000440

Progress Report - Working Plan No. 18/78.

Estimating the Quantity and Distribution of Pine Logging Slash.

N. D. BURROWS 1979.

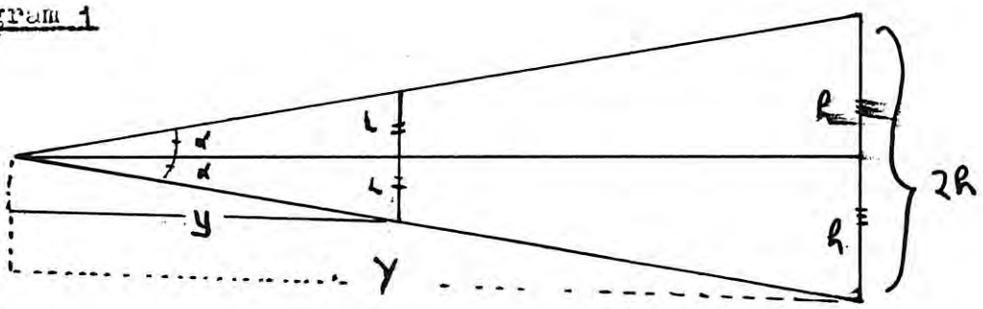
Aim and Method as per submitted working plan. (as attached)

AIM

1) To develop an occular instrument which will measure slash heights from any given point.

A prototype of such an instrument has been made and tested. Naturally, for any occular instrument, it is fundamental that some distances be known. In this case, the distances Y, are known. The unknown is 2H, the slash height.

Diagram 1



METHOD

A number of distances Y, where tested. Y is the distance from the operators eye to the slash heap. Distances tested where 25m, 50m, 75m and 100m. Using a distance of 60cm, the following table summarizes the results of the test.

Table 1

Actual Height (m)	Predicted Ht. (m) (from 3 readings)	% Difference
	Distance Y = 25m	
0.20	.20	0
0.40	.40	0
0.80	.85	6.2
1.00	1.10	0
1.40	1.40	0
	Distance Y = 50m	
0.20	.28	40.0
0.40	.50	25.0
0.80	.85	6.2
1.00	1.20	20.0
1.20	1.30	8.0
	Distance Y = 75m	
0.20	0.42	110.0
0.40	0.58	45.0
0.80	0.95	18.0
1.00	1.35	35.0
1.20	1.55	29

2/....

The greater the distance over which slash height is to be measured, the greater is operator inaccuracy and loss of precision. At a distance of 25 metres, accurate and precise slash height readings can be made. From a sampling viewpoint, it would have been desirable to read over a greater distance. However, enough readings over 25 metres will achieve the same result. Sampling technique will be developed later.

Being satisfied with the principle of occularly measuring slash height, it remained to relate height measurements with slash quantity.

Using a system of quadrats and the line intersect method of sampling fuels, some 700 measurements of slash height and weight were made in thinned Radiata stands. Even with intense sampling, a very poor relationship between slash height and slash weight existed. It is not surprising that slash heights cannot be simply related to slash weight. The diversity of bulk densities found in thinning slash is immense; ranging from 10 to 200. That is, the ratio of height to slash weight is highly variable. This necessitated the establishment of bulk density classes. Bulk density figures for, a) chainsaw felled, non compacted fuels, b) chainsaw felled, compacted outrows, and c) machine felled, compacted outrows were decided upon following much sampling. Figures 1, 2 and 3 show the relationship arrived at. Even by using three bulk density classes, the standard deviation is quite high. As the heavy stem wood is, in most situations, not available fuel, it has not been considered in the weight calculations.

The following is a tabulated form of the instrument reading, slash height and associated tonnages. Refering to diagram 1, these table figures are for Y = 25m. It can be seen that mechanically crushed outrows in both the chainsaw and machine felled areas are similar. It is intended that these tonnages can be read direct from the instrument.

Table 2

Instrument Reading (L) and corresponding fuels, heights (m) and weights (tonnes/ha) readings taken 25M from fuels.

L (mm)	Slash height (m)	Aerial Needle Weight			Light Wood Weight		
		A	B	C	A	B	C
3	0.12	5.0	4.5	3.0	7.0	6.5	5.5
5	0.20	8.0	7.2	5.2	12.1	11.0	9.0
7	0.28	11.2	10.0	7.5	17.0	15.0	12.7
9	0.36	14.1	12.6	9.5	21.7	19.5	16.5
11	0.44	17.5	15.7	12.0	26.8		20.0
13	0.52	20.5	18.3	14.0	31.5	24.0	24.0
15	0.60	24.0	21.7	16.1	36.5	32.5	27.5
18	0.72	28.4	26.0	19.5	43.6	39.1	33.0
21	0.84	33.0	30.0	23.0	51.0	45.5	38.5
24	0.98	39.0	35.0	26.5	59.5	53.5	36.0
27	1.10	43.5	39.5	30.0	72.0	59.5	53.5
30	1.20	48.0	43.0	32.5	-	70.0	60.0
40	1.60	63.5	57.5	43.5	-	-	78.0

where;

A = mechanically harvested outrows (compacted).
B = chainsaw felld outrows (compacted).
C = chainsaw felled - non compacted/

standard deviations are as follows for;

A; SD = 41%

B; SD = 45%

C: SD = 47%

This study to date has revealed that slash height is only a guide to the compaction and tonnage of slash weight. An

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instrument can be used to sample for fuel weight and destribution. Further work in this area will deal with sampling techniques and fire behaviour of slash.

N D Burrows.

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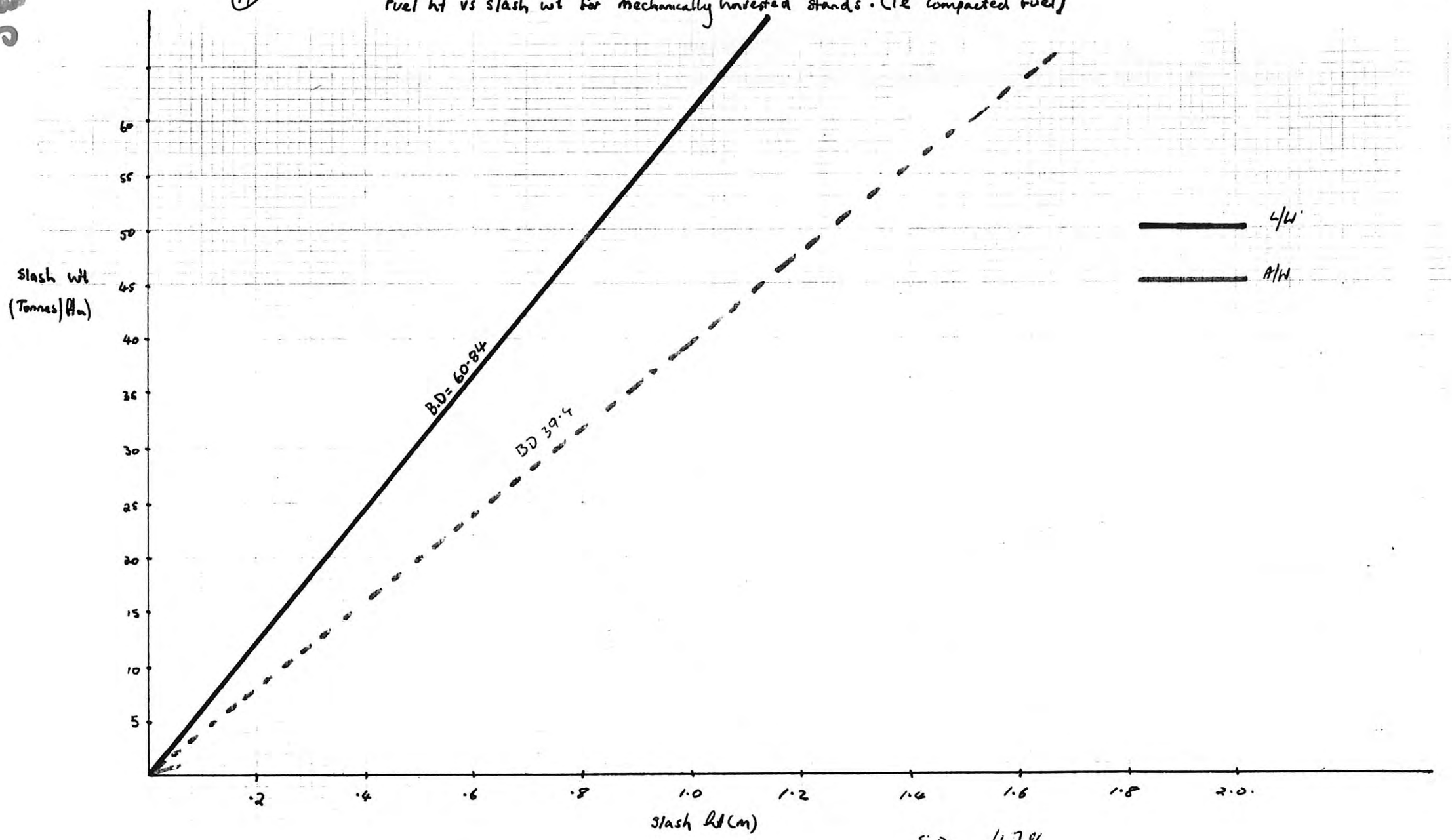
A.D.F.O FIRE RESEARCH
NDB:LEA

(A)

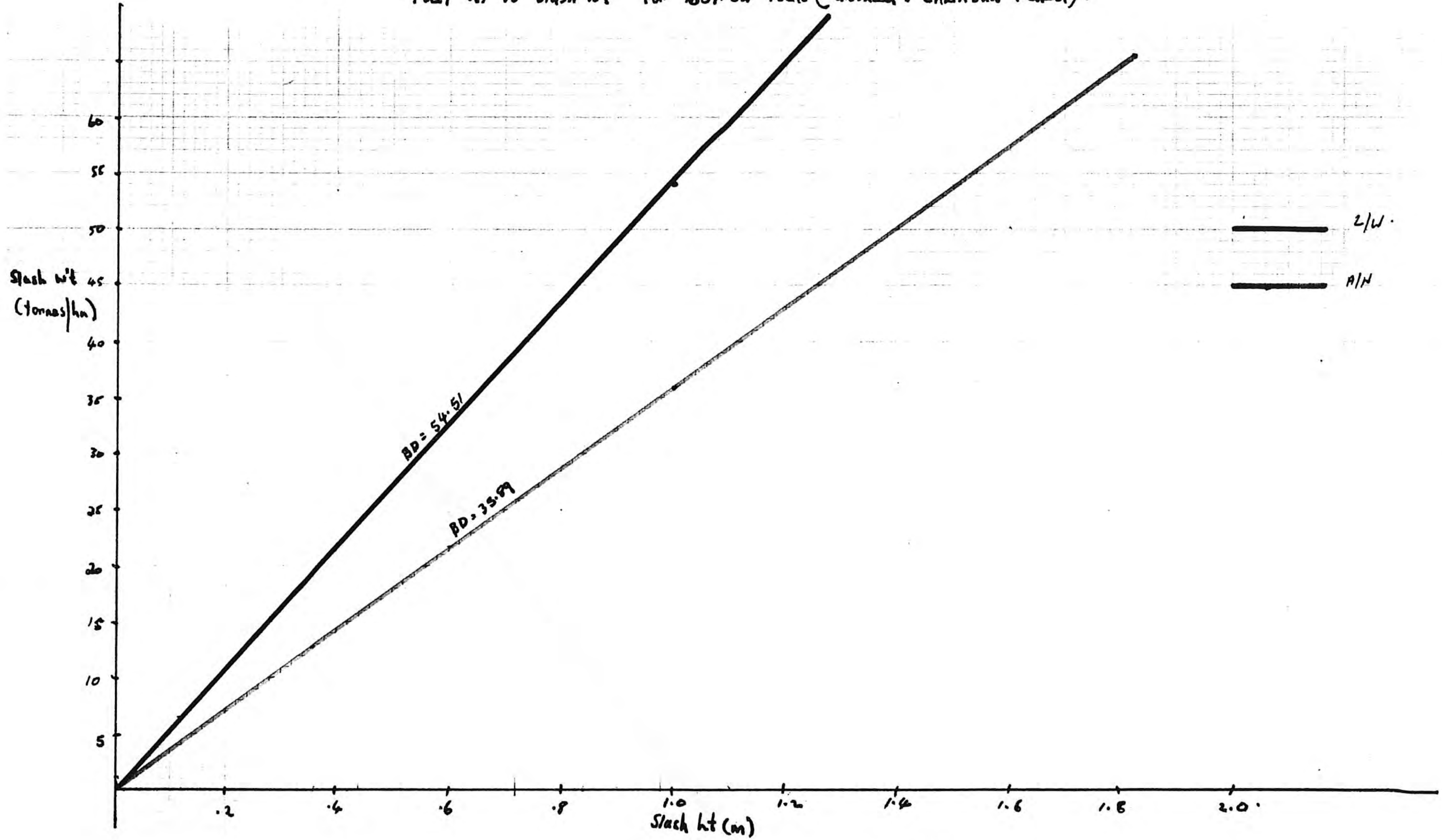
Fuel ht vs slash wt for mechanically harvested stands. (i.e compacted fuel)



S.D. 42%

(13)

fuel ht vs slash wt for outrow fuels (crushed - chainsaw felled).



SD 45%

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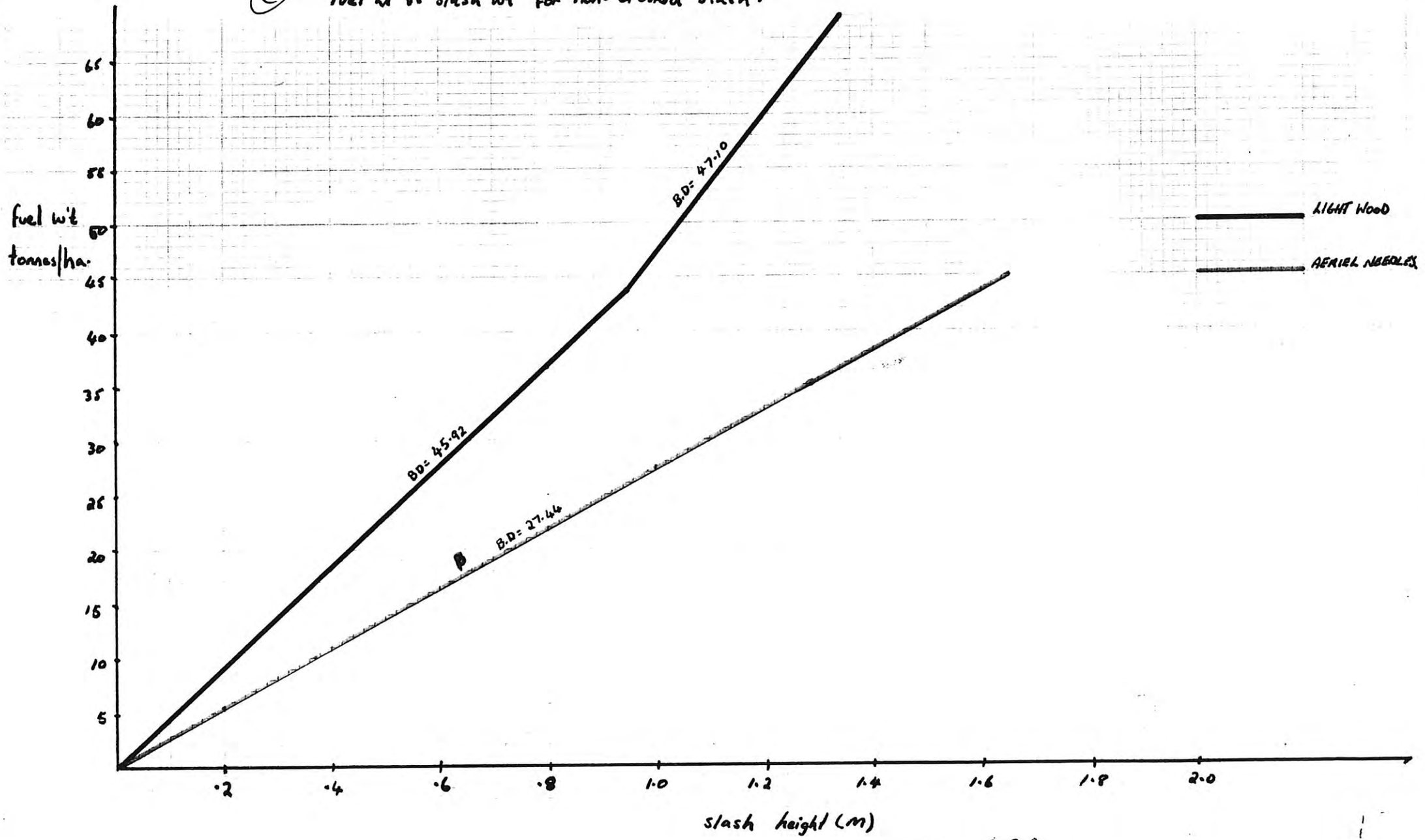
(c) fuel wt vs slash wt for non-crushed slash.



SD. 47%