

# Technology acceptance in nutrient management

Good, bad or indifferent: **TEAGASC** researchers investigate the importance of farmer perceptions in the adoption of nutrient management plans.

The agricultural sector will play an important role in reaching the goals set out in the Water Framework Directive 2000/60/EC (WFD). Strict nutrient management can reduce the risk of nitrogen (N) and phosphorus (P) mobilisation and transfer to water bodies, with positive outcomes for water quality and farm level profitability (Buckley and Carney, 2013). A technology acceptance model (TAM) was employed to assess the probability of farmer acceptance of a nutrient management plan (NMP) underpinned by a soil test. A key purpose of the TAM is to provide a basis for tracing the impact of external variables on internal beliefs/perceptions, which in turn influence/drive attitudes towards use (A), subsequent behavioural intention to use (BI), and actual system use (Davis, 1989), as outlined in **Figure 1**. Within this framework, two specific variables are developed, which are hypothesised to be fundamental determinants of user acceptance: ‘perceived usefulness’; and, ‘perceived ease of use’. Perceived usefulness is defined as “the degree to which a person believes that adopting a particular management practice would enhance his or her job performance”, and perceived ease of use is defined as “the degree to which a person believes that using a particular management practice would be free of effort” (Davis, 1989).

## Survey of farmers

The research is based on a survey of farmers across 12 agricultural catchments, six of which are in the Teagasc Agricultural Catchments Programme. Of the farms surveyed (n=376), not all of those that had a soil test progressed to developing an NMP. In all, 86% of farms soil test, whereas 63% of farms have an NMP (**Table 1**). The data shows that farmers who do not have a soil test are more likely to have extensive livestock farms, have smaller farms, and are more likely to have an off-farm job. Soil testing and NMPs are also mandatory for farmers involved in an agri-environmental scheme (GLAS – Green, Low Carbon, Agri-environment Scheme) or farms

applying for derogation under the Nitrates Directive (ability to farm at 2.94LU/ha versus 2LU/ha). Four categories of farmers are identified based on their soil testing and nutrient management planning behaviours (**Table 2**). Farms that adopt best practice on a voluntary basis and farms that adopt neither are of particular interest from a policy perspective. This formed the basis of the research questions: what are the driving forces that influence farmers to adopt both practices voluntarily? And, how are these farms different to farms that adopt neither practice?

Specific questions were used to assess the perceived usefulness and the perceived ease of use of adopting an NMP (**Table 3**). Responses were scored from strongly disagree to strongly agree on a scale of 1-5. Results from questions 1-4 are grouped together to create a variable perceived usefulness and questions 5 and 6 define perceived ease of use (Davis, 1989).

## Predictors of future intent

Across all categories, farmer beliefs about the perceived usefulness and perceived ease of use of an NMP are highly significant predictors of future intention to adopt and use, even on farms that do not currently have a soil test or an NMP. Voluntary adopters rate perceived usefulness to be significantly more important than the perceived ease of use, indicating that farmers using the technology place more importance on the usefulness and potential benefits (e.g., economic) of an NMP. This highlights the fact that users are often willing to cope with some difficulty of use if they believe in the usefulness of the technology; however, no amount of ease of use can compensate for a perceived lack of usefulness.

## Impact on knowledge transfer

This research applied the TAM to explore the effect of ease of use and usefulness of an NMP on adoption rates. Results indicate that perceived usefulness is the strongest predictor, which indicates that

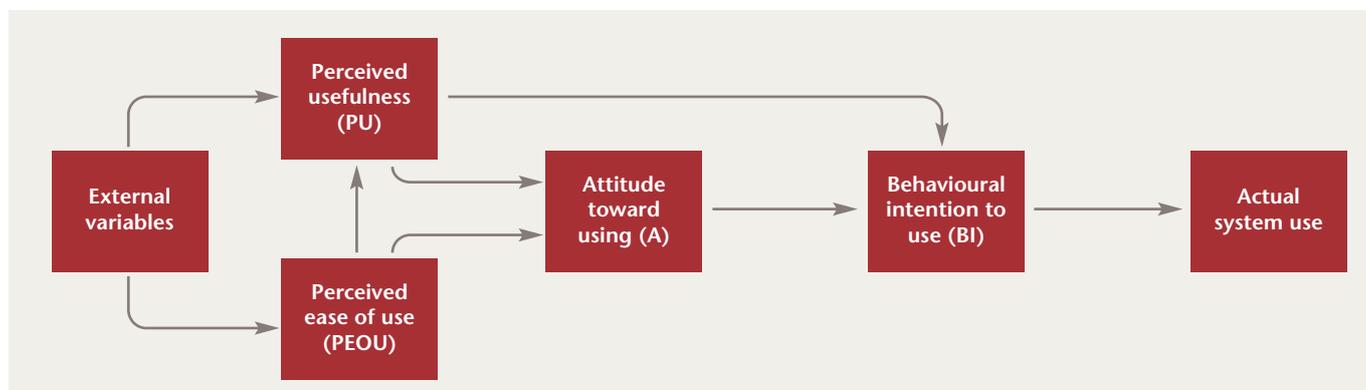


FIGURE 1: Technology acceptance model. Source: Davis, 1989.

Table 1: Percentage of farmers that have and use an NMP (n=376).

Technology	Percentage that have a soil test or NMP	Percentage that have and use a soil test or NMP
Soil test	86.7	78.9
NMP	62.5	60.3

Table 2: Farm categories based on technology usage (n=376).

Category	Frequency of technology use	Percentage of farms
1. No soil test and no NMP	50	13.30
2. Soil test only	91	24.20
3. Soil test and regulatory	170	45.21
4. Soil test and NMP voluntary	65	17.29

Table 3: Survey questions to assess the underlying perceived usefulness and perceived ease of use of an NMP (n=376).

Variable	Mean score (1=strongly disagree; 5=strongly agree)
<b>Perceived usefulness</b>	
1. NMP increases my profits	4.29
2. NMP increases production	4.14
3. NMP is better than no plan	4.12
4. NMP is important to my farming needs	4.07
<b>Perceived ease of use</b>	
5. NMP results are easy to use	3.96
6. NMP results are easy to understand	3.94

perceived or actual benefits are an important determinant in technology adoption. Farmers are also influenced by the ease of understanding and ease of use of that technology. This has important implications for knowledge transfer in relation to the adoption of new or relatively complex technologies.

**Acknowledgements**

The Agricultural Catchments Programme is funded by the Department of Agriculture, Food and the Marine (DAFM). The authors would also like to thank the Agricultural Catchments Programme

farmers for their continued participation and support. Thanks also to Teagasc’s Rural Economy and Development Programme.

**References**

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