

## The Commercial Survey - Results and Interpretation

A database of commercial and semi-commercial suppliers in Northland was compiled from the Yellow Pages, local newspapers and noticeboards. All suppliers in Whangarei who were found through other sources were also advertising in the local paper and so local papers were used to identify suppliers in the rest of Northland. Copies of all papers in the Northland region were analysed over 4-6 weeks in April and May 1994, a period when fuelwood sales are good as consumers stock up for the winter. It is believed that all major suppliers in Whangarei were identified and contacted. The data maybe less complete for the other areas.

Suppliers were asked for the quantity of fuel supplied over a twelve month period, the type of fuelwood supplied and the source of the fuel. Most suppliers were prepared to divulge this information though some were hesitant, a few chose not to and some were not contacted.

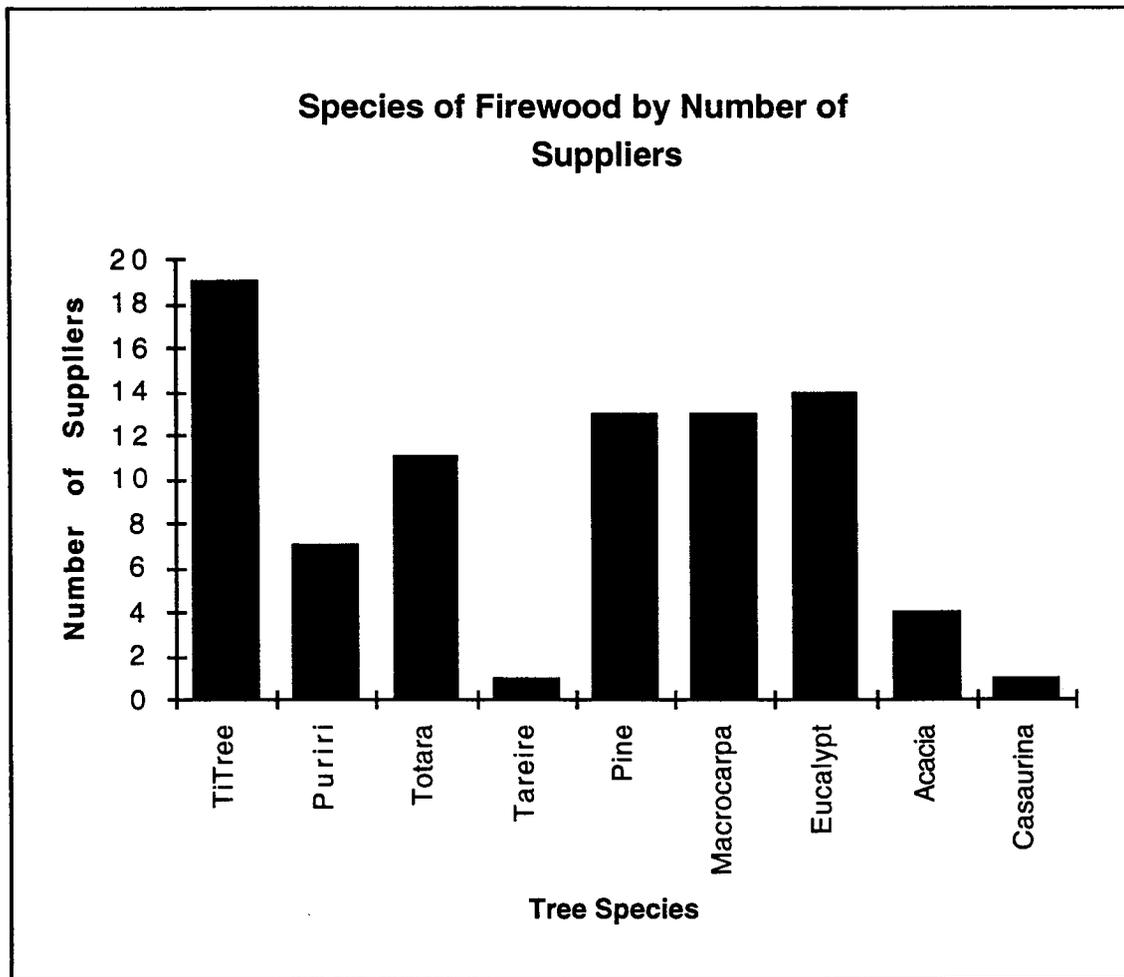
Fuelwood types included ti-tree, totara, puriri, macrocarpa, eucalypt, pine and acacia. The hotter burning woods are preferred by the consumer but are also more expensive. Prices ranged from \$25/m<sup>3</sup> for pine mill slab, to a maximum of \$55/m<sup>3</sup> for ti-tree. Most of the hardwoods sold for between \$35 and \$50/m<sup>3</sup>.

Table 2 Summary of fuelwood species and number of suppliers

<u>Species</u>	>>> No of Suppliers	T i T r e e	P u r i r i	T o t a r a	T a r e i r e	P i n e	M' c a r p a	E u c a l y p t	A c a c i a	C a s a u r i n a	N o t S p e c
<u>Location</u>											
Whangarei	27	9	4	6	1	8	9	6	2	1	2
Kaitia	7	4	1			2	1	1			
Dargaville	7	2	1	3		1	1	5	2		
Far North	10	4	1	2		2	2	2			4
<b>Total</b>	<b>51</b>	<b>19</b>	<b>7</b>	<b>11</b>	<b>1</b>	<b>13</b>	<b>13</b>	<b>14</b>	<b>4</b>	<b>1</b>	<b>6</b>

Ti-tree was the most frequently offered fuelwood in Northland, with 19 of the 45 [42%] suppliers for whom species were identified, offering it. Next most popular were pine, macrocarpa and eucalypt (29-31 %), and then totara (24%), and puriri (16%). Table 2 shows these by area of Northland and Figure 7 shows it for the region.

Figure 7 Number of Suppliers offering fuelwood species.

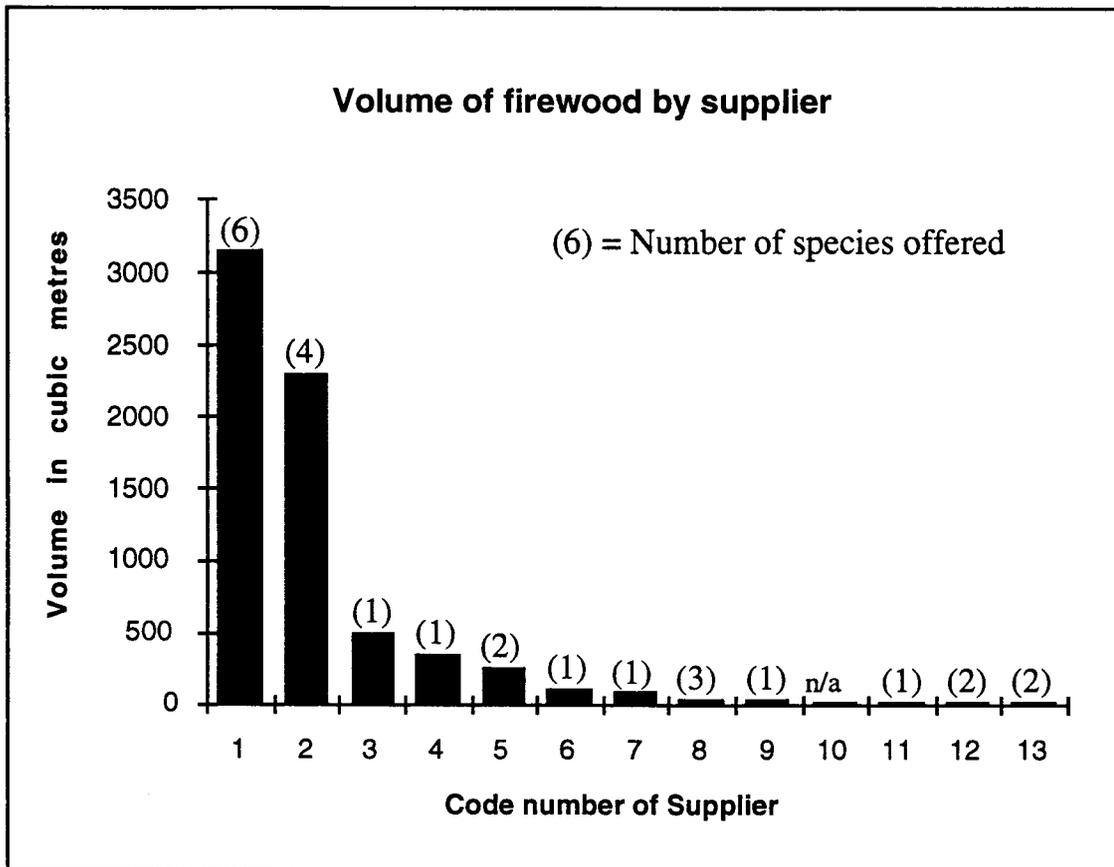


More detailed data was obtained for the Whangarei market. Twenty seven suppliers were identified and detailed data (refer Appendices for full data) was obtained for thirteen of them, including it is believed, all the major suppliers. The total volume of fuelwood supplied to Whangarei consumers, by these thirteen suppliers was 6878 m<sup>3</sup>.

The fourteen who were not contacted or were not forthcoming were deemed to be small due to the minor amount of advertising they undertook and the few number of species offered. The average number of species supplied by the ten of the eleven small suppliers for whom this data was obtained was 1.5 species, compared to 5 species for the two large suppliers. For the 13 of the 14 suppliers for whom volumes were not obtained but for whom number of species offered is known the average number of species was 1.4 species.

The largest supplier sent around half of his fuelwood to Auckland and was therefore not the largest supplier to Whangarei consumers, though he still had around a third of the identified commercial sales. Two thirds of his

Figure 8 Volumes of Fuelwood by Whangarei Suppliers



his supply was macrocarpa and eucalyptus. These mostly came from old shelterbelts and small plantings that had been poorly managed and were thus unable to be processed for timber. He had also gained access to a large volume of eucalyptus that had been bound for export but had been rejected at the port by the purchasers. A third of his supply was ti-tree. He was also developing an area of just over 100 hectare of wasteland that is due for subdivision in ten to fifteen years as a source of fast rotation black wattle (*Acacia mearnsii*) which he intended to harvest at five years and then allow seedlings to come away again. He was also trialling a black wattle cross silver wattle (*Acacia dealbata*) that would hopefully have the fast, straight growing characteristics of black wattle with the coppicing ability of silver wattle.

The second major supplier sold 90% of their product locally and had around 45% of the identified market. Half of this was ti-tree and came from contractors who were clearing areas of over five hectares over periods of upto ten years within a 100 kilometre range of the city.

Many of the smaller suppliers of native fuelwood were sourcing it from cleaning up their own or others properties for the purposes of developing

pasture or forestry. Many commented on the 'near weed' status of totara in Northland with its ability for vigorous regrowth even in well developed pasture. Other fuelwood was coming from already dead species or removal of macrocarpa and eucalypt from fence lines and shelterbelts which had become too large. Some were clearing areas of bush larger than 5 hectares over a period of several years.

Figure 9 Range of fuelwoods available in Whangarei



Excluding the two major players who had nearly 80% of the identified commercial local supply between them, the average for the eleven minor suppliers (volumes 500 m<sup>3</sup> or less) was 168 m<sup>3</sup>, the figure for the smallest eight (volumes 100 m<sup>3</sup> or less) was 43 m<sup>3</sup>. If a low figure of 50 m<sup>3</sup> was allocated to the fourteen small suppliers for whom quantities were not obtained the resultant volume of sales in Whangarei would be close to 7500 m<sup>3</sup> (giving the two major suppliers a 73% share of the supply). A high figure of 150 m<sup>3</sup> would bring the total closer to 9000 m<sup>3</sup>.

We can judge the usefulness of these figures as estimates of the commercial fuelwood market in Whangarei by considering what the

The average volume of wood used by wood burning households was 3.71 m<sup>3</sup> which, if representative, gives a figure for urban Whangarei of 29,973 m<sup>3</sup>. The proportion of users who bought all their fuelwood from merchants (ALL BUY FM) was 25.7%, those who bought some from merchants and obtained some for free (BUY FM + FREE) was 21.7%. To estimate the proportion of fuelwood that was bought by Whangarei consumers we need to share this 21.7% proportionally between ALL BUY FM and ALL FREE according to the ratio of these two groups (25.7:33.6). This gives 35.1% of fuelwood was obtained from fuelwood merchants [refer to footnote 4]. Therefore the figure for fuelwood obtained from merchants would be 35.1% of 29,973 m<sup>3</sup> which is 10,522 m<sup>3</sup>. This figure is substantially higher than the lower estimate of 7,500 m<sup>3</sup> and higher even than the high estimate. There could be several reasons for this.

Firstly the allocation of only 50 m<sup>3</sup> to the fourteen small suppliers who were not contacted is probably too small, also some small part-time operators will have been missed if they only operated during other times of the year. Secondly the consumption figures rely on the accuracy of the householder to estimate their fuelwood usage and the variations in sampling of different areas could add some distortions if either areas of high or low purchasing consumers were under or over represented.

There was confusion on some Urban Survey forms concerning whether fuelwood from Friends and Family [FF] was bought, obtained free or both. 13.3% of users said that they both bought and obtained fuelwood for free from FF, while 31.5% said they only obtained fuelwood from FF for free and only 4.9% said they only bought from FF and did not get it free from them. While undoubtedly some did both buy and get it free from FF, as verified by some interviewers, there were several instances where respondents or the interviewer had written 'free' against FF BUY or a positive response to FF BUY had been subsequently crossed out, and FF FREE had been ticked. If this confusion was frequent but had gone unnoticed, then FF BUY would be overstated and the percentage ALL FREE would be higher, making the ratio ALL BUY FM : ALL FREE smaller, resulting in the ALL BUY FM share of the 10,700 m<sup>3</sup> figure being smaller.

Given these uncertainties the volume for Whangarei's commercial fuelwood supply probably lies towards the upper end of the range 7,500 m<sup>3</sup> to 10,700 m<sup>3</sup>.

## **Environmental Implications of Fuelwood**

To consider the environmental implication of fuelwood consumption it is necessary to translate volumes of fuelwood in to areas of land. A "rule of thumb" for fuelwood growth rates provided by the New Zealand Forest Service for a seminar on fuelwood production [1986] is 20  $\text{m}^3/\text{ha}/\text{year}$ . Fast growing fuelwood species planted at very close spacings can achieve yields of 270 to 300  $\text{m}^3/\text{ha}$  after eight years growth for Eucalyptus species, up to 510  $\text{m}^3/\text{ha}$  after ten years for Acacia species and 270  $\text{m}^3/\text{ha}$  after nine years for Pinus radiata.. Mean Average Increments (MAI) ranged from 10 to 60  $\text{m}^3/\text{ha}/\text{year}$  depending on species and spacings [Hosking, 1982].

A yield of 215  $\text{m}^3/\text{ha}$  was recorded for kanuka (*Leptospermum ericoides*) but with no age specified. The mean breast height diameter (12.3cm) and the mean height (16m) and stocking rate (3,170 stems/ha) would, if compared to tables of regenerating scrub in the East Cape, suggest an age of between 25 and 40 years [Bergin et al, 1993]. This would then give an MAI of between 5.4 - 8.6  $\text{m}^3/\text{ha}/\text{year}$ . A similar figure could be expected from manuka.

One commercial merchant achieved yields of 875-1525  $\text{m}^3/\text{ha}$  [Sands, 1994] but this figure is so much higher than the best plantation fuelwood that it is assumed that this is for felling mature eucalypts, macrocarpa, totara and other large tree species. Such specimens are likely to be at least 30 years old which would give an MAI of between 30-50  $\text{m}^3/\text{ha}/\text{year}$  which still appears high.

Using the 'rule of thumb' of 20  $\text{m}^3/\text{ha}/\text{year}$ , given that it is a low estimate for fuelwood plantations and a high estimate for manuka yields, an annual consumption of 84,151  $\text{m}^3/\text{year}$  by Northland householders would require around 4,000 hectares of mixed commercial fuelwood plantation and manuka forest.

Looked at another way the supply could be achieved through the annual clearance of 210 hectares [using a figure of 400  $\text{m}^3/\text{ha}$ ] of fast-growing fuelwood plantation every year with a regrowth time of around ten years covering a total area of 2000 ha, or around 400 hectares of mature manuka forest annually [using a figure of 215  $\text{m}^3/\text{ha}$ ] with a regeneration time of around 25 years, i.e. a total manuka forested area of 10,000 ha.

These estimates are not intended to describe the status quo as much current fuelwood comes from odd trees in paddocks or shelterbelts. However they are helpful in putting the volumes involved in perspective.

Using the figures from the Commercial Survey, around 35% [2393 m<sup>3</sup> of a total of 6878 m<sup>3</sup>] of the total quantified supply is ti-tree. If we assume a similar breakdown for consumers who do not purchase their fuelwood from merchants [refer footnote 4] this gives a ti-tree consumption for Whangarei of 10,500 m<sup>3</sup> [35% of 30,000 m<sup>3</sup>]. At a yield of 215 m<sup>3</sup>/ha this means Whangarei requires just under 50 hectares of manuka forest every year. An area of 1250 hectares would need to be managed on a 25 year cycle, allowing cleared areas to regenerate.

The proportion of suppliers in the rest of Northland who provide ti-tree is higher than Whangarei, therefore we will use a figure of 40% ti-tree for the total Northland market. A yield of 215 m<sup>3</sup>/ha means a regional fuelwood consumption of 84,000 m<sup>3</sup> requires over 150 hectares of manuka forest to be cleared each year, which with a 25 year regeneration period means around 4,000 hectares would need to be managed on a sustainable rotation extraction basis to supply Northland's current consumption of manuka.

However most manuka is not being felled and allowed to regenerate. But nor is it being cleared primarily for fuelwood but rather to change land use either to exotic plantations or pasture. However the profits from selling the fuelwood will make some marginal land economic to develop.

None of these figures include the ti-tree which is being supplied to the Auckland market and therefore the figures will be higher. Given comments by suppliers contacted that substantial areas are being cleared and sent to the Auckland market I would suggest the figure of manuka forest being converted to fuelwood will be between 200 and 300 hectares per year.

Figure 10 Ti-tree ready to head to Auckland



Northland has some 164,000 hectares of scrub, shrubland and dune vegetation, 13.6% of the total area. Its manuka forest is a major habitat for kiwi, has two species of native gecko one of which is endemic, as well as rare orchids and other plants [Daly, 1993]. No figures were obtained as to what area is specifically under manuka cover and may not exist, so it is hard to suggest what implications the clearance of 2-300 hectares per year of manuka would have on the overall ecology of Northland. Studies incorporating the use of G.I.S. would be able to shed light onto the extent of manuka forest and its rate of disappearance.

The Regional Plan requires that clearance of areas over five hectares requires a resource permit but it would appear that this may be being avoided by clearing large areas over a number of years. There is also clearance going on without permits and these are sometimes being dealt with after they come to light.

Several respondents to the commercial survey made unsubstantiated comments about large areas of scrub being cleared in several areas, including south of the Brynderwyns (where one area of 50 ha does have a resource consent for clearance), near Helensville and in the Far North. Two operators in Kaitaia indicated that they were sending ti-tree down to Auckland and given the distance involved the operations would likely be of a substantial size to justify the transport costs.

One forestry consultant commented that most of the big forestry companies are signatories to the Forest Accord and so were beholden to not clear areas of bush, but that many of the smaller and newer investors in forestry were not under that restraint [Page, 1994].

Both RF&B and DoC have expressed concern about the clearance of indigenous bush without sufficient consideration of their habitat value. Resource consents for clearance of bush are not currently notifiable but both DoC and RF&B are working to change this, at least so that consents for clearance of areas with significant conservation value are notified [Rowan, 1994, Winch 1994].

Initiatives such as the development of commercial acacia fuelwood plantations has the potential to take the pressure off the manuka resource by supplying the market with an equally hot burning fuel at reasonable cost, however it will take more than a new product to change the dominance of manuka in the market since fuelwood is not always the primary reason for it being felled.

## **Conclusion**

This study has endeavoured to establish the volumes of fuelwood being consumed in Whangarei and in the Northland region. Within the confines of the study this has been achieved though all figures are approximate and involve a number of assumptions which have been defined. Data from the Census has shown that the hypothesis that fuelwood usage is more prevalent in Northland than in the N.N.I. region used in the CFK report is borne out but the situation is not clear for Whangarei due to possible urban/rural variations that are masked in the CFK data. Fuelwood usage was shown to be more common in rural than urban areas, but any similar trend in volumes consumed could not be confirmed due to lack of data for rural consumers.

The research has supported the conjecture that manuka is a major fuelwood species, accounting for around 35% of Whangarei's commercial fuelwood supplies.

The commercial supply sector has been analysed and figures from that and from the Urban Survey have enabled us to develop some indicative figures for total volumes consumed, the area of land needed if fuelwood was plantation grown and the area of manuka forest that is being cleared to supply the volumes of ti-tree that are being consumed. It was noted that manuka is not necessarily being cleared for fuelwood but is often a by-product of land clearance for other purposes.

There are many areas where this study could be further developed, especially in the area of the impact on biodiversity of the loss of manuka forest. Also more detail is needed on consumption patterns and habits in the rest of Northland in order to study rural/urban variations.

Consumption by commercial users was not considered at all though it is noted that the Hikurangi dairy factory which Fitzsimons [1985] praised for its fuelwood plantation to provide all its heating needs has been closed down due to restructuring in the dairy industry.

Problems with the Urban Survey were identified though discrepancies due to sampling variations are reduced at the aggregate level that the results were mostly used at. The Commercial Survey was useful and could be extended to cover the other non-Whangarei suppliers especially in order to establish volumes of fuelwood going to Auckland. It would also be useful to survey Auckland fuelwood merchants cross check amounts of fuelwood coming out of Northland.

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## **Appendix 1      Chandler Fraser Keating Report**

The Chandler Fraser Keating Report [1989] conducted home interviews of 2402 households to examine the domestic use of wood and wood residues for fuel and sent a questionnaire to industrial wood fuel users. It divided the nation into five regions, grouping Northland with Auckland, Waikato, Hauraki Plains and Coromandel as the North North Island (N.N.I.).

Figures for the N.N.I. are as follows [national figure follow in brackets]  
58.7% (66.7%) had a wood burner facility

53% (49.4%) of these were open fireplaces - highest regional figure

18.4% (23.9%) were slow combustion burners - lowest regional figure

12.2% (7.7%) were pot bellies - highest regional figure

4.3% (7.3%) were wood ranges - lowest regional figure

This suggests NNI residents do not invest in economic burners due to a short mild winters and possibly a plentiful supply of cheap fuelwood.

85% (85.2) of those with facilities had burnt wood in past year

10% nationally had burned wood for cooking purposes as well.

49.9% (56.8) of all homes had burned wood in last 12 months.

This compares with a national figure of 55% who used wood, coke or coal as a means of heating in the 1981 Census by the Department of Statistics.

Nearly all (99.2%) of those (nationally) who had not burned wood classified themselves as non-fuelwood users.

84.1 % of wood users (79.6%) used wood as their main source of heat.

NB The figure for NXI is higher than the national average as those in colder areas like the South South Island (55.2%) had other sources in addition to wood, especially coal. Northland may have a higher figure than the N.N.I. figure as Auckland has piped gas heating as an option and cheaper coal, as has the Waikato.

This gives a figure of 42% of all N.N.I. household (45.2%) relied on wood as the main source of heating.

Less than a third, 27.7% (36.3%) of domestic consumers purchased their fuel, the rest is obtained it from free sources - most often their own or others' properties.

Of the wood that was purchased the following shows the sources;

Sawmill	24.3%	(29.3%)
Plywood Mill	1.8%	(0.4%)
Firewood merchants	34.6%	(51.6%)
Joinery Factories	1.5%	(1.0%)
Other	37.8%	(17.7%)

Nationally 81 % of wood purchasers were urban dwellers. It is suggested that this reflects the relative ease of access to free fuelwood in rural areas, unfortunately the report does not include the rural/urban breakup of those who do access free wood.

The report goes on to calculate that domestic fuelwood consumption has an energy value of 6428 TJ (2102 TJ or 33% of the total in N.N.I.)

**Cross Tabulation of Fuelwood Sources**  
**Source codes**  
**Questions for Urban Survey**

Cross Tabulation of Fuelwood Sources from Urban Survey

	<u>Sources of Free Firewood</u>										Grand total
	None	FF	OP	OF	CW	FS	PL	Beach			
None	214	39.34	16	10.5	5.83	3.33	1	0			290
Sub-total%	48.6%	8.9%	3.6%	2.4%	1.3%	0.8%	0.2%	0.0%			65.9%
FM	58	31.75	4.75	7	2.5	1.5	0	1			106.5
Total%	13.2%	7.2%	1.1%	1.6%	0.6%	0.3%	0.0%	0.2%			24.2%
FF	6	29.75	0.75	3	0.5	0.5	0.5	0			41
Total%	1.4%	6.8%	0.2%	0.7%	0.1%	0.1%	0.1%	0.0%			9.3%
CW	1	1	0	0	0	0.5	0	0			2.5
Total%	0.2%	0.2%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%			0.6%
Grand total	279	101.84	21.5	20.5	8.83	5.83	1.5	1			440
Total%	63.4%	23.1%	4.9%	4.7%	2.0%	1.3%	0.3%	0.2%			100%

Fuelwood Source Codes

FM=Firewood Merchants  
 FF=Family and Friends  
 OP=Own Property  
 OF=Other Farm  
 CW=Commercial Waste  
 FS=Forest or Scrub  
 PL=Plantation Forest  
 Beach=Beach

Urban Survey Questions

1/ How much firewood do you estimate your household would use in 12 months? [please quantify using any listed measure]

No of trailer loads . . . . . cubic metres . . . . .  
 No of truck loads . . . . . other . . . . .

2/ If you buy firewood which sources do you use?

Firewood merchants . . . . . Timber/furniture factory . . . . .  
 Other (specify) . . . . . Friend/family . . . . .

3/ If you get 'free' firewood which sources do you use?

Own property . . . . . Friends/family property . . . . .  
 Other farmland . . . . . Native forest/scrub . . . . .  
 Plantation forest . . . . . Other (specify) . . . . .

<u>Method of Obtaining Fuelwood</u>			
<u>Buy</u>	<u>Free</u>	<u>N<sub>o</sub></u>	<u>%</u>
None	FF	39	17.3%
None	OP	16	7.1%
None	Other	21	9.3%
<b>Get All Free</b>		<b>76</b>	<b>33.6%</b>
FM	None	58	25.7%
FF	None	6	2.7%
Others	None	1	0.4%
<b>Buy it all</b>		<b>65</b>	<b>28.8%</b>
FM	FF	32	14.2%
FF	FF	30	13.3%
FM	OF	7	3.1%
FM	OP	5	2.2%
FM	Other	5	2.2%
FF	OF	3	1.3%
FF	Other	2	0.9%
Other	Other	1	0.4%
<b>Both</b>		<b>85</b>	<b>37.6</b>
<b>Total</b>		<b>226</b>	<b>100%</b>

<u>Proportion of Consumers</u>			
<u>Buy</u>	<u>Free</u>	<u>N<sub>o</sub></u>	<u>%</u>
None	FF	39	17.3%
None	OP	16	7.1%
None	Other	21	9.3%
<b>Subtotal</b>		<b>76</b>	<b>33.6%</b>
FM	None	58	25.7%
<b>Subtotal</b>		<b>58</b>	<b>25.7%</b>
FM	FF	32	14.2%
FM	OF	7	3.1%
FM	OP	5	2.2%
FM	Other	5	2.2%
<b>Subtotal</b>		<b>49</b>	<b>21.7%</b>
FF	FF	30	13.3%
FF	None	6	2.7%
FF	OF	3	1.3%
FF	Other	2	0.9%
<b>Subtotal</b>		<b>41</b>	<b>18.1%</b>
Others	All	2	0.9%
<b>Subtotal</b>		<b>2</b>	<b>0.9%</b>
<b>Total</b>		<b>226</b>	<b>100.0%</b>

<u>Proportion of Households</u>			
<u>Buy</u>	<u>Free</u>	<u>N<sub>o</sub></u>	<u>%</u>
None	None	214	48.6%
<b>Subtotal</b>		<b>214</b>	<b>48.6%</b>
None	FF	39	8.9%
None	OP	16	3.6%
None	Other	21	4.8%
<b>Subtotal</b>		<b>76</b>	<b>17.3%</b>
FM	None	58	13.2%
FM	FF	32	7.3%
FM	OF	7	1.6%
FM	OP	5	1.1%
FM	Other	5	1.1%
<b>Subtotal</b>		<b>107</b>	<b>24.3%</b>
FF	FF	30	6.8%
FF	None	6	1.4%
FF	OF	3	0.7%
FF	Other	2	0.5%
<b>Subtotal</b>		<b>41</b>	<b>9.3%</b>
Others	All	2	0.5%
<b>Total</b>		<b>440</b>	<b>100.0%</b>



**Appendix 5**

**Comments from Suppliers**

<b>Comments from Firewood Suppliers</b>	
W1	Gets from farms in radius of 100 km. Clearing areas of over 5ha but over several years.
W2	Not much. Only to family. Already fallen trees
W3	Off farms, cleared bush, tidying up. Coal sales dropped off due to Kent burners only using wood. Wood sales have increased.
W4	Scrubby totaras to improve pasture or for forestry. Some regrowth ti-tree. All off one paddock last year.
W5	
W6	
W7	
W8	Clearing ti-tree off piece of land to create pasture.
W9	
W10	
W11	
W12	
W13	Not willing to say anything.
W14	Not selling any.
W15	Cleaning up block of land, pruning and tidying up dead trees.
W16	Pine mill slabs from Waipu sawmill near Brynderwyns
W17	Gets off in-laws farm. Trees already felled for clearing pasture.
W18	Clears odd trees that farmers want tidied up.
W19	Take old macrocarpa and eucs from fencelines etc
W20	Getting macrocarpa off farms
W21	Lots being cleared in Far North, 70ha, for plantation forest preparation by landowners
W22	
W23	
W24	
W25	
W26	
W27	
W28	
K1	Clearing a farm. Goes to Auckland
K2	Clearing farm for pasture
K3	Taking ti-tree off farms to clear for pasture. Large area, takes several years to clear. Less than 5ha per year.
K4	
K5	
K6	Have contract to supply Auckland
K7	
<b>Subtotal</b>	
D1	
D2	Only sells a few trailer loads.
D3	Buys off contractor who is clearing own land
D4	

*Comments End*

	Quantity	Destination		Local m <sup>3</sup>		Tree Species offered for sale								
	Total m <sup>3</sup>	Local	Auckland	Native	Other	TiTree	Puriri	Totara	Tareire	Pine	Macrocarpa	Eucalypt	Acacia	Casaurina
W1	3500	3150	350	1575	1575	1	1	1	1	1	1			
W2	small	20												
W3	40	40		40				1		1	1			
W4	350	350		350				1						
W5						1								
W6							1							
W7						1								
W8	38	38		38		1								
W9						1								
W10														
W11						1								
W12	100	100		50	50			1						
W13	not say											1		1
W14	none						1	1			1	1		
W15	10	10		5	5		1				1			
W16	500	500			500					1				
W17	20	20		20		1								
W18	small	20		10	10			1			1			
W19	250	250			250						1	1		
W20	80	80			80						1			
W21	4700	2300	2400	759	1541	1					1	1	1	
W22	small									1	1	1		
W23	small									1				
W24	small					1								
W25	small									1				
W26	small									1				
W27	small													
W28	small									1		1	1	
Total	9628	6878	2750	2847	4011	9	4	6	1	8	9	6	2	1