EFFECT OF UNEVEN DISTRIBUTION OF SUPERPHOSPHATE ON PASTURE PRODUCTION

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The efficiency with which superphosphate is used has a considerableinfluence on the profitability of the Australian livestock industries. One likely cause of low efficiency is the uneven distribution of the fertilizer during aerial top-dressing.

The tetrahedron spreader (Trayford and Taylor 1975) was developed to spread fertilizers more evenly. However, it is scarcely used because farmers areunaware of the production losses caused by uneven fertilizer application. We have used a mathematical approach to examine the effects of uneven distribution of superphosphate on pasture productivity. Uneven distribution of fertilizer results in sub-optimal pasture response because the relationship between fertilizer rate and pasture production is curvilinear. Estimates of the extent to which uneven distribution of superphosphate reduces pasture yield were made using a Mitscherlich type response function integrated with several typical fertilizer distribution patterns. We examined pasture response to applied superphosphate using Australian data for swath width and application rate with and withoutthetetrahedron spreader as presented by Trayford and Taylor (1975) for a De Havilland Beaver, a typical aerial topdressing aircraft. Two cases were examined: i) a newly established pasture with a yield at zero fertilizer of 2000 kg/ha/yr; ii) a pasture with maintenance fertilizer requirements and a yield of 8000 kg/ha/yr without fertilizer.

Calculated percentage losses in pasture response from uneven compared to uniform application of superphosphate for an aircraft flying at 53 metres with and without the tetrahedron spreader are:

	Pasture type	Method of spreading	Rate of superphosphate (kg/ha)		
			40	112	202
i)	Newly sown pasture	Standard	5.2	10.0	14.4
		Tetrahedron	0.1	0.6	6.2
ii)	Maintenance pasture	Standard	12.2	20.1	24.1
		Tetrahedron	0.4	1.2	9.9

From these data it may be seen that at the normal application rate for most agricultural aircraft, 125 kg/ha, significant losses in pasture productionofabout 10-20% will occur. Further, estimated losses for the tetrahedron spreaderwillbe negligible up to a rate of 112 kg/ha of superphosphate.

Because the problem is greater on older than new pastures, the losses from uneven fertilizer distribution will increase in Australia as more and more pasture attainshigh total fertilizer inputs; thus the economic benefits from modifying aircraft to improve the uniformity of fertilizer distribution will be substantial.

TRAYFORD, R.S. and TAYLOR, P.A. (1975). Vth Int. Agric. Aviation Congr. Proc., Kenilworth, U.K., p. 294.

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