footnote-22) In support of this need for skilled operators, all of the major manufacturers had developed forest machine simulators for enhanced operator training on harvesters and forwarders.[[23]](#footnote-23)

For Canadian buyers, two other considerations were import duties and safety. With the exception of machines purchased from Tigercat International Inc. (Tigercat)—the only Canadian manufacturer of harvester equipment—all other machine purchases were subject to import duties. The Canada–United States Free Trade Agreement of 1989 eliminated import duties on machines imported into Canada from the United States, and it was hoped that the implementation of the 2014 Canada–European Union Comprehensive Economic and Trade Agreement would do the same for machines imported from the European Union. Removing the import duties on forestry equipment from Europe would make Nordic equipment more attractive to buyers in terms of price, and would also improve the attractiveness of the industry for suppliers.

Machines with remote control capability were of interest for safety reasons. Injury rates in the forestry industry were a concern because they were typically higher than in other industries. In British Columbia, for example, the injury rate in the forestry industry was almost double that of all other industries (in 2012, the injury rate per 100 workers was 5.0 compared to 2.3 for all other industries).[[24]](#footnote-24) Operators of feller bunchers and harvesters, for example, worked from the safety of an enclosed cab, which reduced the chances of injury from falling trees or branches.

The most common substitutes for specialized forestry equipment were in the form of modifications to standard construction equipment or used equipment (e.g., as noted, attaching a harvester head to an excavator mechanized the tree-felling process and turned an excavator into a dual-purpose machine). Used machines were often used as trade-ins on the purchase of a new machine, creating a ready supply of previously owned equipment. An inventory check of a major North American used equipment supplier over a four-month period showed the stability of this market (see Exhibit 7).

Logset’s Canadian Presence

Logset began investigating the potential of the Canadian market in 2000. The firm signed an agreement with Wajax Equipment (Wajax), a heavy equipment supplier to the mining industry, to provide forwarders in Eastern Canada. Corporate changes at Wajax ended this relationship within a year or two of signing. In 2015, Logset had one Canadian dealer who was responsible for the Quebec market and had been with the firm since 2009. Five agents had been added to the dealer network since 2009 to service the Ontario and New Brunswick markets. Some 15 machines a year were sold by the dealer/agent network of which 80 per cent of these were new. Forwarders typically cost CA$450,000 to $650,000, and wheel-based harvesters cost CA$800,000 to $1,000,000, including delivery.

The Canadian customer base represented 150 to 200 operators, many of which were small contractors with one to three machines. The most cost-effective solution for small operators was to mount a harvester head on an excavator rather than purchasing a full machine. The excavator could be used for other purposes, such as road building or snow plowing. The nature of the harvester head was such that it could fit on a harvester provided by Tigercat or TimberPro Inc., the two biggest competitors to Logset in the Canadian market. Customers would typically trade in their machines at the five-year mark, thereby creating a supply of used machines.

Réty believed customers sought out Logset machines because they were reliable and economical to operate, and they provided a comfortable ergonomic working environment for the operator. In addition, the relationship between Logset, the dealer, and the end user was one of trust that had been built over a number of years. Logset employees prided themselves on recognizing their customers’ faces. To ensure the firm’s equipment met the continuing needs of its customers, 12 employees were working with suppliers on a variety of research and development initiatives. [[25]](#footnote-25) The firm’s latest addition to its product portfolio, the 12H GTE Hybrid Harvester (a combination of a diesel engine plus a generator/electric motor), was the only one of its kind.[[26]](#footnote-26)

Logset wanted to increase its sales by an additional five to ten machines each year; the principal impediment to this goal was the lack of a dealer for Western Canada. The ideal dealer was difficult to source, especially from a distance, as this dealer would need good connections within the logging industry and a commitment to the Logset product line, along with significant financial assets. Canadian dealers had to have at least four new and one or more used machines on site, as well as €300,000 worth of spare parts in order to service the local market. (Delivery time on a new machine was upwards of four months, so dealers would sell from inventory. Spare parts could be delivered within four to five days out of Finland.)

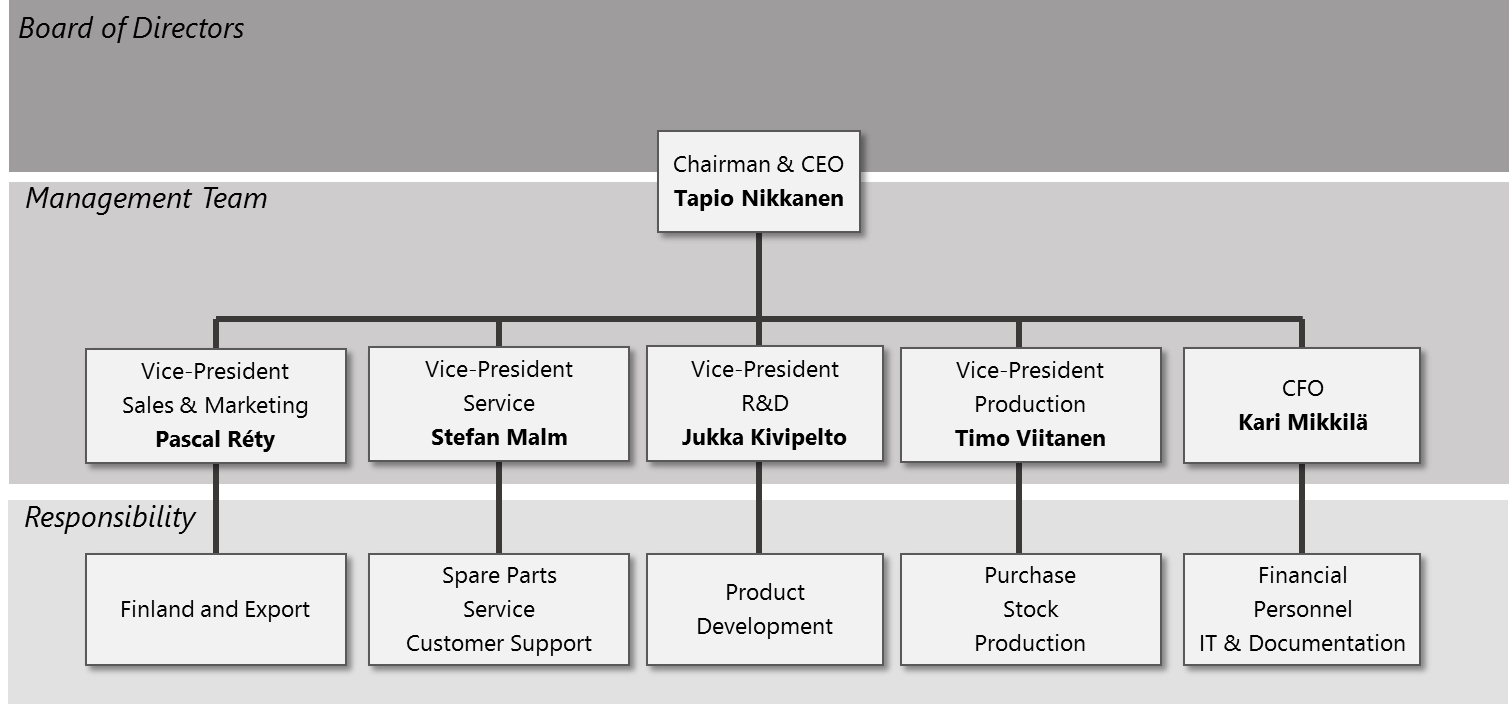
Dealer relationships were further challenged by the lack of direct contact with end customers (although personnel from Logset made regular visits to customer sites whenever they were in Canada) and the limited control Logset had over customer buying decisions, particularly as dealers could carry competing products. Recognizing that the lack of a dealer for Western Canada was an important problem for Logset, Réty was planning to attend the next Canadian Woodlands Forum. He hoped that by participating in this event, he might be able to recruit a Western Canada dealer from among the visitors and/or other exhibitors. Failure to recruit a dealer would probably mean the firm would need to look elsewhere for its next opportunity.

Exhibit 1: Logset Product Line

|  |  |
| --- | --- |
| **Forwarder** | **Harvester** |
|  |  |

Source: Company documents.

Exhibit 2: LOGSET COMPANY Organization Chart

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Note: R&D = research and development; CFO = chief financial officer; IT = information technology.

Source: Company documents.

exhibit 3: logset Dealer Network

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Note: Dots show dealer locations.

Source: Company documents.

exhibit 4: LOGSET Annual Turnover by Region (in €)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **2015 (estimated)** | **2014** | **2013** | **2012** | **2011** |
| **Finland** | 8,550,000 | 5,218,082 | 7,668,118 | 9,283,291 | 4,226,525 |
| **Europe** | 14,884,929 | 17,921,932 | 10,550,416 | 13,106,166 | 18,014,943 |
| **Canada** | 2,203,071 | 1,935,990 | 1,988,092 | 2,053,107 | 1,006,981 |
| **Other** | 3,950,000 | 3,653,878 | 3,230,176 | 3,437,098 | 7,422,146 |
| **Total** | 29,588,000 | 28,729,882 | 23,436,802 | 27,879,662 | 30,670,595 |

Source: Company documents.

EXHIBIT 5: TREE HARVESTING METHODS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Method** | **Description** | **Advantages** | **Disadvantages** | **Use in Canada** |
| **Cut-to-length** | Trees are cut off above the stump, the branches are removed, and trees are cut to various lengths before transport to the roadside | * Logging can be fully mechanized * Size of roadside landings can be minimized as branches are removed directly in the stump area * Easier to sort the cut lumber and less chance of damage or soil contamination during transport * Less ground disturbance and good protection of residual trees * Cut logs can be delivered to the mill directly | * Mill and truck fleet need to be configured for cut-to-length logs * High initial capitalization for harvester/forwarder equipment * Higher skill requirements for harvester/forwarder operators; can take up to two years for an operator to become fully proficient in the use of the equipment | 20% of the volume harvested east of Alberta;  dominant method in Nova Scotia |
| **Tree length** | Trees are felled, and the branches and tree tops are removed before transport to the roadside or central processing site | * Less mechanization so lower initial capitalization * Equipment tends to be more robust * Less operator training required * Ready availability of equipment and parts | * Roadside landings much larger than for cut-to-length * Moderate ground disturbance and moderate protection of residual trees * Higher moving and set- up costs when cut areas are small or widely dispersed * Can take up to four weeks for cut logs to be delivered to the mill due to the number of discrete operations and the mix of equipment needed to prepare the trees for the mill | Dominant method in Newfoundland, Manitoba, and Alberta |

Exhibit 5 Continued: Tree Harvesting Methods

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Full tree** | Trees are felled and transported with branches and top intact to the roadside or central processing site | Similar to tree length | * Requires largest roadside landings * Branches and tree tops accumulate at the roadside for burning/removal * Heavy ground disturbance and poor protection of residual trees | Dominant method in New Brunswick, Quebec, Ontario, Saskatchewan, and British Columbia |
| **Whole tree** | Full trees, including stump, are felled and removed to the roadside or central processing site | Similar to tree length | Similar to full tree | Seldom used in Canada |
| **Complete tree** | Full trees, including stump and major roots, are felled and removed to the roadside or central processing site | Similar to tree length | Similar to full tree | Seldom used in Canada |

Source: Created by the authors from Dr. Reino Pulkki, *Cut-to-Length, Tree Length or Full Tree Harvesting?* Lakehead University, Faculty of Forestry, accessed November 22, 2015, www.borealforest.org/world/innova/compare.htm.

EXHIBIT 6: MANUFACTURERS OF SPECIALIZED HARVESTING EQUIPMENT

A. Firms with Sales of 700+ Machines per Year

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Manufacturer** | **Country of Origin** | **Number of Distributors in Canada** | **Equipment** | **Strengths** |
| John Deere Construction and Forestry | United States | 3 master dealers with multiple locations in all provinces | Forward crawler dozers, feller bunchers, forwarders, harvesters, loaders, skidders, and felling heads | * Industry leader * Diverse product portfolio * Superior customer service * Tracked and wheeled machines * Flexible financing options * Final assembly in Finland for compact track loaders |
| Ponsse OYJ | Finland | 4 | Harvesters, forwarders, harvest heads, cranes, loaders, and information systems | * Research and development capabilities * Heavy-duty equipment, including an 8-wheeler harvester |
| Komatsu Forest  Construction, Mining, and Utility | Japan | 1 master dealer with multiple locations in all provinces, including the Northwest Territories | Harvesters, forwarders, feller bunchers, and harvest heads | * Tracked and wheeled machines * Final assembly in Sweden for compact track loaders |

EXHIBIT 6 continued: MANUFACTURERS OF SPECIALIZED HARVESTING EQUIPMENT

B. Firms with Sales of 50–150 Machines per Year

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Manufacturer** | **Country of Origin** | **Number of Distributors in Canada** | **Equipment** | **Strengths** |
| Rottne Industri AB | Sweden | 3 | Wheel-based harvesters and forwarders | * Harvesters have an articulated steering joint and a small turning radius for precise tracking |
| Tigercat International Inc. in an alliance with Wajax Equipment | Canada | 21 with Wajax Equipment dealers (all provinces but British Columbia and Prince Edward Island);  10 with Inland dealers in British Columbia and 2 with Redhead Equipment Ltd. dealers in Saskatchewan | Feller bunchers, track-based harvesters only, skidders, forwarders, loaders, loggers, felling and harvester heads | * Machines capable of felling full-length trees * Only supplier of high-speed, high-capacity shears * Heavier equipment with higher fuel consumption |
| Eco Log Sweden AB (purchased Caterpillar’s cut-to-length product line) | Sweden | 1 (New Brunswick) | Wheel-based harvesters, forwarders, and harvester heads | * Unique pendulum arm levelling system |
| TimberPro Inc. (family owned) | United States | 6 (Quebec, Ontario, Alberta, British Columbia) | Feller bunchers, track-based harvesters only, forwarders, harvester heads, skidders, and mulchers | * 360-degree continuous rotation combination machines with a quick detach boom that can be converted from a forwarder to a harvester in 10 minutes * Specialized, heavy- duty equipment |
| Gremo AB | Sweden | 0 | Wheel-based harvesters, forwarders, and one-harvester head | * Leading manufacturer in the 8- to 10-tonne load category * Tracks could be attached to the tires on the harvesters and forwarders for wet terrain |
| Logset Oy | Finland | 1 master dealer (Quebec) | Wheel-based harvesters, forwarders, and harvester heads | * Hybrid power technology |

Source: Company documents.

EXHIBIT 7: MARKET FOR USED forestry EQUIPMENT

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Month 1** | | **Month 2** | | **Month 3** | | **Month 4** | |
| **Manufacturer** | **Harvesters** | **Forwarders** | **Harvesters** | **Forwarders** | **Harvesters** | **Forwarders** | **Harvesters** | **Forwarders** |
| John Deere | 268 | 0 | 283 | 228 | 272 | 215 | 258 | 208 |
| Ponsse OYJ | 218 | 102 | 295 | 142 | 219 | 141 | 221 | 105 |
| Komatsu Forest | 77 | 51 | 136 | 75 | 118 | 78 | 77 | 56 |
| Rottne Industri AB | 0 | 38 | 37 | 37 | 39 | 42 | 33 | 39 |
| Tigercat International Inc. | 4 | 3 | 4 | 3 | 3 | 6 | 2 | 5 |
| Eco Log Sweden AB | 82 | 17 | 84 | 19 | 84 | 17 | 83 | 14 |
| TimberPro Inc. | 2 | 1 | 2 | 3 | 2 | 2 | 2 | 3 |
| Gremo AB | 0 | 10 | 17 | 10 | 17 | 12 | 16 | 14 |
| Logset Oy | 0 | 18 | 31 | 21 | 27 | 18 | 27 | 20 |

Source: Created by the authors using information from Mascus, www.mascus.ca/forestry, accessed between August and November 2016.

1. € = euro; all currency amounts are in € unless otherwise specified; €1 = CA$1.418925 (2015 average rate). [↑](#footnote-ref-1)
2. In 2005, Logset deviated from this approach by establishing a sales and service operation (Logset Ltd.) in the British Isles. This business model was never a financial success and was later discontinued. [↑](#footnote-ref-2)
3. Natural Resources Canada, *The State of Canada’s Forests: Annual Report 2014*, accessed November 18, 2015,

   http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/35713.pdf. [↑](#footnote-ref-3)
4. Ibid. [↑](#footnote-ref-4)
5. Peter Lee, “Backgrounder: Canada’s Commercial Forest Tenures,” 2004, accessed November 5, 2017,

   https://www.globalforestwatch.ca/sites/gfwc/files/news\_releases/Archive/20040405A\_tbkgrndr.pdf . [↑](#footnote-ref-5)
6. “Forest Land Ownership,” Natural Resources Canada, accessed November 5, 2017,

   www.nrcan.gc.ca/forests/canada/ownership/17495 [↑](#footnote-ref-6)
7. “Forestry: Productive Forest Land Use,” Natural Resources Canada, accessed November 18, 2015, www.nrcan.gc.ca/earth-sciences/geography/atlas-canada/selected-thematic-maps/16874#forestdistribution. [↑](#footnote-ref-7)
8. Natural Resources Canada, *Annual Report 2014,* op. cit. [↑](#footnote-ref-8)
9. Ibid. [↑](#footnote-ref-9)
10. Ibid. [↑](#footnote-ref-10)
11. Sustainable Forest Management in Canada, “Harvesting Practices: Managing Canada’s Forests,” accessed November 18, 2015, www.sfmcanada.org/en/forest-products/harvesting-practice. [↑](#footnote-ref-11)
12. Stephen Long, “Three Logging Systems: Matching Equipment to the Job,” Northern Woodlands, August 26, 2011, accessed July 11, 2017, http://northernwoodlands.org/articles/article/three-logging-systems-matching-equipment-to-the-job. [↑](#footnote-ref-12)
13. US$1 = CA$1.279163 (2015 average rate). [↑](#footnote-ref-13)
14. “World Forestry Equipment,” Freedonia, June 2015, accessed December 27, 2015, www.freedoniagroup.com/brochure /32xx/3270smwe.pdf. [↑](#footnote-ref-14)
15. Ibid. [↑](#footnote-ref-15)
16. “Looking to the Future in Logging Equipment,” *Journal of Logging and Sawmills,* *TimberWest,* July–August 2013, accessed December 27, 2015, <http://forestnet.com/TWissues/2013_july_august/looking_to_the_future.php>. [↑](#footnote-ref-16)
17. Ibid. [↑](#footnote-ref-17)
18. “North American Industry Classification System (NAICS) Canada 2012,” Statistics Canada, accessed December 27, 2017, www23.statcan.gc.ca/imdb/p3VD.pl?Function=getVD&TVD=118464 [↑](#footnote-ref-18)
19. Companies were increasingly moving to the use of specialized forestry equipment for the comfort of the operator. [↑](#footnote-ref-19)
20. In steep slope logging (slopes greater than 35 per cent for wheeled machines and 40 per cent for tracked machines), tethered or winch-assisted logging was less costly than helicopter logging for high-value timber. Operators in New Zealand, Chile, and the Pacific Northwest were using this type of equipment; Tigercat, *Between the Branches* 40 (2015): 8–9. [↑](#footnote-ref-20)
21. Although each manufacturer would customize the software for its own equipment, the base programs followed the standards set by the Scandinavian manufacturers. [↑](#footnote-ref-21)
22. “Looking to the Future in Logging Equipment,” op. cit. [↑](#footnote-ref-22)
23. Buyers would invest in simulator training because well-trained operators were more productive and caused less machine damage than those with little training. [↑](#footnote-ref-23)
24. “Forest Industry Claims Statistics 2008–2012,” WorkSafeBC, accessed July 11, 2017, https://online.worksafebc.com/anonymous/wcb.ISR.web/IndustryStatsPortal.aspx?c=2; Please note this is a searchable site that requires applying a set of filters to display the data. The two filters used were: Industry Classification (Industry Group) and Industry Selection (DR01 Forestry). [↑](#footnote-ref-24)
25. The firm had approximately 100 long-term suppliers with which it collaborated on new products. [↑](#footnote-ref-25)
26. However, Logset’s advantage would be relatively short lived, as Réty expected that within six years, its competitors would also have hybrid machines. [↑](#footnote-ref-26)