STIRLING RANGE FUEL ASSESSMENT W/P 19/73

Further extension work to the Stirling Range fuel assessment has been completed with some modifications being made to the sampling technique.

The previous assessment was based on a comparison of the oven dry weights of small sub-samples and each fuel component, and the total number of levy point contacts per foot of the vegetation in the sampling area.

The relationship found between these two variables was apparently linear with high correlation. However the range of the data was limited and the number of samples small. It was considered possible that the high correlation could have been unduly influenced by these two factors and that more field sampling was necessary.

This was done in conjunction with the burning programme which followed, with emphasis being placed on the collection of samples from the areas of maximum as well as minimum fuel quantities, to extend the range of the data.

The samples were sealed and later transported to Manjimup Research Headquarters where better facilities allowed the oven dry weight of the whole of each fuel component to be measured. The aim of this was to obtain a greater degree of accuracy than the original method of using small sub-samples which are prone to a certain amount of bias, in that the observer must choose what he considers to be a representative sub-sample. The values so obtained were then converted to tonnes per hectare by a factor of ten as described in an earlier report.

*During processing of the data wide variations were noticed between the interpretation of the total number of levy point contacts by different operators. For example a comparison of estimated fuel weights and the levy point counts by various operators gave a correlation co-efficient of only 0.5, whereas a similar comparison using the counts of one specific operator increased this correlation to 0.9

The reason for this variation appears to lie in the counting of contacts in the lower levels of the fuel profile, which in many areas of the park is composed of a sedge type vegetation sufficiently dense as to make accurate counting quite impossible. Operators must then resort to estimates which vary widely from person to person.

Obviously, a useful assessment technique must work well with any and all operators if the results are to be of any use at all. The necessity to estimate has been eliminated by a simple modification to the counting technique. This requires that it be done on a "contact or no contact" basis rather than on the basis of total contacts.

The modified technique may be explained more fully by examining contacts of both live and dead material at any given level on the levy point rod. The observer simply calls "one live and one dead" and the recorder enters it thus on the field sheet. The method enables similar results to be obtained by all observers, and has the added advantage of increasing the rate at which the work may be done.

The data gathered during the extension work suggests that the relationship between fuel weights and levy point contacts is exponential, and not linear as previously thought. (Graphs I and II).

The technique now involves running a line of 20 sampling points through the area to be assessed. At each sample point a levi point assessment is made and contacts at any height interval recorded as one. The contacts for the line are summed and the total fuel weight may be read off against this number (see Table). Similarly for total dead fuel.

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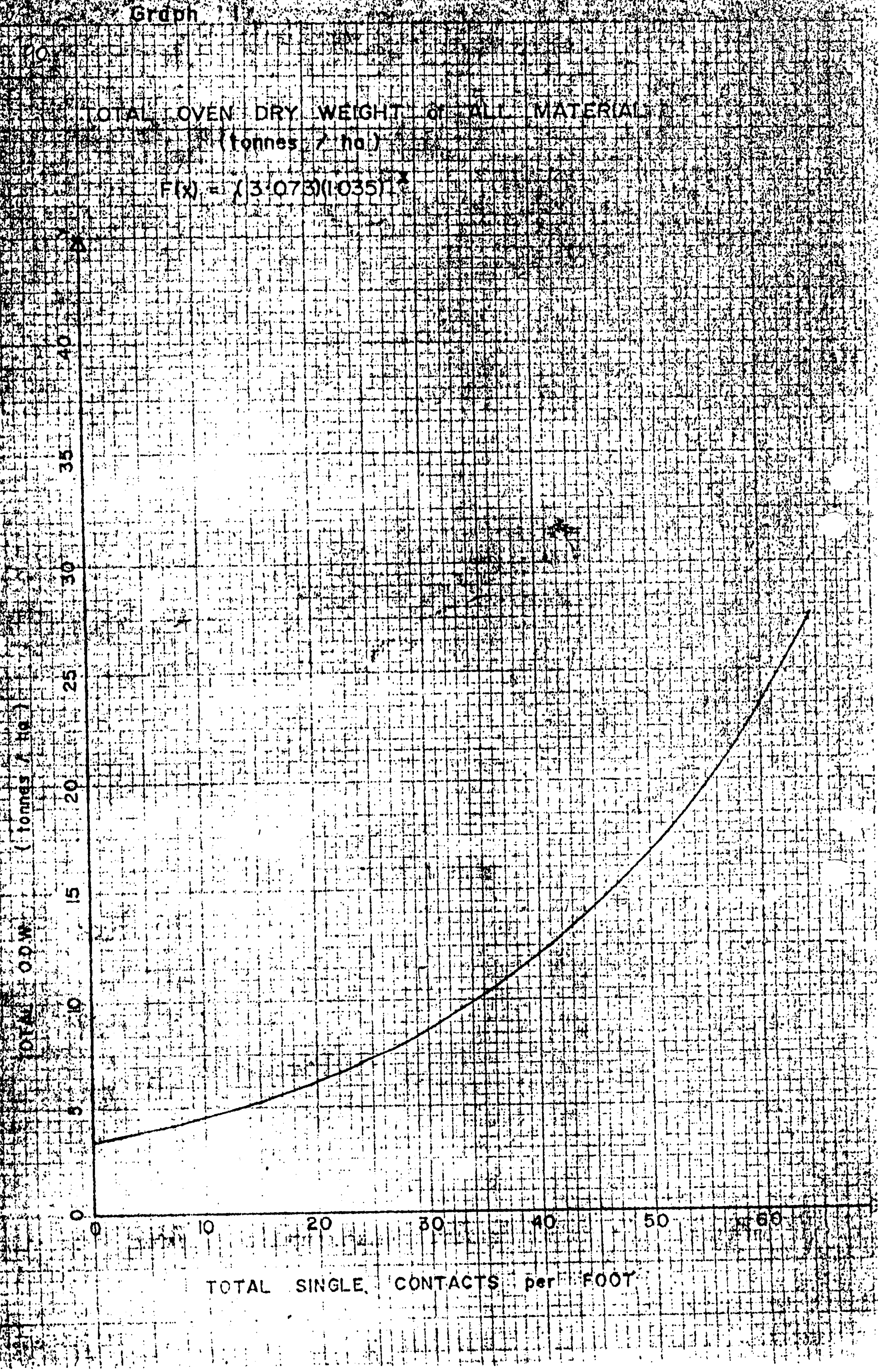
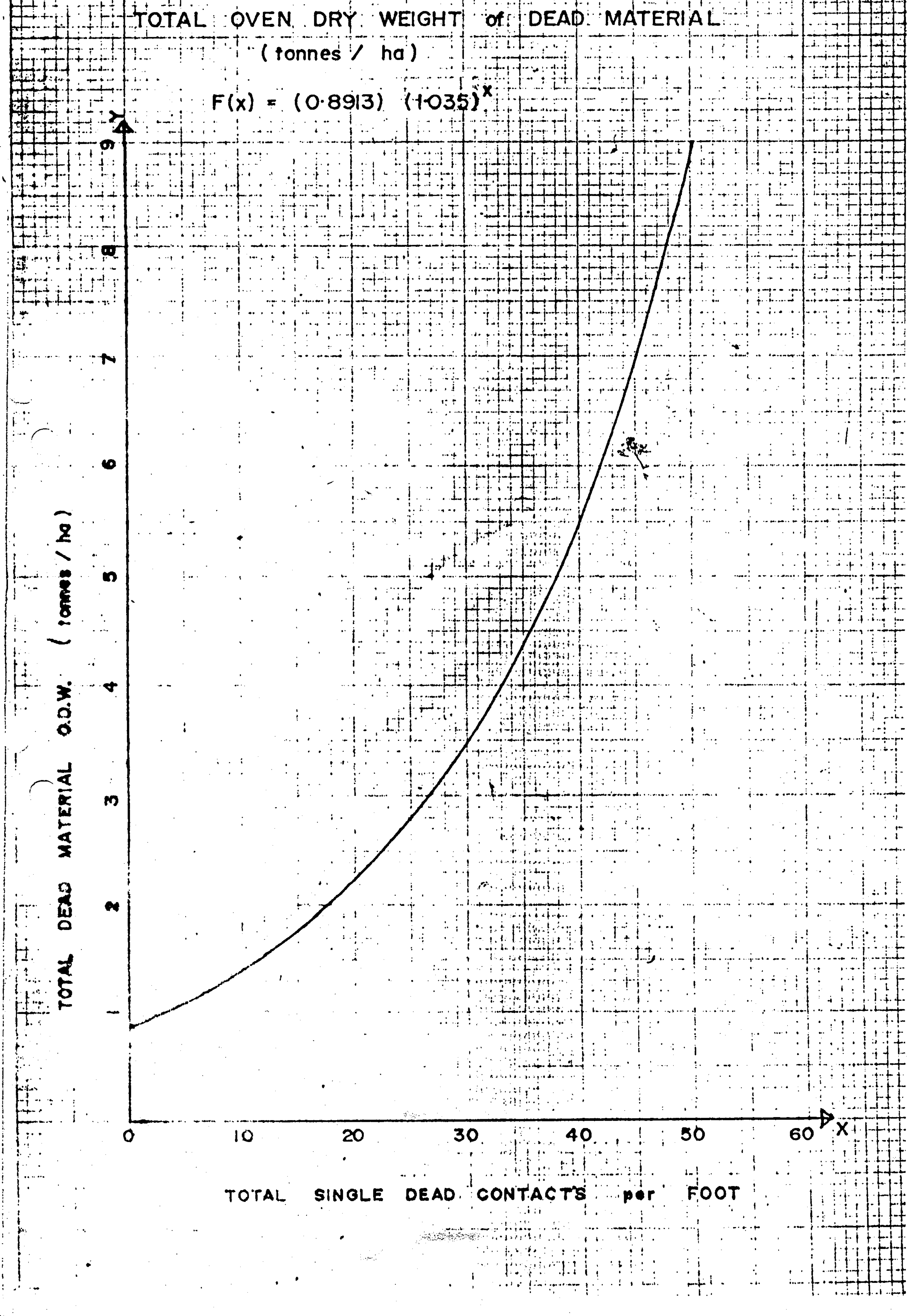
FIRE RESEARCH

TABLE OF FUEL WEIGHTS BY LEVY POINT CONTACT

Total Number of Single Contacts per foot	Total O.D.W. of all Material in Tonnes/ha	Total O.D.W. of Dead Material in Tonnes/ha.
5	3.6	1.0
10	4.3	1.2
15	5.1	1.4
20	6.0	1.7
25	7.2	2.0
30	8.5	2.4
35	10.0	2.9
40	11.9	3.4
45	14.1	4.1
50	16.7	4.8
55	19.8	5.7
60	21.9	6.8


Graph 1
TOTAL OVEN DRY WEIGHT of ALL MATERIAL
(tonnes / ha)
F(x) = (3.073)(1.035)^x
TOTAL ODW (tonnes / ha)
0
5
10
15
20
25
30
35
40
0
10
20
30
40
50
60
TOTAL SINGLE CONTACTS per FOOT

Graph 2


TOTAL OVEN DRY WEIGHT of DEAD MATERIAL
(tonnes / ha)
F(x) = (0·8913) (1·035)^x
Y
TOTAL DEAD MATERIAL O.D.W. (tonnes / ha)
9
8
7
6
5
4
3
2
0
10
20
30
40
50
60
X
TOTAL SINGLE DEAD CONTACTS per FOOT

10m—O

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Form 9 F.D. 80B

FORESTS DEPARTMENT

MANJIMUP FIRE RESEARCH Office,

To A.D.F.O. JONES

OCTOBER 1ST 19 73

Western Australia

MANJIMUP

Reference—H.O.

Local 19/73

SUBJECT: STIRLING RANGE FUEL ASSESSMENT: PROGRESS REPORT

INTRODUCTION

The Processing of field data related to the fuel assessment conducted in the Stirling Range National Park has been completed and the results are presented herein.

The aim of the assessment was to determine the approximate density and volume of fuels present on the experimental fire sites and to develop if possible a simple rapid technique by which the work could be done in the future.

Ground fuel quantities within the study areas are so small that it is doubtful whether they would contribute greatly to fire behaviour, and even if so, it would be extremely difficult to measure them with any degree of accuracy. On the other hand the scrub fuel profile is heavily loaded with suspended dry vegetation which must be the main behavioural factor. For this reason the assessment was confined to the scrub fuels at least for the time being.

METHOD

Density

Levy point sampling was carried out in each of the twelve fire plots on all four sites. Live and dead contacts were counted and recorded at five metre intervals along a one hundred metre line through the centre of each plot. The total cover density (T.D.C) and percentage cover contribution (P.C.C.) by dead and live vegetation were calculated from this data. The sampling of sites 1A and 2B has not been fully completed but estimates have been made from the available data and are included.

Quantity

Estimates of the quantity of scrub fuels on each site were made from the weights of cylindrical samples cut from the vegetation.

Each cylinder was cut by placing a long rod vertically in the sampling area, and attaching to it a revolving arm of length 56 centimetres. As the arm turned about the rod it described a circular area of one square metre from which all vegetation was removed and weighed. The weight in kilogrammes per square metre was then easily converted to tonnes per hectare by using a factor of ten.

Several cylinders were cut from each site, and from these one was randomly chosen as a representative sample of the site from which it was taken. The total oven-dry weight of the vegetation on the site was then estimated from small tin samples taken from the cylinder.

The cylinder was then broken down into its three main components of dead material, green sticks and green foliage. Each was weighed and its oven-dry weight estimated from tin samples also.

RESULTS AND DISCUSSION

Total Cover Density (T.D.C)

The difference between total cover density at sites 1a and 1b (southern aspect and flat topography) and sites 2a and 2b (northern aspect and flat topography) is quite pronounced with 1a and 1b having roughly twice the density of 2a and 2b. Table I. While this may be accounted for in part by variation in vegetation ages, there is another possible explanation. The Range is oriented east and west, and it is probable that the influence on plant growth of topography and aspect is quite strong. The southern and eastern slopes and to a lesser degree the flats, are sheltered from the afternoon sun and are in the lee of the prevailing winds which, from short term observation appear to blow generally from the north-west. Because of this, these areas remain moist for longer periods than their more exposed counterparts on the northern and western ends of the Range, resulting in greater vegetative growth.

Percentage Cover Contribution (P.C.C)

The percentage cover contribution by dead and live material also supports the evidence for greater vegetative growth on the sheltered sites. Table I. On the southern aspect slope of site 1a the contribution by live materials is 10 per cent greater than that of the exposed northern aspect slope of site 2a, while the contribution by dead material is 10 per cent less. The same pattern is apparent for the flat sites 1b and 2b, but with a difference in cover contribution of only 3 per cent.

The total oven dry weight of the vegetation on sites 1a and 1b is found to be much greater than that of sites 2a and 2b. Table II. This is to be expected in view of their greater total cover density, although once more, variation in the ages would account for part of it.

There is considerable variation also, between the oven dry weight of the vegetation components at each site, but the variation is in a manner consistent with their different total cover density, aspect and location. For example it is clear from Table II that in the moister situation of sites 1a and 1b the combined weight of the live components (green sticks and foliage) greatly exceeds that of the dead component. By contrast, in the drier situation of sites 2a and 2b the combined weight of the two live components represents only 50 per cent of the dead material.

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CONCLUSION

Relationship

The assessment has indicated that linear relationship exists between the number of levy point contacts and the oven-dry weight of vegetative fuels in tonnes per hectare. Graphs I - IV. Although the regressions obtained are rough and incomplete, they should nevertheless provide the basis for a guide to scrub fuel weights in future assessments and, could doubtless be refined by more intensive sampling, particularly at the extremities of the data. This would provide useful back-up work in the event of the burning programme being held up by unsuitable weather conditions.

R. VOUTIER
T/A II FIRE RESEARCH

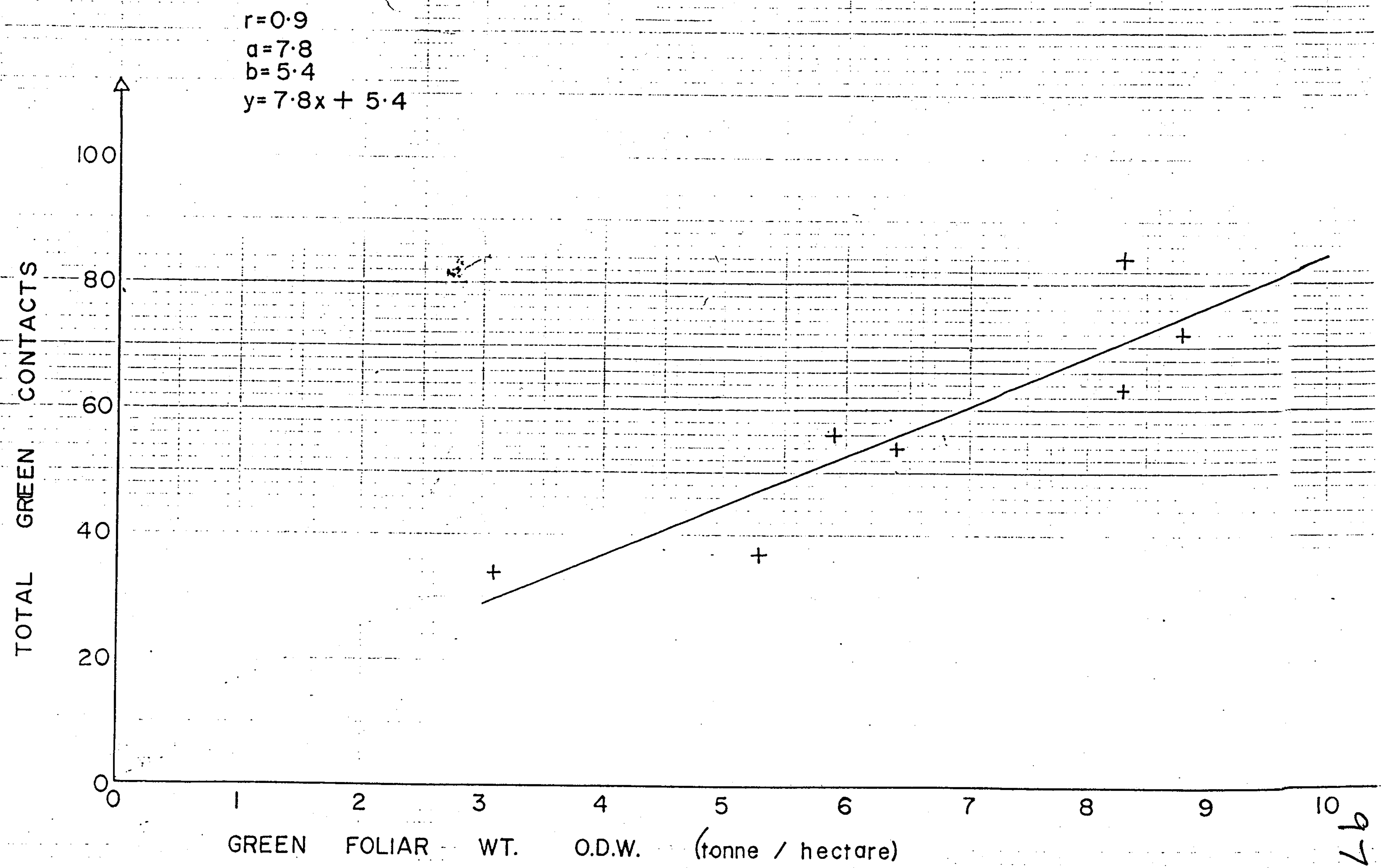
TABLE I

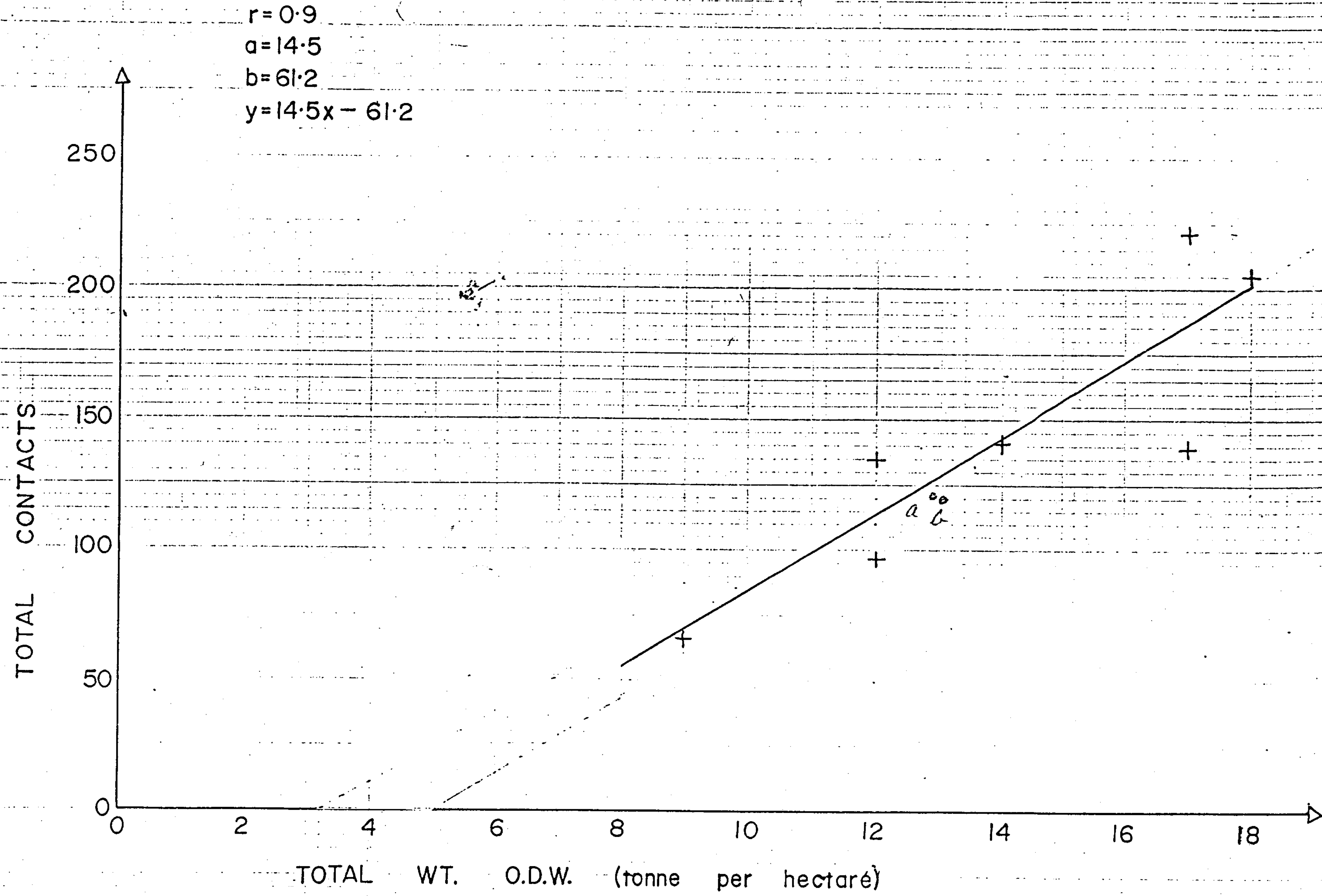
Site	Aspect	Total Cover Density (T.D.C)	Percentage Cover Contribution (P.C.C.)	
			Dead Material	Live Material
1A	South	8.4	52%	48%
1B	Flat	8.7	58%	42%
2a	North	4.5	62%	38%
2b	Flat	4.2	61%	39%

TABLE II

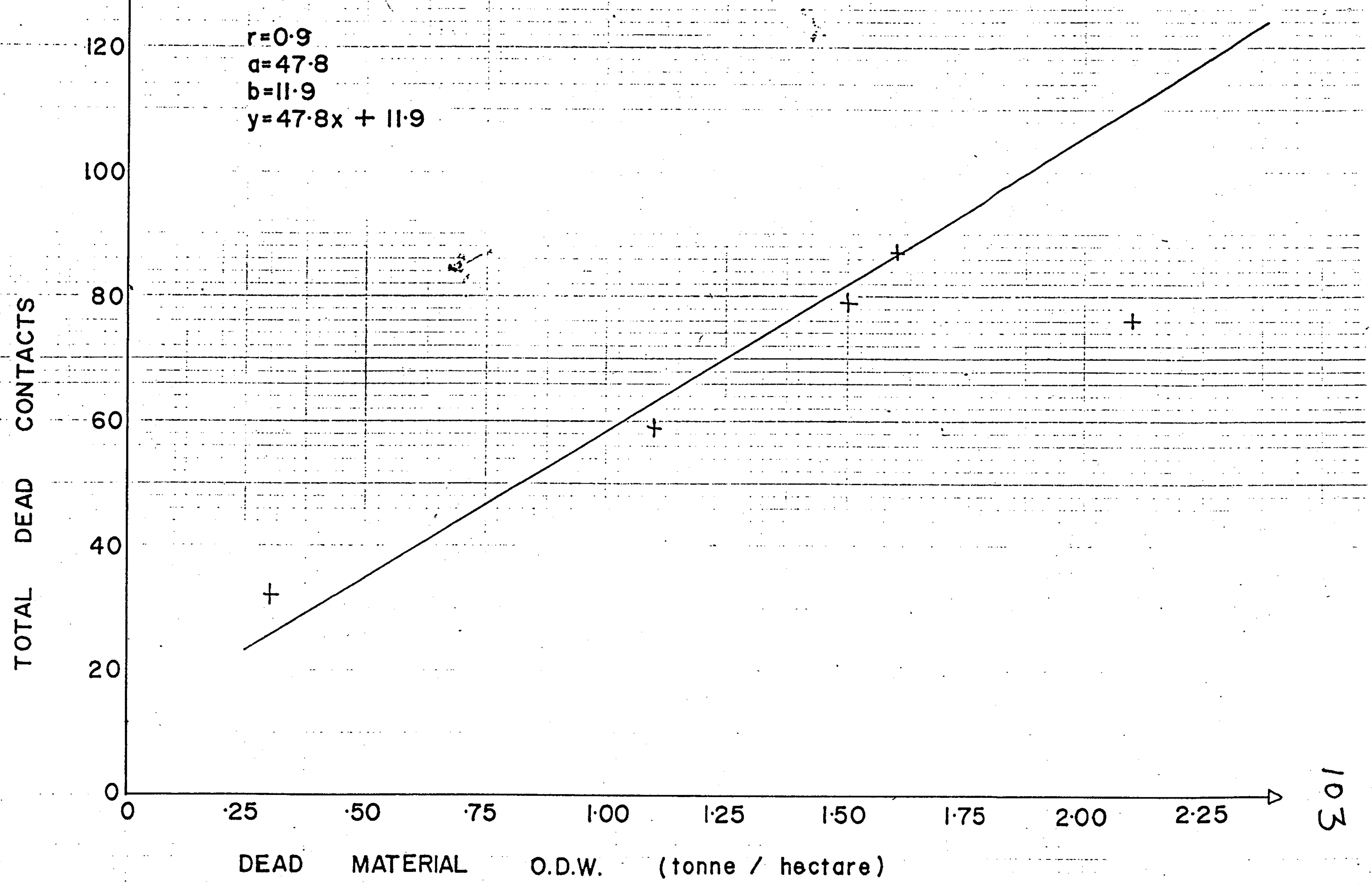
Site	Aspect	Vegetative Fuel Components in Tonnes per Hectare, O.D.W.			Total O.D.W. in Tonnes per Hectare
		Dead Material	Green Sticks	Green Foliage	
1A	South	2.0	6.0	5.0	13.0
1B	Flat	5.0	5.0	3.5	13.5
2A	North	6.0	1.4	1.6	9.0
2B	Flat	4.0	1.0	1.0	6.0

GRAPH 2


r=0·9
a=7·8
b=5·4
y=7·8x + 5·4
100
80
60
40
20
0
TOTAL GREEN CONTACTS
0
1
2
3
4
5
6
7
8
9
10
GREEN FOLIAR WT. O.D.W. (tonne / hectare)

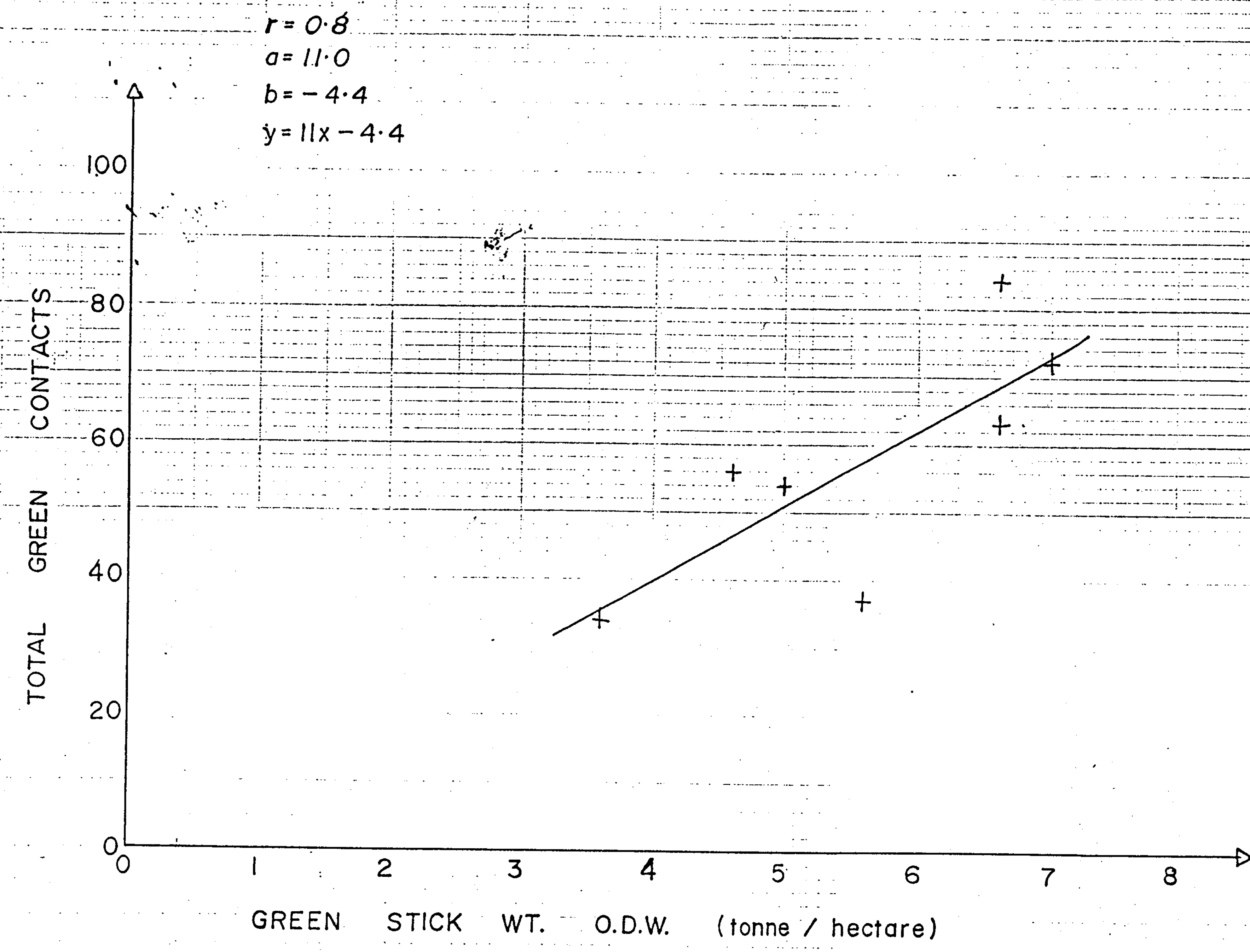

r = 0·9
a = 14·5
b = 61·2
y = 14·5x − 61·2
TOTAL CONTACTS
250
200
150
100
50
0
0
2
4
6
8
10
12
14
16
18
TOTAL WT. O.D.W. (tonne per hectare)

GRAPH 4


r=0·9
a=47·8
b=11·9
y=47·8x + 11·9
TOTAL DEAD CONTACTS
0
20
40
60
80
100
120
0
·25
·50
·75
1·00
1·25
1·50
1·75
2·00
2·25
DEAD MATERIAL O.D.W. (tonne / hectare)

2

GRAPH 3


r = 0·8
a = 11·0
b = −4·4
y = 11x − 4·4
TOTAL GREEN CONTACTS
100
80
60
40
20
0
0
1
2
3
4
5
6
7
8
GREEN STICK WT. O.D.W. (tonne / hectare)