

PROJECT REPORT

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**LOG SUPPLY CHAIN AUDIT:
A SURVEY OF CUSTOMER
SATISFACTION**

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TABLE OF CONTENTS

TABLE OF CONTENTS.....	III
EXECUTIVE SUMMARY.....	IV
INTRODUCTION.....	I
A CASE STUDY: MEASURING SUPPLY CHAIN PERFORMANCE BY MEASURING CUSTOMER SERVICE.....	5
METHOD.....	5
ACKNOWLEDGEMENTS	5
RESULTS	5
DISCUSSION AND CONCLUSIONS	9
REFERENCES.....	12
APPENDIX.....	13

EXECUTIVE SUMMARY

In a forestry context, “the Supply Chain (SC)” can be said to refer to the connected processes by which standing trees are transformed into products ultimately for the consumer. The practice of SC Audit is not well established. New Zealand’s two largest forestry companies are currently implementing Supply Chain Management (SCM) in their businesses as part of major investments in Enterprise Resource Planning (ERP) software.

There is one measure of performance by which any group of business processes can be measured: that of customer satisfaction. In a forestry context, and to some extent in any raw material supply business, there are three principal dimensions of customer satisfaction: Product volume, Timeliness, and Quality.

This report provides the results of a confidential survey of nine customers, that is, sawmills, regarding their log supply. Because of its confidential nature, neither suppliers nor their customers are identified.

Key findings:

Volumes

There is room for improvement in the supply of exactly what is ordered. Only 50% of orders were delivered in full. Which does not indicate a high level of success.

Timing

Most orders were delivered on time. There is little room for improvement here.

Quality

There is some dissatisfaction evident with log quality. Only 64% of orders met expectations, allowing for 5% out-of-specification logs. This result would suggest that suppliers still have some way to go in terms of meeting customers’ expectations. Most stated reasons for dissatisfaction were related to log freshness. Others included measurement issues such as wrong length, or assortment issues such as “average SED requirement not met”.

Inventory issues

Inventory levels varied from two day’s to one week’s supply. Two-thirds said they would reduce their inventory levels if supply could be guaranteed.

The most requested desired “guaranteed” feature was log freshness. Other important features included, age class, and wood density.

Additional information about individual logs, or loads

Most respondents wanted hard data on pruned log quality such as Pruned Log Index data (PLI) and silvicultural treatment; presumably so that they could compare the relative values of logs having had different treatment, and match returns to log costs.

A common request was a reliable indicator of freshness, along with basic stand data such as age at clearfell, and compartment or location.

Communication

Communication between supplier and customer seems well established, with most communicating on a regular weekly basis with provision for flexibility.

The use of a customer service satisfaction report is a positive step forward in improving communication between customer and supplier organisations.

Additional services

These features of the relationship could be seen as gestures of goodwill, or as a another form of communication. Of particular value to the customer are:

- newsletter and information access
- reciprocal visits by harvesting and mill staff
- extra-contractual supply
- flexibility of supply eg. outside normal hours
- rapid change of specifications

Customer Service, Added value and product differentiation

The results of this limited survey indicates the potential for log suppliers to either improve their customer service, differentiate their products and/or add value for their customers by:

- improving log quality
- guaranteeing supply volumes, timing of delivery, and log freshness
- using sophisticated harvesting methods to provide requested SED distributions
- improving communication systems
- formalising extra-contractual services

INTRODUCTION

Because of the adoption of SCM approaches to business by our leading forestry companies (as well as many of the world's largest corporations) there is a need to examine some of the implications for the harvesting sector of the industry.

This report attempts this, and is comprised of two parts. The first section addresses the definition of commonly used supply chain-related terms, and the relevance of the "supply chain approach" to those involved in harvesting. The second part describes the results of a survey which attempted to measure the effectiveness of supplier logistics from a customer viewpoint. Also, comment is made on the kind of information that these customers would find useful for their business.

Definitions

"Business begins and ends with the customer" - is a phrase which encapsulates one of the most common approaches of business management philosophy today, and echoed by Christopher (1994) "The ultimate measure is the customer". This is can be expanded to a recently expounded definition of SCM :

"The delivery of enhanced customer and economic value through synchronised management of the flow of material and associated information from point of origin to consumption" (Langley, 1998).

A textbook definition (Slack *et al.*, 1995) may be helpful in defining what is meant by a supply chain :

"A Supply Network is a term used to describe all the operations which can be linked to provide the supply of goods and services to an operation, and the demand for its goods and services, through to the end customers. Goods and services can be said to "flow" through this network along individual channels or strands

The product flow within these network operations can be described as an "immediate" supply chain. A supply chain is a component of a supply network.

A Supply Chain then, consists of a single strand of linked operations through which goods and services flow into, and out of, an operation."

Slack *et al.*, (1995) also prioritises the objectives of supply chain management as:

1. To focus on satisfying end customers.
2. To formulate and implement strategies based on capturing and retaining end-customer business.
3. To manage the chain effectively and efficiently.

There is one measure of performance by which any group of business processes can be measured: that of customer satisfaction. In a forestry context, and to some extent in any business, there are three principal dimensions of customer satisfaction: Product volume, Timeliness, and Quality. They are included in the five dimensions that comprise "the perfect order", the others being: Lack

of downgrade, and At least total cost (Langley, 1998). In a sense, this “quality of order fulfilment” is also an aspect of inventory control, a major concern of logistics (Mentzer and Konrad, 1991).

Coincidentally, these dimensions also provide a measure of logistical performance. Having achieved these dimensional goals, an organisation can then work at fine-tuning contributing processes to meet those goals at minimal cost (and perhaps with the aim of adding more value for their customers). The area of customer service can be extremely complex, Hansen *et al.*, (1996) constructed a five dimension, 80 item model for assessing the customers of sawn timber suppliers. The five dimensions were: Supplier or salesperson characteristics, Supplier services, Supplier facilities, Lumber performance, and Lumber characteristics.

Supply chains in a forestry context

In a forestry context, “the Supply Chain (SC)” can be said to refer to the connected processes by which standing trees are transformed into products for the ultimate consumer. In business management literature, most references to SCM refer to manufacturing industries, where sharp distinctions can be drawn between suppliers and manufacturing operations. In forestry the distinction is less clear cut.

New Zealand’s two largest forestry companies are currently implementing SCM in their businesses as part of major investments in Enterprise Resource Planning (ERP) software. This means that the auditing of discrete chains of integrated processes is not yet possible.

The framework for the supply chain is a horizontal rather than a vertically integrated one. Vertical integration implies full or partial ownership of upstream suppliers and/or downstream customers, while horizontal integration involves a focussing on “core” activities, and the outsourcing of everything else. The restructuring of harvesting functions into “key supplier” units is a development of this process. A “possible” structure of part of the harvesting supply chain is shown in Figure 1.

The reality is that many forest owners are adopting the principles of what has been defined as supply chain management, and restructuring their businesses accordingly. Other large (and larger) businesses overseas are not doing this voluntarily, but are being forced to reconfigure to stay competitive. In changing, they are recognising the notion that “customer relationships and customer service are the key to long-term profitability”. Effective customer service is being seen as being generated largely by “logistics systems that enable consistent delivery of the service package” (Christopher, 1994).

Why should logging contractors and managers be concerned with supply chain management and logistics?

In large-scale plantation forestry, the contractor is placed close to the start of the supply chain (after the administration of order-taking, and harvest planning, by the forest owner). This puts the contractor in the position of “supplier” of services to the forest owner, which could include delivery of the product to the “customer” further downstream.

It is important that the contractor considers both the forest owner’s needs, and those of the customer. The relationship is becoming more symbiotic, in the sense that each “partner” is

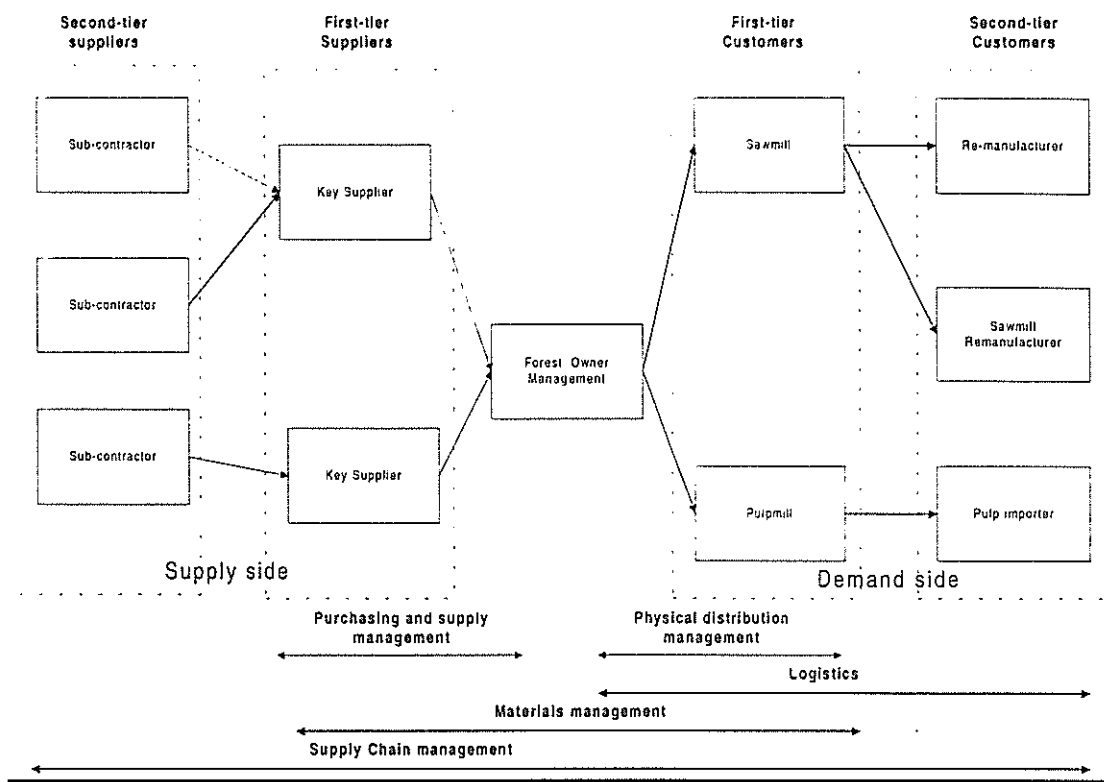


Figure 1. Some of the terms used to describe the management of the supply chain, with forestry context applied by the author (after Slack et al., (1995))

dependent on the other for his welfare. Logistically-speaking, the contractor must perform in order to both stay in business in the short term, and ensure the sustainability of the larger partnership in the longer term. It follows that the contractor must have an appreciation of measures of logistical in order to meet standards with regard to volume, timeliness and product quality, or manage improvements.

The harvesting manager, as intermediary between customer and supplier must facilitate the “partnership” from the forest owner’s perspective, enabling the supplier to function efficiently. As the contractor, in most cases, is not in full control of all supply-related functions (order processing, stand allocation, harvest planning, inventory control and distribution) the manager must enable the contractor to operate efficiently. Logistical systems will enable this by providing the appropriate tools. It also follows that supply-related functions under management control should be measured, monitored and managed to an appropriate standard because they are part of the service to the customer or end-user.

Measures of supply chain/logistical performance

The measurement of supply chain performance is commonly referred to as benchmarking, although this implies a comparison between one’s own performance and that of another business.

Competitive benchmarking can be defined as the continuous measurement of a company’s products, services, processes and practices against the standards of best competitors and other companies that are recognised as leaders (Christopher, 1994). The measures that are chosen must directly or indirectly affect customer’s evaluations of the company’s performance:

- the ultimate measure is the customer
- compare with the “best in the class”
- both outputs and processes must be measured

Christopher identifies three main types of benchmarking activity:

1. Customer Service
2. The Logistics process
3. Supplier and Distributor

Chow *et al.*, (1994) suggested that the main issue with measurement of logistical performance is that performance is multi-dimensional, and that a number of performance measures, both hard and soft, are required to adequately describe the logistics process.

“Hard” and “soft” measures are proposed by Chow *et al.*, Hard measures include:

- Raw financial statistics - eg. net income, gross sales. Advantages are: the statistics are easy and inexpensive to collect; comparable between organisations; accurate; include important dimensions of performance.
- Cost statistics - eg. transport cost, standard labour cost. Disadvantages are problems with: time intervals; different accounting methods; aggregation; and confidentiality.
- Input/Output measures (performance indicators) - eg. the number of shipments per vehicle hour. These can be used to evaluate goal attainment.
- Quality measures - eg. order cycle time. These have the potential for narrow focus, poor data availability, and may not be comparable.

Soft measures mainly hinge on “customer satisfaction” and also have inter-organisation comparability problems. A method for improving validity of comparison is the use of the “Churchill paradigm” (Churchill, 1979). It consists of a number of carefully ordered steps by which literature searches, surveys and analysis are linked together in a coherent and justified sequence.

Benchmarking priorities:

What to measure? The processes and outputs that:

- are of strategic importance
- have a high relative impact on the business
- offer a choice between “make or buy”
- have an internal readiness to change

The ultimate guide to what to measure is the effect that an activity or function has on competitive advantage.

A CASE STUDY: MEASURING SUPPLY CHAIN PERFORMANCE BY MEASURING CUSTOMER SERVICE

Despite being a “soft” measure, customer service has an importance in the SCM environment that makes it a key concern. Accordingly, it was decided to examine this aspect of the supply/chain/logistical process.

The main three dimensions that were used to measure customer satisfaction:

1. Does the ordered product arrive in the right quantities?
2. Does it arrive at the right time?
3. Does it have the right specifications?

Additional emphasis was placed on the supplier forwarding information to aid the customer’s operation, and on the customer giving feedback to ensure that the supplied product continues to meet requirements.

METHOD

A confidential questionnaire was prepared and submitted to ten sawmills in the central North Island (CNI) area (Appendix). To ensure that there was no perceived ambiguity, each site was visited and the meaning and purpose of the questionnaire explained.

Respondents were asked to comment on a recent week’s orders, and to outline types of log-related information which they would find useful for their businesses.

ACKNOWLEDGEMENTS

The cooperation of the mill managers who completed the survey forms was essential to the successful compilation of this report. Also helpful was the advice of Dr. Louw van Wyk of Forest Research, Rotorua.

RESULTS

The nine mills (combined input requirements of approx. 0.8 million tonnes of logs/yr) that replied to the survey, ranged in input capacity from 30 000 to 360 000 tonnes of logs/year (Table 1). Most of the mills mixed logs from different suppliers, meaning that it would be difficult to attribute poor lumber outturn to logs from a particular supplier. Sometimes though, a mill receiving logs from a first-time supplier, or a new area, would batch process a load to test the recovery of target products. Most had a large proportion (70 to 95%) of their inventory sourced from their 3 largest suppliers.

Matching received volumes with ordered volumes

A total of 53 orders (612 loads) were assessed. Thirteen orders were over-delivered, and average volume over-delivery per order was 27% (range: 7 - 100%). Eleven orders were under-delivered, with an average under-delivery of 39% per order (range: 1 - 90%). Fifty-five percent of orders were delivered with the requested volume (Figure 2).

Table 1. Description of processors

Processor	Volume processed (tonnes/yr)	Batch process by supplier or grade	Supplier Split: % of volume	
			major	minor
1	58,000	Grade	80	20
2	30,000	Grade	80	20
3	45,500	supplier and grade	90	10
4	56,000	supplier and grade	95	5
5	54,000	Grade	95	5
6	85,000	Grade	70	30
7	86,000	Grade	98	2
8	43,000	supplier and grade	100	0
9	356,000	Grade	91	9

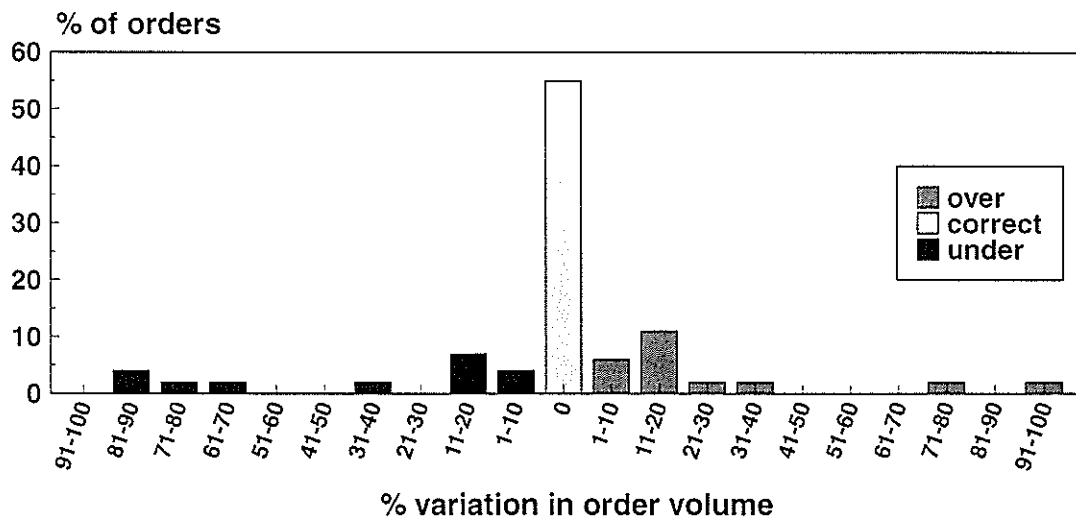


Figure 2. Order performance, in terms of volume matching

With some mills, over-delivery of loads was accepted as fitting within the contractual arrangement. A disadvantage of this situation was that in warm, wet weather there would be more chance of sapstain degrade occurring in their stocks. Over-delivery was also disruptive to efficient management because it affected both quality control operations and the scheduling of batches for processing.

In answer to a question regarding supply restrictions, the answers reflected a general concern over pruned log availability, and quality. In winter, in areas with high rainfall or rough terrain, supply could sometimes be a problem.

Timing of arrivals

Ninety percent of orders were delivered on time. The 10% of poorly timed orders included a five-day period when for two orders, 2 loads per day were requested: the arrival volumes were 0, 4, 3, 1, and 2 loads per day.

Quality

In terms of log quality, 64% of orders were of satisfactory quality i.e. meeting expectations (e.g. 95% to specification).

Answers given: the remainder were not up to quality expectations for reasons of:

- bush lengths out
- too close to minimum SED
- some sapstain present
- too old
- blemishes in pruned wood present
- low density
- too many logs out-of-specification
- 3 loads, each with 50% of the logs the wrong length

Inventory, and the issue of guaranteed supply

Respondents were asked if they would reduce inventory levels (a cost against the business) if supply was guaranteed.

Inventory levels varied from two days to one week's supply. Two-thirds of respondents said they would reduce inventory levels if supply was guaranteed.

Guaranteed quality

Respondents were asked what guaranteed log qualities they would like. Answers are listed below:

- freshness (x4)
- wood density
- age class of the tree
- felling dates suspect - mark at felling face, not at the skid.
- longer term pricing (not quarterly)

The most common request was for fresh logs. Other requests were for longer term supply-price contracts and wood density data.

Additional desired information about individual logs or loads

When asked what additional information would be useful, the following answers were received:

Pruned logs

- silviculture records (x3)
- PLI records (x2)
- number of logs per load
- age at clearfell
- Lengths mix

Unpruned logs

- Age
- No. of logs/load
- Length mix
- Diameter range
- Branch index

Other desired information

- Density and age class (x2)
- log length predictions for random lengths (1 month ahead)
- longer term pricing (not quarterly)
- longer term outlook, volumes and grades
- source compartments/areas
- tonnes to m³ conversion factors

Nature of communication between customer and supplier

Respondents were asked to comment on communication between themselves and their suppliers.

Answers:

- By phone weekly, or at need. Customer Satisfaction Rating Report sent with each week's order.
- Weekly, bi-weekly faxed log order: Returned with confirmed orders and delivery dates.
- ISO 9002 for non-conformance of grade or delivery. Informal phone call every 2 days, discussion etc. Other suppliers get a weekly phone call.

- Weekly delivery requirements - 2 weeks ahead. Weekly confirmation. Weekly informal phone call and site-visit by supplier. Three-monthly price negotiation.
- Weekly fax to confirm next week's requirements. Phone calls to arrange day-to-day deliveries. Monthly reconciliation of out-of-specification logs. Reciprocal visits to operations.
- Weekly phone calls (sometimes daily). Reciprocal visits. Three-monthly meetings/negotiations. Weekly quality reports to suppliers.

Most communication was on a weekly basis, by fax and by phone. Occasionally communication was daily. A new development is a customer satisfaction report provided by one supplier, returned on a weekly basis. Others aggregated reports of out-of-specification logs and sent them monthly to their supplier for a credit payment.

Additional services from suppliers

Respondents (sawmillers) were asked whether they received additional services from log suppliers.

Answers:

Nearly half the respondents considered that their main suppliers did not provide extra services beyond contractual arrangements. The others reported the following services:

- total volume predictions several years ahead
- alterations to specifications on request
- volume fluctuations to control mill stock
- delivery time alterations
- newsletter and information access
- forest visits by mill workers
- mill visits by logmaker
- occasional supply of pruned logs (not included in contractual agreement)
- delivery outside of normal hours if needed
- debarked log supply when problems with mill debarker.

DISCUSSION AND CONCLUSIONS

The sample orders indicate the following:

Volumes

There is room for improvement in the supply of exactly what is ordered. Only 50% of orders were delivered in full, which does not indicate a high level of success.

This must be tempered by the situation where there may be a shortage of a specific log product, and the mill concerned would happily take all that it could get, in excess of its regular order.

Timing

Most orders were delivered on time. There is little room for improvement here.

Quality

There is some dissatisfaction evident with log quality. Only 64% of orders met expectations, allowing for 5% out-of-specification logs. This result would suggest that suppliers still have some way to go in terms of meeting customers' expectations. Most stated reasons for dissatisfaction were related to log freshness. Others included measurement issues such as wrong length, or assortment issues such as "average SED requirement not met".

The supplier is able to influence the minimum dimensions of logs supplied by giving harvesting crews the requested specifications and monitoring log quality. The distribution of log SEDs supplied depends more on competing grades and the characteristics of the stands the harvesting crews have been assigned. Suppliers with mechanised processing crews, or those with optimising calipers, have more ability to control the distributions of log SEDs and lengths (as is now done in Sweden). With a more sophisticated log supply policy, however, there may be changes to pricing structures.

Inventory issues

Inventory levels varied from two day's to one week's supply. Two-thirds said they would reduce their inventory levels if supply could be guaranteed.

If supply could be assured to this level, this could be an additional service provided to customers.

The most requested desired "guaranteed" feature was log freshness. This suggests that a premium might be paid by customers for logs of varying levels of freshness, perhaps reflecting the extra effort necessary to maintain this kind of supply. Other important features included, age class, and wood density.

Additional information about individual logs, or loads

Most respondents wanted hard data on pruned log quality such as Pruned Log Index data (PLI) and silvicultural treatment; presumably so that they could compare the relative values of logs having had different treatment, and match returns to log costs.

Most of the information requested would be easily obtained since most suppliers maintain extensive databases on their resource. A common request was a reliable indicator of freshness, along with basic stand data such as age at clearfell, and compartment or location.

Communication

Communication between supplier and customer seems well established, with most communication on a regular weekly basis with provision for flexibility.

The use of customer service satisfaction reports is a positive step forward in improving communication between customer and supplier organisations. A further step might be an informal linkage between the mill and the harvesting contractor. This may work better in a key-supplier environment, where more responsibility has been devolved to the contractor.

Additional services

These features of the relationship could be seen as gestures of goodwill, or as a another form of communication. Of particular value to the customer are:

- newsletter and information access
- reciprocal visits by harvesting, and mill staff
- extra-contractual supply
- flexibility of supply eg. outside normal hours
- rapid change of specifications.

Some of these services could be formalised by the supplier in the sense of forming part of the contractual package. This would reinforce the notion that the supplier-customer relationship was not just a purely financial one. This may lead to advantages in dealing with a particular supplier that could be worth either a higher price, or the loyalty of a customer.

Customer Service, Added value and product differentiation

The results of this limited survey indicates the potential for log suppliers to either improve their customer service, differentiate their products and/or add value for their customers by:

- improving log quality
- guaranteeing supply volumes, timing of delivery, and log freshness
- using sophisticated harvesting methods to provide requested SED distributions
- improving communication systems
- formalising extra-contractual services.

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APPENDIX

Liro Confidential Supplier Quality questionnaire:

- 1. What volume of wood did you process last year? (m3 and tonnes)
- 2. Do you saw/process your logs by supplier, or by log grade?
- 3. What is the percentage split between your regular suppliers and your intermittent suppliers?
- 4. Orders - from your three largest suppliers:

What volumes of which grades of log did you order last week? eg. 5 loads, 125m³ of 6.1m S1 sawlog. Were there any additional specifications for these grades?

4.1.

Loads or Volume	Grade	Xtra spec.

4.2.

Loads or Volume	Grade	Xtra spec.

4.3.

Loads or Volume	Grade	Xtra spec.

- 5. Did you receive what you ordered, from each supplier:

In terms of volume or loads?

5.1.

Loads or Volume	Grade	Volume OK?	Notes

5.2.

Loads or Volume	Grade	Volume OK?	Notes

5.3.

Loads or Volume	Grade	Volume OK?	Notes

6. Did the ordered volume arrive at the requested time/s, from each supplier?

6.1.

Grade	Time OK?	notes

6.2.

Grade	Time OK?	notes

6.3.

Grade	Time OK?	notes

7. Did the qualities (including specifications) of the ordered logs meet your expectations ?

7.1.

Grade	Quality OK?	Notes

7.2.

Grade	Quality OK?	Notes

7.3.

Grade	Quality OK?	Notes

8. Supplementary questions:

- 1. Is your operation subject to seasonal supply? Are there any other restrictions to supply?
- 2. What level of log inventory do you carry? (days and tonnes)

If you were given guaranteed supply (in terms of volumes and delivery times), would you reduce your inventory levels?

What other “guaranteed” features or specifications would be desirable?

3. What additional information about either individual logs, or loads, would you find useful for your business?
4. What systematic formal/informal communication or feedback exists between yourself and your supplier/s?
5. Do your suppliers help your business by providing additional service/s not included by contractual arrangement? For example: