Fire Research
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19th July,

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The Use of Nomographs in Forest Fire Danger Tables

1. Introduction

Most Forest Fire Danger Tables are based upon a series of mathematical operations which relate the various independent variables to the dependent variables of fire behaviour such as rate of spread, intensity, flame height etc. Due to the complexity of these relationships, the tables can prove cumbersome if the matrix type of representation is used. This report examines the use of nomographs for this purpose.

2. Theory

The basic mathematical operations can be represented by simple line charts known as nomographs. Fig.(i) attached shows the operations of addition and subtraction. Multiplication and division can, of course, be represented by using logarithmic scales.

3. Application:

Fig. (ii) attached shows a model for predicting R.O.S. in P. Radiata needles. The independent variables of moisture content, fuel depth, wind speed, and slope are used to predict B.F.R.O.S., then H.F.R.O.S. A matrix is used to determine the Fuel Index Factor, since for that particular operation nomographs would be more complex. It is emphasized that this is a working model only, and should not be used for actual prediction. The values shown are based upon e trapolations from thin data, and will probably be adjusted when more information has been recorded. The aim here is to introduce the method.

4. Discussion

The use of nomographs in Forest Fire Danger Tables is certainly possible. Whether it is better than the current matrix system is open to debate. The writer feels that the nomograph is, for some operations, neater, and simpler to use. It is also more accurate, since it is not necessary to divide input into cells, which process is necessary with matrices. For example, wind can be fed in correct to the nearest half mile per hour, whereas the present system breaks wind speed down into cells, each with a domain of 2.5 miles per hour, thus losing some accuracy.

5. Acknowledgement:

Acknowledgement is due to Dr. Michail Prodan for the discussion of nomographs in his book "Forest Biometrics".

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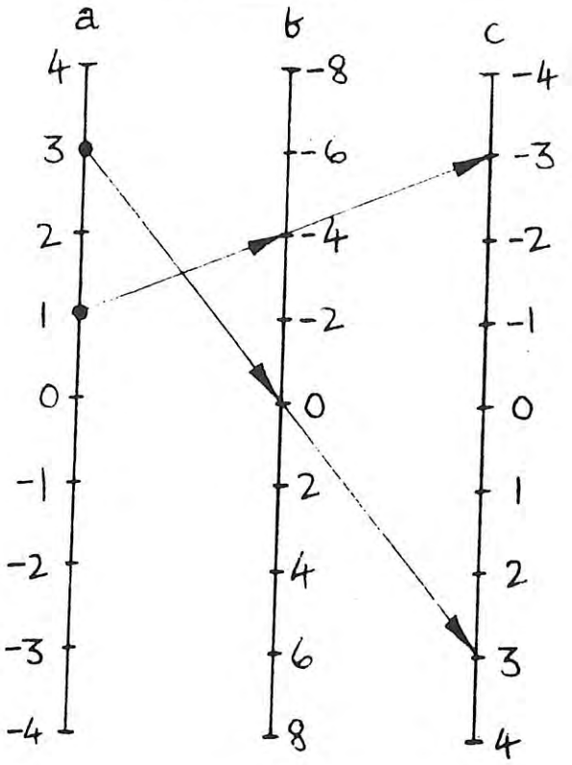
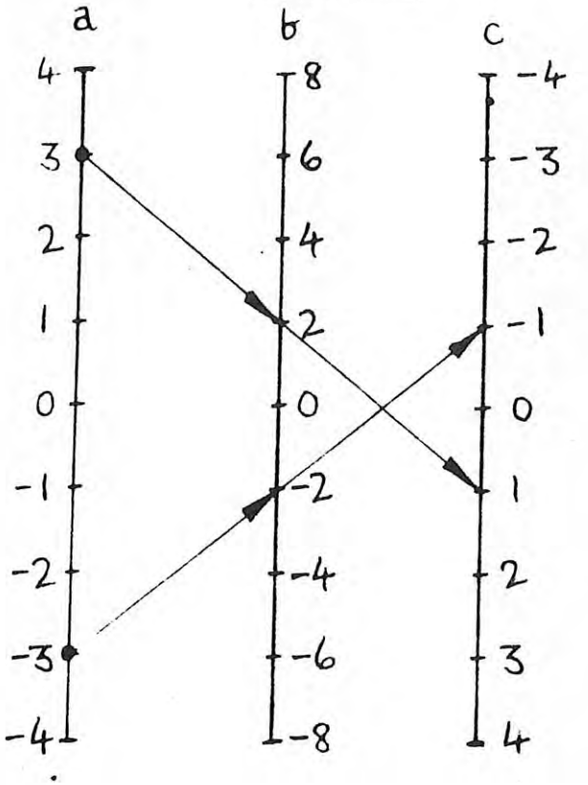
ADDITION

$a + b = c$



SUBTRACTION

$a - b = c$



P. RADIATA – R.O.S. TABLE

FIG. (ii)

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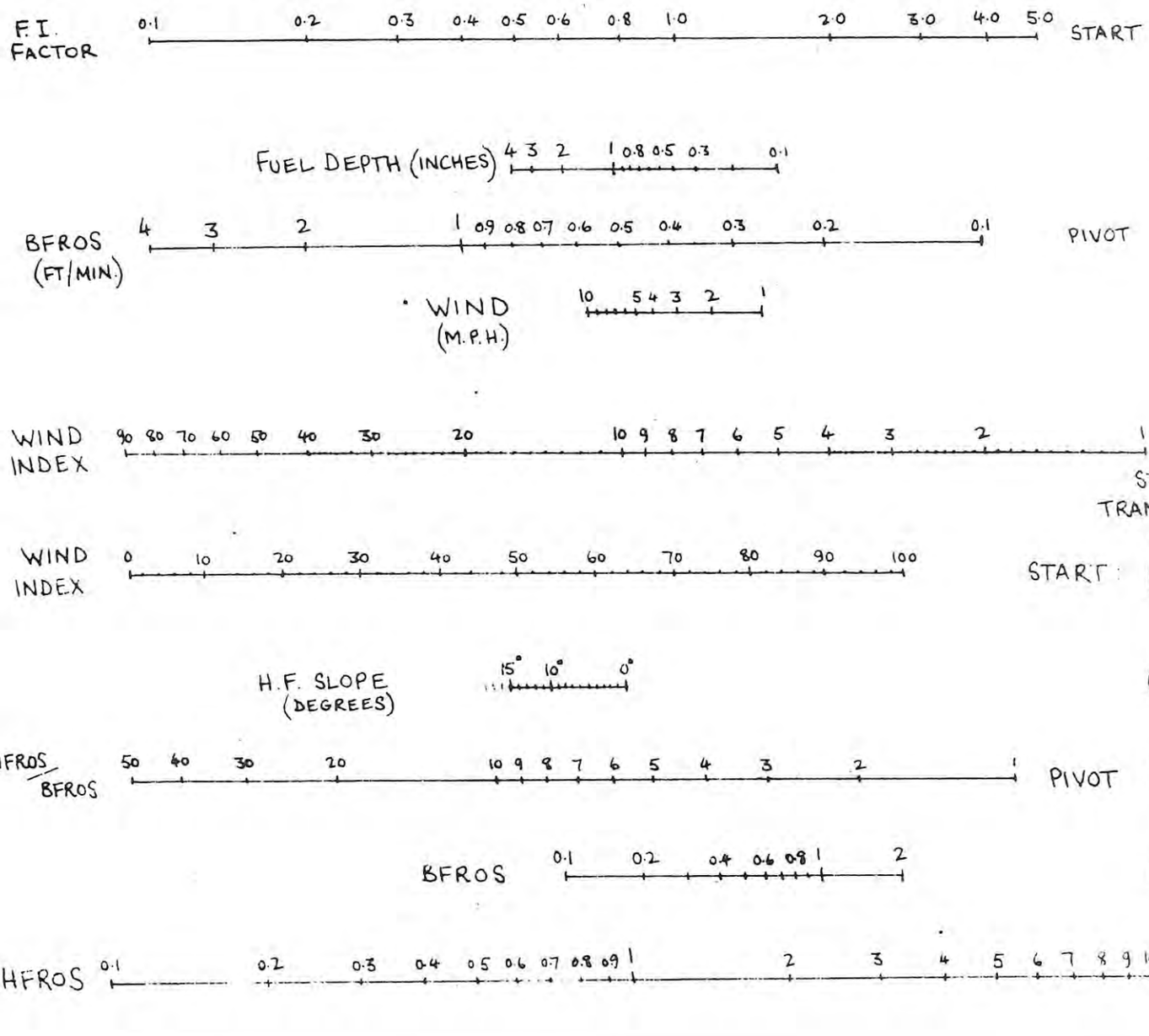
SMC \ DMC	10	15	20	30	40	50	60	80	100	120	140	160	180	200
5	2·6	1·6	1·3	1·0	0·9	0·8	0·7	0·6	0·6	0·6	0·5	0·5	0·5	0·5
10	–	2·7	1·6	1·0	0·8	0·7	0·6	0·5	0·5	0·4	0·4	0·4	0·4	0·4
15	–	–	2·4	1·0	0·7	0·6	0·5	0·4	0·4	0·3	0·3	0·3	0·3	0·3
20	–	–	–	1·0	0·6	0·4	0·4	0·3	0·3	0·2	0·2	0·2	0·2	0·2
25	–	–	–	1·0	0·4	0·3	0·2	0·2	0·1	0·1	0·1	0·1	0·1	0·1
30	–	–	–	–	–	–	–	–	–	–	–	–	–	–

READ OFF FUEL INDEX FACTOR:

INSTRUCTIONS:

USING A RULER, LINE UP F I FACTOR (a) WITH FUEL DEPTH (b) READ OFF BACKFIRE ROS (c). PIVOT ON (c) AND LINE UP WIND SPEED (d) READ OFF WIND INDEX (e). TRANSFER VALUE FROM (e) TO (f). LINE UP (f) WITH SLOPE IN HEADFIRE DIRECTION (g). READ OFF HFROS/BFROS RATIO (h) PIVOT ON (h) AND LINE UP B.F.R.O.S. (i), TO GIVE H.F.R.O.S. (j)