

‘Quick Washing’ of poultry litter

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1. Introduction

The Nitrates Directive 91/676/EC places restrictions on the amount of organic nitrogen that can be spread on land. This is generally limited to 170 kg N per hectare per year although some countries have achieved derogations from this limit and are allowed to spread higher amounts – up to 250 kg N per hectare per year.

A recent proposal for disposal of poultry litter to aid compliance with the Nitrates Directive for Northern Ireland’s poultry producers is the establishment of a biomass fuelled power plant near to Glenavy. It is proposed that this facility will process 220,000 tonnes of poultry bedding and 40,000 tonnes of meat and bone meal (MBM) and in doing so will generate 30MWe of electrical output, with 25MWe of this exported to the Northern Ireland grid.

A paper on possible alternatives for poultry litter disposal has previously been submitted but a development in respect of treating poultry manure to remove nutrients has been recently reported in a scientific journal and local farming papers. This short paper aims to answer specific questions about this development.

2. What is this new development and is there a scientific basis for it?

A paper was recently published in the Transactions of the American Society of Agricultural and Biological Engineers (ASABE)¹ that described a process of recovering (‘washing’) phosphorous (P) from poultry litter. The method basically involves 3 steps:

- (i). P extraction – the solid litter is mixed with selected acids to convert bound P to soluble P. The solid washed waste is then separated from the liquid and dewatered.
- (ii). P is precipitated out of the liquid.
- (iii). P grade is enhanced by addition of chemicals to produce a product that can be used as fertilizer.

The method described removes more than 60% of the phosphorous from the poultry litter solids. On the basis of this article being peer reviewed before publication it is a verifiable method with a sound scientific basis.

3. Where and how would it be operational in Northern Ireland?

The information to date indicates that this is at the prototype stage. The developers, who are employees of the Agriculture Research Service (ARS) (a section of the

United States Department of Agriculture), used two connected reactor vessels as the prototype system in the field experiment. For illustration purposes this is highlighted in Figure 1.

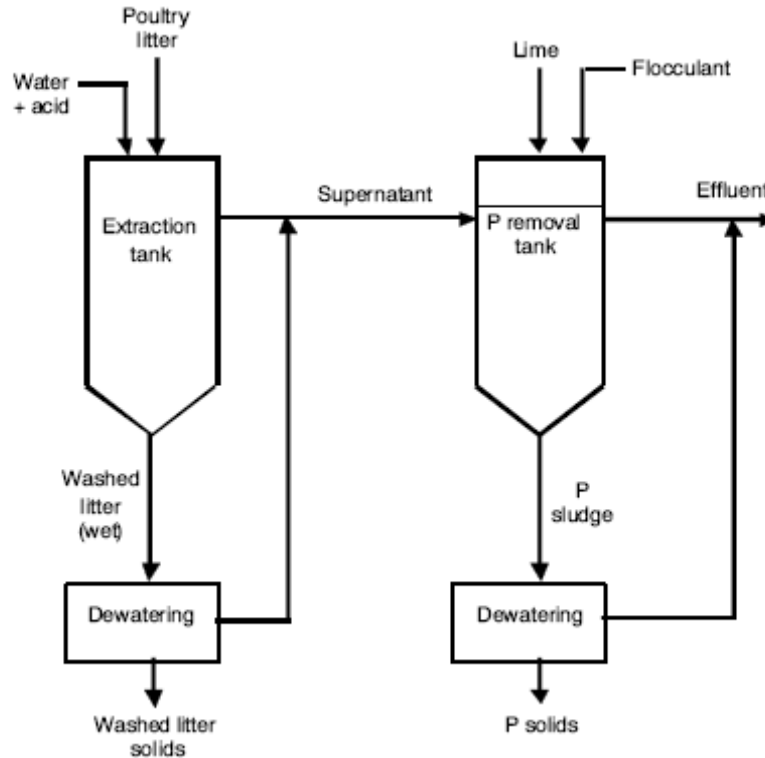


Figure 1 Field prototype system for manure quick wash
(taken from Szögi et al 2008)

However, ARS has indicated that it is currently looking for business partners to move the product² to market; therefore it is still at an early stage of development. It is difficult to say where and how it would be operational in Northern Ireland though presumably a large scale centralised operation e.g. large enough to deal with 220,000 tonnes of poultry litter, would be subjected to the same planning scrutiny as the proposed biomass fuelled power plant at Glenavy. It should be noted however that the developers of the method assume that the process is carried out *on-farm* in order to eliminate the cost of transporting litter to a centralised facility.

4. What happens to the water used for washing and where is it disposed of?

Both the washed litter and the effluent produced as a result of the process remain on-farm. The washed litter can be applied to the land, although this retains the nitrogen and therefore would have implications for compliance with the Nitrates Directive, or used again as a bedding material, while the effluent can also be spread on the land.

5. Is this a viable option to waste disposal?

This process is focussed on the removal of phosphorous from poultry manure – it leaves the nitrogen behind in the washed litter that is subsequently recovered.

However, there are three possible options for use of this material:

- Recovered washed litter *can* be used again as bedding BUT there is no indication if *new* bedding material would also have to be added, or what *proportion* of the bedding might have to be *new* material. There is also no indication of how many times this process could be applied to a single 'batch' of bedding material.
- The authors state that the recovered litter is more environmentally safe for land application and use by crops but this relates to the reduced *phosphorous* levels minimising the impact of eutrophicationⁱ of freshwaters. This would not assist poultry farmers to achieve compliance with the requirements of the Nitrates Directive given that nitrogen remains in the litter. Its use as a fertiliser *in this context* is not viable.
- Another use for the litter is use in energy production - e.g. in a biomass unit for energy production.

In addition the recovered, and concentrated, *phosphorous product* can be used as a fertilizer.

The method is not an alternative for waste disposal rather it opens up possible alternative uses for the poultry litter e.g. reuse as bedding, but ultimately this material will have to be disposed off.

6. Conclusion

The 'Quick Wash' method treats poultry litter by the removal of phosphorous – the key limiting nutrient in the eutrophication of freshwaters. It recovers this phosphorous which can subsequently be used as a fertiliser thereby opening up the possibility of a market for a product from waste. In addition there is the possible *reuse* of bedding material (washed and recovered litter).

However, as the developers of the process point out further economic analysis needs to be carried out including determining the annualised capital and labour costs and the market potential of the recovered phosphorous as a fertiliser. Investment is also needed to bring the process to market.

Furthermore, in a Northern Ireland context, while eutrophication of freshwaters is a major problem, the main issue for the poultry industry in respect of litter is the nitrogen content and compliance with the Nitrates Directive. Given that the nitrogen component remains in the litter it is not an option to subsequently spread this on land in Northern Ireland. Its re-use as a bedding material *is* an option. However, the economic benefit of processing and reusing litter would have to be weighed up

ⁱ Eutrophication refers to the process of nutrient enrichment and can lead to the over-enrichment of lakes, rivers and the marine environment to the extent that there are excessive growths of algae and other aquatic plants. For lakes and rivers, phosphorus is considered to be the limiting nutrient that determines plant nutrient and algal growth and so is the driver of eutrophication.

against the option of purchasing new bedding material – taking into account capital and labour costs and determining the payback period on the initial investment.

This process is an exciting development in the *management* of poultry waste but within a NI context it does not remove the need for disposal options.

¹ Szögi, A.A., Vanotti, M.B., and Hunt, P.G. (2008). Phosphorous Recovery form Poultry Litter. Transactions of the ASABE, vol.51(5):1727-1734.

² USDA News and Events. Mining Manure for Phosphorous <http://www.ars.usda.gov/is/pr/2008/080229.htm>