Remote sensing and tme phosphorus status of pasture

J.W.D. Cayley[1], P.J. Vickery[2] and D.A. Hedges[2]

[1]Pastoral Research Institute Department of Agriculture and Rural Affairs Hamilton, Victoria 3300
[2]CSIRO Division of Animal Production, Armidale NSW 2350

Remote sensing offers a means of assessing the extent of pasture improvement in large areas. This paper reports on the evaluation of two maps of the Hamilton region produced from LANDSAT data as a means of assessing the phosphorus (P) status of pasture.

Methods

LANDSAT data of the Hamilton region collected on 26.10.85 and 21.9.87 were displayed in false colour and representative samples selected. Data from four LANDSAT channels from this 'seedset' of the data were subjected to a POLYDIV classification procedure (1), and maps produced by assigning colours to the classes.Areas of pasture in 1985 were classified into four groups. Using this map several sites representing these groups were chosen and duplicate samples of subterranean clover leaves taken from each site in the spring of 1987 in order to assess the P status of pastures (2).

The 1987 LANDSAT data were classified into five pasture groups. The association between the number of sites of each class at a low, medium, high or very high P status in 1987 was assessed for each image.

Results and discussion

The highly significant values of $_x2$ for both images (65.4 or 56.8 with 9 or 12 degrees of freedom for 1985 or 1987, respectively) were due to areas of low fertility being associated with a predominance of 'green' sites and a low number of 'red' or 'orange' sites. The converse was the case for sites of high fertility. The mean levels of clover P also showed an association with class (Table 1). A meaningful classification of the LANDSAT data was thus made with no first-hand knowledge of the area in question.

Table 1. Number of sites associated with map class ('light green' to 'red') and leve1 of P status, together with the mean Pi[c] level for each class in the 1985 and 1987 images

| Pasture P status | Map class (assigned colour) | | | | | | | | |
| | light green | | dark green | yellow | | orange | | red | |
	1985	1987	1987	1985	1987	1985	1987	1985	1987
Pi 50	47	32	9	14	27	15	15	8	1
Pi = 50.5-75	25	16	5	37	55	43	66	46	9
Pi = 75.5-100	4	5	5	13	15	20	33	23	2
Pi 100	2	1	0	3	5	4	8	7	2
mean Pi	51	51	56	66	64	67	70	73	73
+se	2	2	5.1	2.9	2.5	1.9	1.9	2.7	6.3

[c]Pi = inorganic P in fresh clover leaflets sampled in 1987 (mg.kg^{-1})

1. Vickery, P.J., Hedges, D.A. and Duggin, M.J. (1980). Remote Sens. Environ. 9, 131-146.

2. Bouma, D. and Dowling, E.J. (1982). Aust. J. Exp. Agric. Anim. Husb. 22, 428-436.