

Sourfelling Trial Results

- a pilot study



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What is Sourfelling?

The term “sour-felling” refers to

- ‘the practice of felling trees and leaving them lying in the forest for a period of time with their crowns intact’.
- The crowns of the felled trees continue to lose moisture through transpiration thus accelerating the rate of drying of the timber when compared to trees or logs from which branches have been removed.
- After the trees have been left in the forest for the required period either the trees are delimbed and the timber removed as fuel wood or the whole tree is harvested for biomass.



What are the benefits?

The benefits of this system to biomass energy producers are

1. the weight of biomass to be transported is lower, thus reducing transport costs
2. the initial drying of the timber has taken place, reducing the need for subsequent drying to achieve target moisture contents for combustion.



Objectives

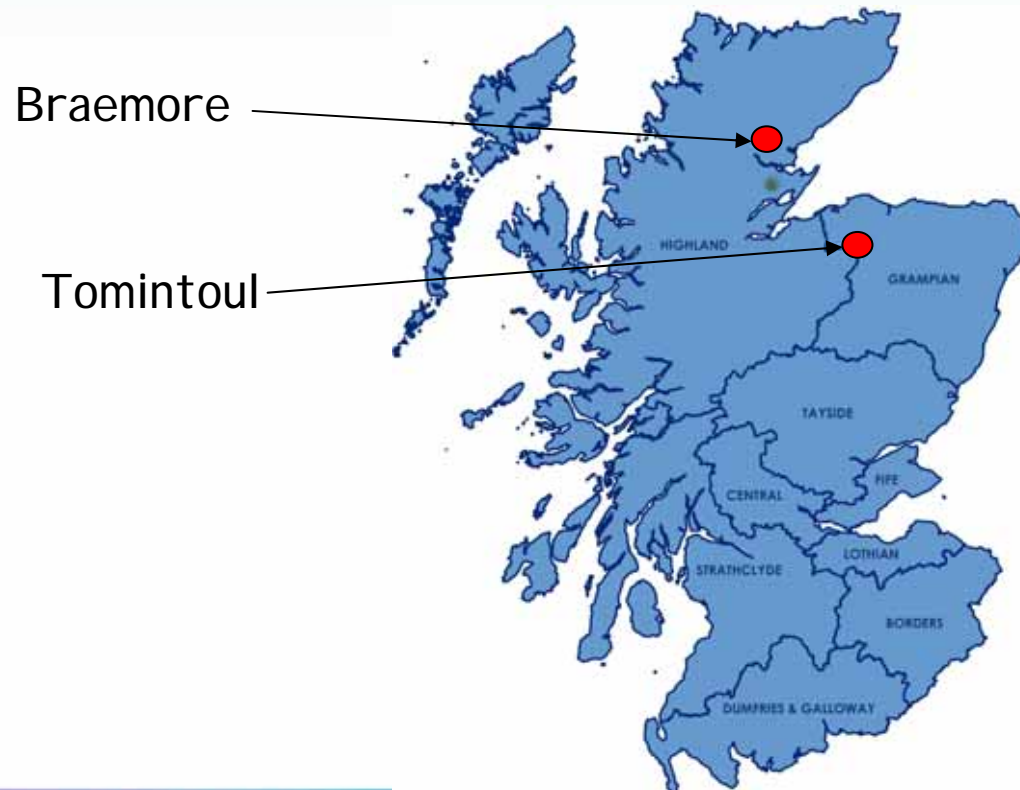
This work is intended as a pilot study to determine whether it is realistic to make forecasts of the moisture content of LP whole trees in relation to needle fall and loss in the nutrient cycle of the forest floor.

- To assess the variation in initial moisture content (immediately after felling) of lodgepole pine roundwood stems in relation to month of felling
- To investigate the rate of drying of lodgepole pine roundwood stems in relation to month of felling and the length of time following felling, comparing trees with crowns left intact with trees from which all branches have been removed
- To investigate the rate of needle fall from felled lodgepole pine trees in relation to month of felling and length of time following felling
- To assess the nitrogen content of lodgepole pine tree crowns at time of felling (in relation to month of felling) and to assess how this changes when sourefelled trees are left lying in the forest during a drying period.



Locations

Sample Stand	Location (NGR)	Planting Year	Yield Class	Mean DBH	Top Height	Altitude (m asl)	DAMS Windiness score	North Scotland Jan-Oct mm	East Scotland Jan -Oct mm
Braemore	NC 535 016	1973	8	19.6 cm	12.9m	190m	12	1242.9	-
Tomintoul	NJ 178 257	1973	8	16.1 cm	13.7m	450m	18	-	849.4



Sampling...



Timing of sampling

Seven felling periods were planned, March, April, May, July, September, November and January with two sites being sampled in each.

Reasons:-

1. Rising of the sap within the stem in spring.
2. The expected temperature differences between spring and summer.
3. Variations in rain fall and wind drying were also anticipated.

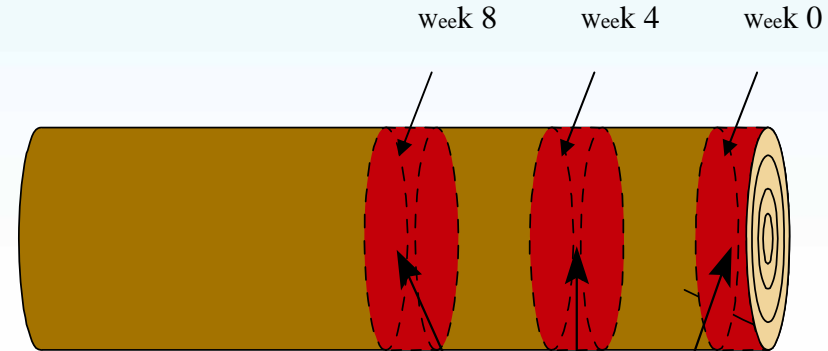


Methods and Materials

- Two sites – different elevation and rainfall
- 15 sour-felling trees: these trees were also felled and their crowns left intact. Six 10 cm thick cross-sectional sample discs were marked on the stem, starting at 1.3 m and thereafter at 1m intervals
- 15 control trees: these trees were felled and all branches removed, leaving the whole stem intact. Cross-sectional sample discs were marked on the stem as for the sour-felling trees.
- 15 needle assessment trees: these trees were felled and left with their crowns intact. Within the crown of these trees three whorls were marked for assessment of needle fall and nitrogen content, at the bottom, middle and top of the crown. Within each sample whorl six sprigs were selected at random and labelled for sampling on each measurement occasion (i.e. weeks 0,4,8,12,16 and 52).



Sampling



Sample discs marked c 1m apart starting from 1.3m.



Sampling



Results...

When considering the results of this study it should be borne in mind that at each measurement point (i.e. weeks 0, 4, 8, 12, and 16) a **different** set of sample discs were assessed due to the destructive nature of the assessment technique.



Moisture Content...



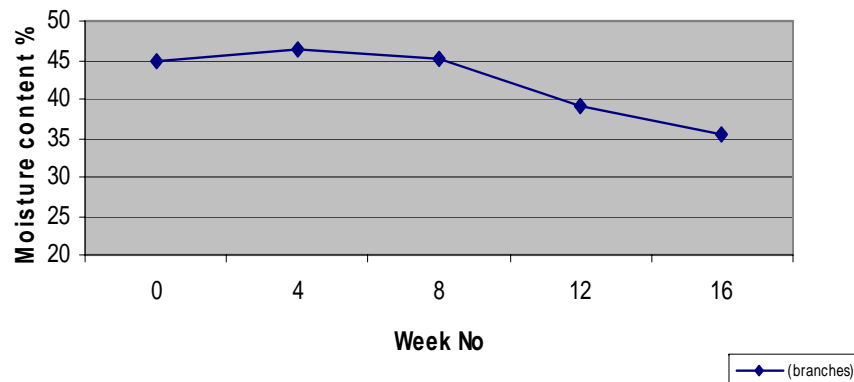
Moisture Contents

Felling Period	Felling week (calendar year)	Average Moisture Content Week 0		Average Moisture Content Week 4		Average Moisture Content Week 8		Average Moisture Content Week 12		Average Moisture Content Week 16		Monthly rainfall	
		Branches	No Branches	Branches	No Branches	Branches	No Branches	Branches	No Branches	Branches	No Branches	Braemore	Tomintoul
March '06 (B)	12	44.85	0	46.26	0	45.01	0	39.09	0	35.40	0	200	100
April (T)	16	43.02	45.58	42.24	46.12	41.14	47.49	34.93	45.79	36.98	47.53	100	75
May	20	44.66	45.27	42.11	45.88	38.72	46.03	37.77	46.43	36.56	41.50	100	75
July	29	42.58	44.95	44.57	47.98	44.61	49.94	44.58	52.39			50	50
September	38	45.70	46.39	47.33	49.47							100	75
January '07	3												

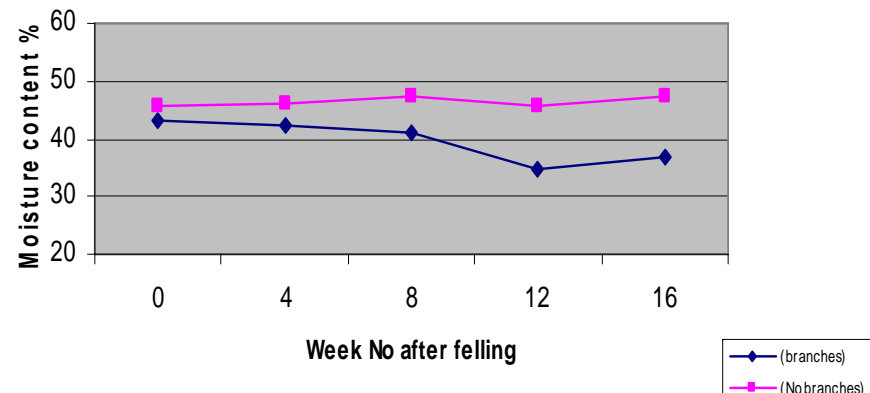


Moisture content variations

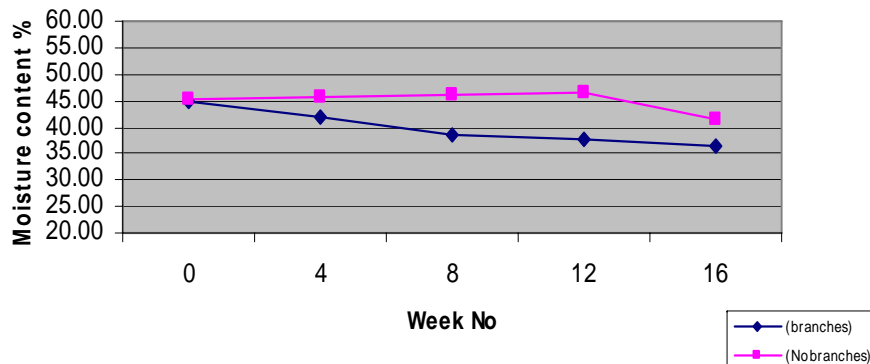
Moisture content for March



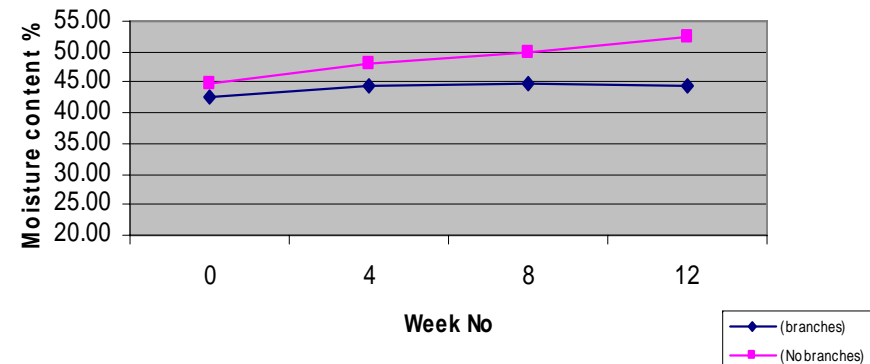
Mean moisture content for April



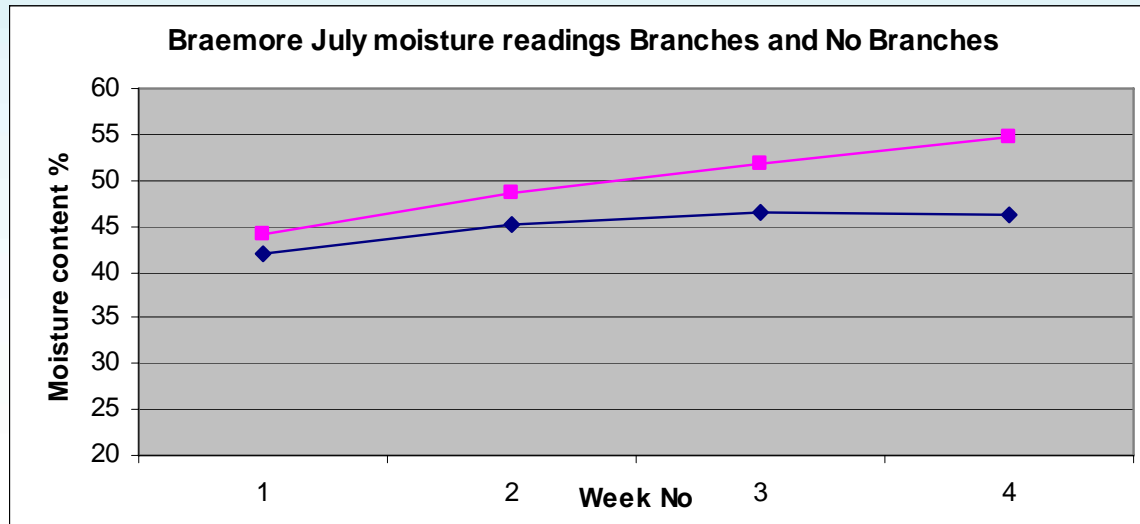
Mean Moisture content for May from 2 sites



Mean moisture content for July for 2 sites



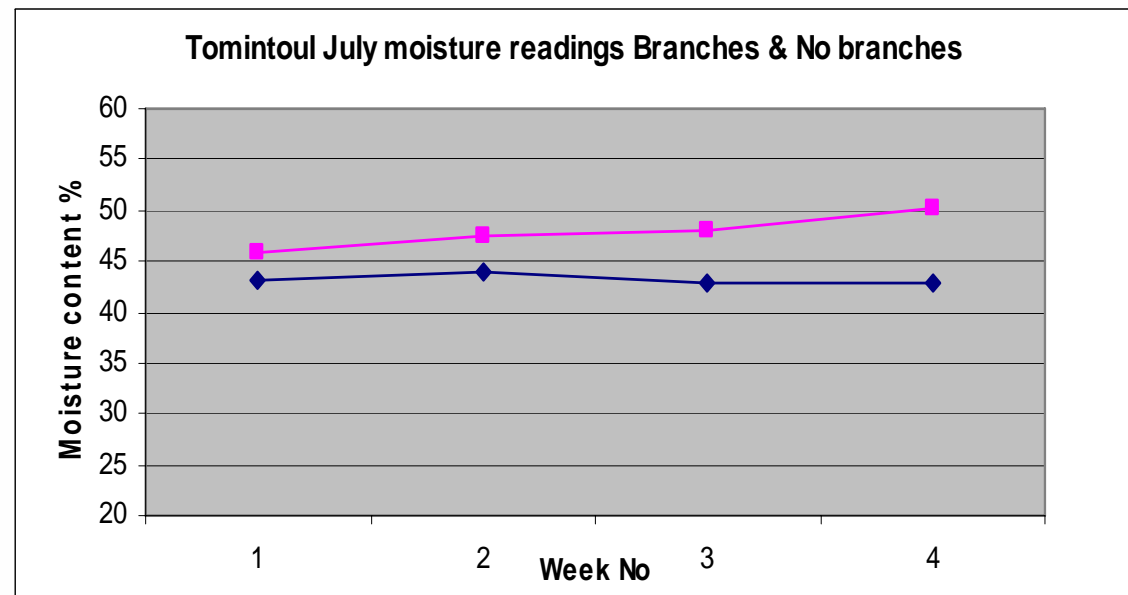
Anomalies!!



Monthly Rainfall (mm)	N Scotland	E Scotland
March	128.1	127.3
April	153.1	44
May	121.5	92.2
July	79.6	51.4
September	131.2	117.5
October	229.7	151.2

Two explanations-

1. Travelling up the stem where there is more moisture
2. Higher rainfall being absorbed by the wood.



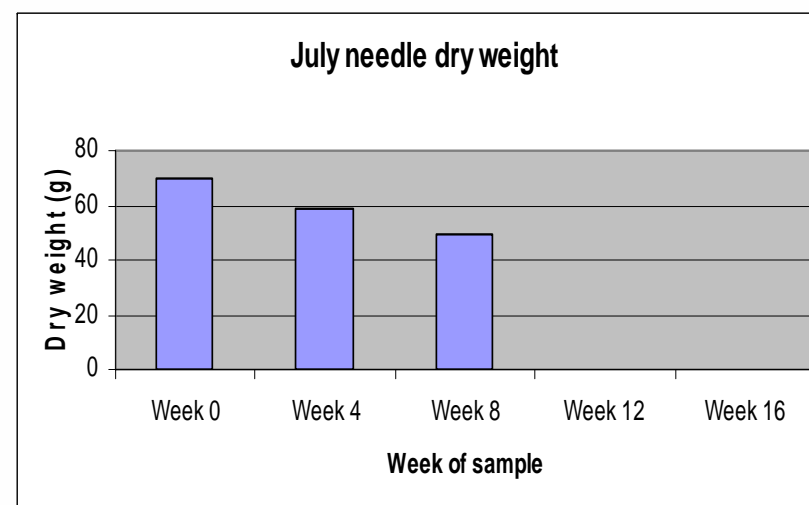
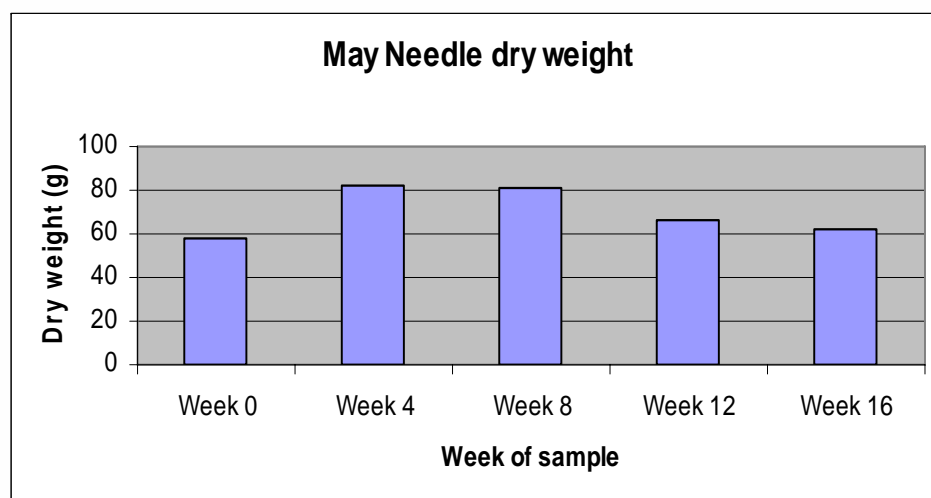
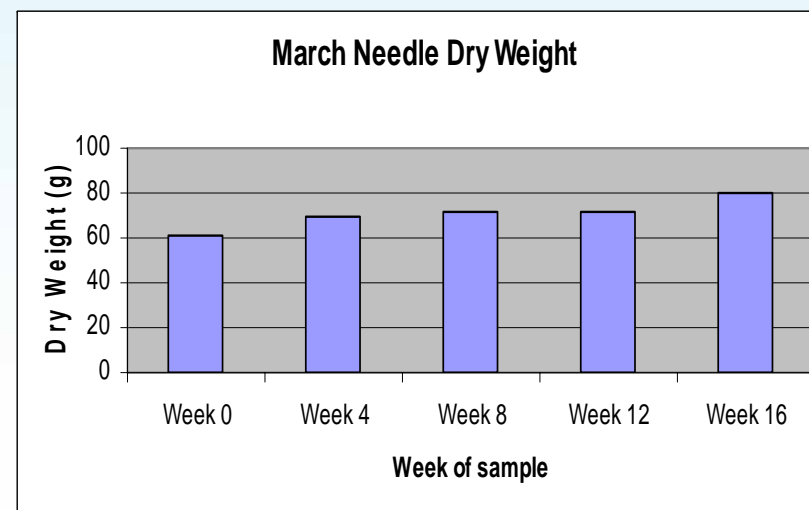
Needle Fall...



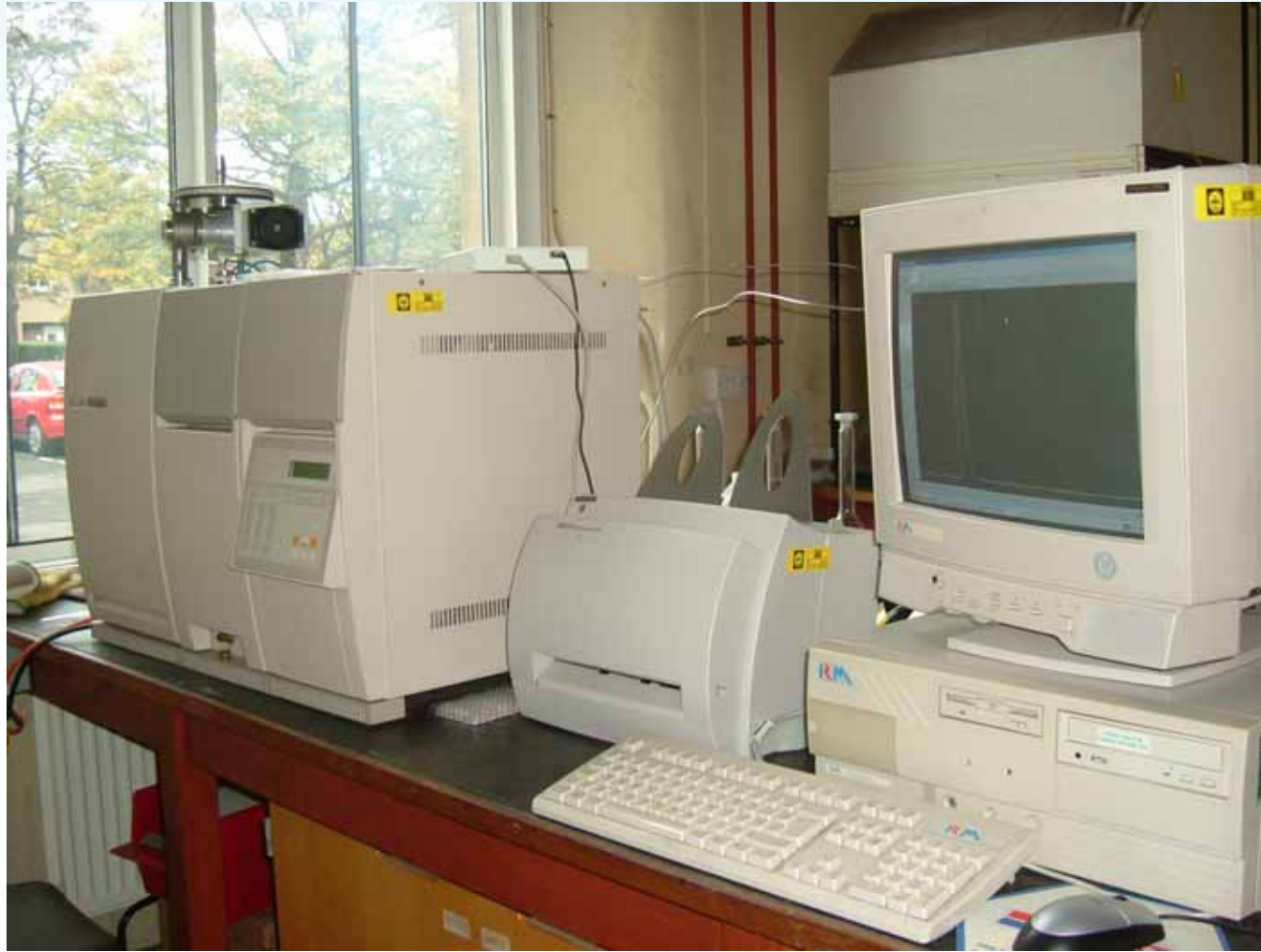
Needle fall

One example - Braemore

- Rising sap new growth for March
- Initial rise then gradual decrease
- July has steady decrease over time



Nitrogen...

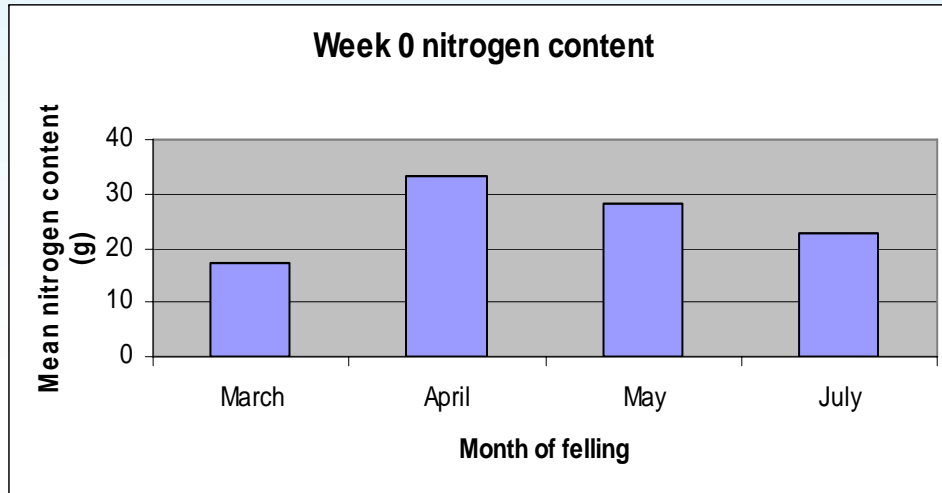


Nitrogen values relating to Leaf area

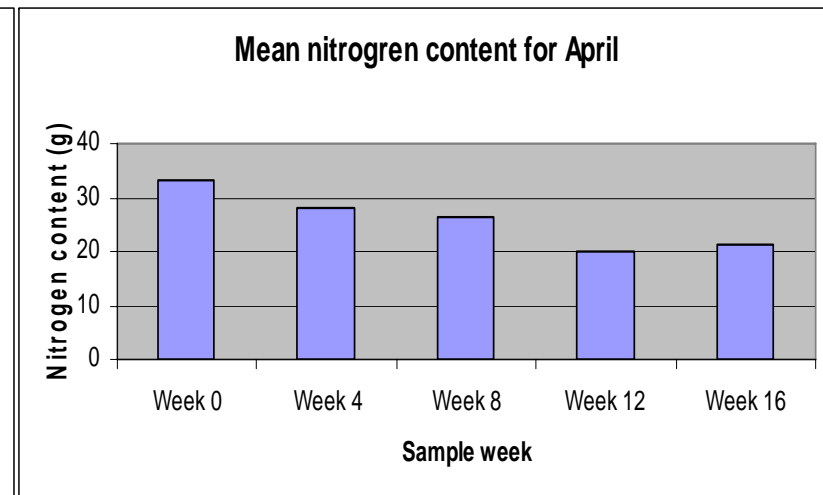
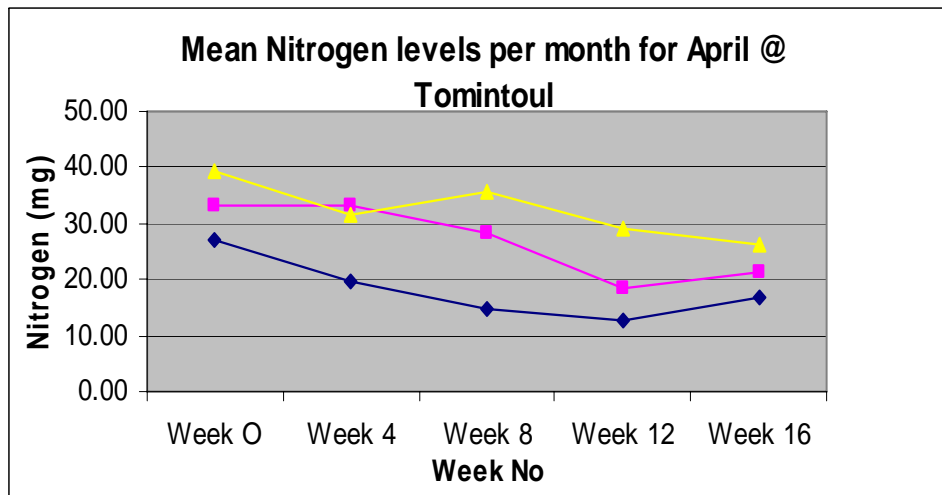
Felling Period	Felling week (calendar year)	Nitrogen Content Week 0		Nitrogen Content Week 4		Nitrogen Content Week 8		Nitrogen Content Week 12		Nitrogen Content Week 16	
		Total (mg)	% of Leaf area	Total (mg)	% of Leaf area	Total (mg)	% of Leaf area	Total (mg)	% of Leaf area	Total (mg)	% of Leaf area
Tomintoul (T) Braemore (B)											
March '06 (B)	12	771.11	1.26	940.10	1.36	804.58	1.13	847.23	1.18	1007.10	1.25
April (T)	16	1492.99	1.43	1264.85	1.26	1182.78	1.15	1161.74	1.54	1161.74	1.62
May (B)	20	750.09	1.29	995.01	1.21	1045.34	1.30	770.09	1.15	698.70	1.13
May (T)	20	903.52	1.09			807.52	1.18	723.54	1.16		
July (T)	29	578.95	1.19	555.25	1.10						



Nitrogen variations



- Increase during April
- Steady decline May and July
- April showing a steady decrease



Conclusions

No firm conclusions can be accurately drawn at this stage of the study. However the work in progress may indicate

- a strong trend towards faster drying of LP timber when the branches remain intact on the felled trees.
- There does appear to be a strong trend with the loss of Nitrogen levels at this early stage.
- The balance between moisture content requirements for wood fuel use and the loss of the nutrient cycle in relation to Nitrogen levels has still to be examined.



References

- Forestry Commission (2002). *The national inventory of woodland and trees*. Forestry Commission Inventory report for Scotland. Forestry Commission, Edinburgh.
- Mochan, S., Hubert. J, 2005. Utilisation of Lodgepole pine. Forestry Commission Information Note 70. Forestry Commission, Edinburgh
- Pyatt, D. G., D. Ray, (2000). *An Ecological Site Classification for Forestry in Great Britain*. Forestry Commission Bulletin 124. Forestry Commission, Edinburgh.

