Upgrading the slurry tanker fleet – approximate cost.

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Introduction

The splash plate (SP) slurry tanker has served farming well but the high gaseous and aerosol emissions and uneven spreading by this tanker are no longer acceptable. The Gothenberg agreement (UNECE, 1999) requires a reduction in national NH_3 emission to 8% below 1990 levels by 2010. The object of this study is to select the ideal spreader for use on Irish farms and indicate the cost to the nation of this innovation.

Materials and Method s

Slurry spreading has been widely researched. The most suitable tanker for use on Irish farms was sought using an existing literature review. Data used in the selection include NH_3 emission by spreaders, the NH_3 content of slurry, national slurry volume and the total number of slurry tankers in the Republic of Ireland.. The costs of the proposed tanker and of a SP tanker were calculated and cost to the nation was estimated. The proposed tankers each consisted of a closed tank with running gear fit for road and field conditions, a fixed displacement pump and a chopper filter. A band, trailing foot (TF) or injector spreader was included as required.

Results and discussion

The three tankers considered offered similar performance in relation to the key concerns of NH_3, odour and nutrient loss to water. The selection sought to identify the machine with the best performance at lowest cost.

The comparison between tankers required the use of a common variable across the field. Finance was used in this study. The main cost (capital cost) was offset by cost benefits in improved grass growth and reduced odour. Ideally a cost/benefit study would yield a positive result for one of the candidate machines but no positive result was obtained here.

An alternative approach allows the observation that the Republic of Ireland is obliged to reduce NH_3 emissions by 2010. Improvements in slurry spreaders to reduce NH_3 emissions are costly. The calculations in this study show the cost of these changes per kg of NH_3 saved. This cost amounted to €29.5, €23.6, and €24.9 for band, TF and injector tankers respectively where slurry had a low TAN (total NH_3 content) of 1.5 kg/t of slurry. At a higher TAN content of 6.4 kg/t, the corresponding costs were €6.9, €5.5, and €5.8. In each case the TF tanker offered the lowest cost per kg of NH_3 saved. This tanker appears to be the most economical slurry tanker available to reduce NH_3 emissions.

The result of the cost analysis for TF and SP tankers is given in Table 1. Capital cost and spreading cost of TF tankers is two to three times that of a SP tanker. The increased value of nutrients does not cover the increased cost of spreading.

Table 1. Estimated cost of operating SP and TF tankers (2005 values)[a].

	Splash Plate [b]		Trailing Foot [c]	
Tanker size (m^3)	5	9	5	9
Capital cost (1000 €)	7.0	15.4	20.0	28.4
Spreading cost (€/m^3) [d]	5.7	2.7	14.0	4.8
Nutrient value (€/m^3) [d]	3.0	3.0	4.0	4.0

Notes: a. Cost variables: depreciation over 8 years; interest rate 7% $annum^{-1}$; repair cost 11% of purchase price per year and labour 10 € h^{-1}.
b. This includes tanker, vacuum pump, SP and tractor. Working width is 10 m
c. This includes tanker, chopper filter, FD pump, trailing foot spreader and tractor. Working width is 5 m.
d. Read "€/m^3"as "€/m^3 of slurry"

The cost is shown in Table 2 of upgrading all or most slurry spreaders in the Republic of Ireland from SP to the proposed TF tanker. Where all slurry tankers were improved a reduction of 17% in National NH_3 emission could be expected. Costs could be reduced if only tankers larger than 9 m^3 are modified. A reduction exceeding 10% of NH_3 emission can be expected from this option.

Table 2. Approximate Cost of introducing the proposed slurry tanker to Ireland [a, b].

	All tankers (€m)	Tankers ≥ 9 m^3 (€m)
Replace tankers	800	450
Modify tankers [c]	400	200

Notes: a. Total number of slurry tankers: 31,000 (CSO, 2000).
b. Sales distribution – Tanker size (m^3); Market share (%): 4.8;4, 6;21, 7.2;27, 9;19, 10.2;17, 11.4;4, 13.6;4, 15.9;4.
c. Cost of modification for all tanker sizes; €13,000

Possible alternatives to improving slurry tankers include digesting slurry and reducing emissions from livestock housing. These options reduce NH_3 emissions but they are not viable at present. If they were they would probably be more expensive than the slurry tanker proposal.

Conclusion

The TF slurry tanker offers the most economical reduction in NH3 emission of any slurry tanker available in Ireland. The cost of introducing this tanker to Irish farms lies between €200m and €800m depending on the options chosen.

References

CSO (Central Statistics Office) (2000) Census of agriculture – Tables 13 and 14. http://www.cso.ie/releasespublications/pr_agrifishpubshardcopies.htm

UNECE (UN Ecomomic Commission for Europe) (1999) Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone, Convention on Long Range Transboundary Air Pollution. http://www.unece.org/env/lrtap/multi_h1.htm