

Nutrient Management Efficiency in the Republic of Ireland – Saving the Environment and Reducing Costs.

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Introduction

Within the constraints of the EU Nitrates and Water Framework Directives, controlling and managing nutrient transfers to water from excessive fertiliser use on agricultural land is a significant environmental policy challenge. This paper assesses whether there is room to reduce nitrogen and phosphorus fertiliser application on intensive farms in the Republic of Ireland by exploring the extent of their over application using data envelopment analysis methodology.

Methodology

Data envelopment analysis (DEA) is a deterministic approach to efficiency measurement. It measures the relative efficiency of a decision making unit (DMU) by comparing relative inputs to outputs. DEA establishes the most efficient DMU's and compares all others to the most efficient. The method uses linear programming to place a non-parametric frontier over the data. This frontier consists of the most efficient DMUs and all other DMUs are measured by their relative distance to this frontier as a measure of their level of efficiency (Coelli et al., 1998).

The main data source employed in this analysis is the Teagasc National Farm Survey (NFS) 2008. The NFS is collected annually as part of the Farm Accountancy Data Network requirements of the European Union. A farm accounts book is recorded on a random representative sample of farms throughout the Republic of Ireland. The sample is weighted to be representative of farming nationally across Ireland. In the 2008 NFS survey 1,102 farmers were surveyed representing 104,800 farmers nationally (Connolly et al., 2009).

This paper concentrates on specialist dairy and tillage farms. These agricultural systems are the most intensive and may pose the greatest risk in terms of managing nutrient transfer from agricultural land to water courses. The analysis was undertaken and stratified by land use potential. Output for specialist dairy farms was measured in litres of milk per hectare and the inputs examined were chemical nitrogen (N) and phosphate (P) fertiliser usage (kg ha^{-1}) as well as N and P in feeds, labour and other variable costs. Output for specialist tillage farms was measured in the form of gross output in € ha^{-1} and the inputs examined were again chemical nitrogen and phosphate fertiliser usage (kg ha^{-1}), labour and other variable costs.

Results

Analysis indicates that specialist dairy farmers on good soils tended on average to overuse fertiliser to the greatest extent at 33.3 kg N ha⁻¹ and 3.0 kg P ha⁻¹. Average cost saving on fertilisers of €49.6 ha⁻¹ could be achieved by operating at the benchmark standard. This figure declined to between €40.7 ha⁻¹ for those on average soils based on N over application of 25.9 kg ha⁻¹ and average excess P of 3.0 kg ha⁻¹ as shown in Table 1. Results for specialist tillage farms on good soils indicate over application compared to the benchmark of 21.2 kg N ha⁻¹ and 3.3 kg P ha⁻¹. Potential cost savings compared to the benchmark were indicated at €36.4 ha⁻¹ as illustrated by Table 1.

Table 1: DEA analysis of over application of N and P on specialist dairy and tillage farms.

Farm System	N	N (Kg ha ⁻¹) Over application	P (Kg ha ⁻¹) Over application	Potential cost saving* (€ ha ⁻¹)
Specialist Dairy - Good Soils	137	33.3	3.0	49.6
Specialist Dairy - Average Soils	89	25.9	3.0	40.7
Specialist Tillage - Good Soils	80	21.2	3.3	36.4

*Average prices from the CSO (CSO, 2009)

Conclusions and Discussion

Results demonstrate room for improved efficiency in the utilisation of N and P fertilisers across specialist dairy and tillage farms in the Republic of Ireland. Consequently, there is potentially an opportunity for inefficient producers to reduce costs on N and P fertilisers without affecting output by adopting similar practices to those of the most efficient benchmark farms. Potential cost savings on average ranged from €49.6 ha⁻¹ to €36.4 ha⁻¹. Such reductions have the potential to deliver a win-win situation by reducing the risk of nutrient leaching and diffuse pollution from agricultural land while improving economic margins.

References

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