ADOPT BATCH STORAGE OF SOLID MANURE second DRAFT

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Description

- Store solid manure for at least 90 days before spreading on fields.
- No fresh manure should be added to the heap during this storage period.

Rationale, mechanism of action

Faecal Indicator Organisms (FIOs) die off during storage. There are fewer organisms in the material that is spread and therefore less risk of microorganisms from the manure entering water bodies *via* surface run-off or percolation through the soil to field drains. Also, the readily available N and total N content of stored farmyard manure will be lower than in the fresh manure, which will lessen the risk of nitrate leaching losses.

Numbers of FIOs decline during storage of the manure [1]. The rate of decline is accelerated if composting occurs and high temperatures develop in the heap. This happens naturally in most farmyard manure (FYM) and poultry litter heaps [2]. There are thus fewer microorganisms in the manure when it is spread and therefore less risk of FIOs entering water bodies in run-off or where water percolates to underlying drains. Although storage is effective at reducing bacterial numbers, it is less effective in reducing populations of the protozoan parasite, *Cryptosporidium*. There will also be gaseous losses of ammonia and nitrous oxide and immobilisation of N during storage, which will reduce the quantity of mineral-N available for loss by leaching or in surface run-off. Fresh cattle FYM typically contains 25% of ammonium-N [2], compared with 10% in FYM that has been stored for more than 3 months. There is also a reduction in the total N content; typically, 30-50% of the total N in FYM is lost during storage. For poultry manure, about 15% of the N is lost during storage but the proportion of readily-available N remains similar to that in the fresh material. The method will have no effect on P losses.

Applicability

The method is applicable to livestock farms that produce solid manure and have only a single store where fresh manure is continuously added to that already present. Potential benefits will be greatest on impermeable soils where the risk of surface run-off is greatest, on drained clay soils with rapid by-pass flow routes to drains and on freely drained soils that are susceptible to nitrate leaching.

Effectiveness, including certainty

For nitrate, Cuttle et al. [1] based their estimates on a beef and sheep model farm system in which FYM is stored for three months. Assuming FYM is applied one year in three, the effect would be a reduction of 3 kg N/ha per year (when compared with a baseline loss of 10-20 kg N/ha) on the fields to which the FYM is applied. There will be no effect on P losses.

For FIOs, Cuttle et al. [1] estimated that there would be no change on the model beef and sheep farm studied. The method is of limited effectiveness because most FYM is already stacked on farms for more than 3 months before spreading.

Time frame
For nitrate the method will be fully effective within a couple of winters following implementation.

Environmental side-effects / pollution swapping
Storage gives rise to increased ammonia and nitrous oxide losses [1], whereas gaseous N losses during and after field application can be reduced through good management. For example, incorporation of FYM into the soil within 24 hours can significantly reduce ammonia losses, and applying FYM in the spring can potentially reduce N_2O emissions. Through incorporation and better timing of fresh manure applications, the overall gaseous losses can be lower from the application of fresh manure than from the long-term storage and application of 'old' manure.

Relevance, potential for targeting, administrative handling, control
Storage facilities for solid manures can be constructed relatively simply and cheaply and there are therefore few limitations to adopting this method.
If manure from loose-housed cattle is only removed from the animal house at the end of the winter housing period, a 90-day storage period would restrict its use on some spring-sown crops, e.g. maize. This might have an adverse environmental effect, as farmers would then have to apply manure from loose-housed cattle in the autumn, ahead of cereals or oilseed rape. Despite the low mineral N content of stored manure, autumn manure applications can lead to higher nitrate leaching than spring applications. Thomsen [3] reported that N leaching losses after FYM autumn applications were twice those following spring applications. Grall and Morvan [4] also showed that FYM application before maize provided a suitable compromise between environmental, economic and production criteria.
In conclusion, the adoption of 90 days storage for solid manure should be limited to situations where there is a high risk of transfer (via surface run-off, by-pass flow, or drains) to sensitive waters.

Costs: investment, labour
Assuming storage on concrete, this involves making a hard-standing with a drain and trap, on which to store the manure, assuming no concrete pad is used at present.

References
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