COMPOST SOLID MANURE

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Description

- Encourage the breakdown of solid manures by actively composting the manure heap.
- Turn the solid manure heap twice in the first seven days of composting to facilitate aeration and the development of high temperatures within the heap.

Rationale, mechanism of action

The aim is to allow naturally occurring microflora to degrade cellulose and other carbon compounds in the manure (or other added material) to produce a more friable, stable, and spreadable product with reduced volume. In the process, the manure is sanitised and the readily available N content is reduced, thereby lowering nitrate and FIO losses when the compost is spread. This is a source method that uses aerobic microbial metabolism to increase temperatures sufficiently to inactivate pathogens and to reduce the readily available N content of manures. The biological and subsequent chemical reactions can involve a rise in temperature up to around 70^{o}C, which serves to inactivate weed seeds and most pathogens. The whole process involves close monitoring to ensure that the pile temperature increases to above 55^{o}C for three days after each turn. The readily available N content of farmyard manure is typically reduced from 25% to 10% of the total N, so N losses following land spreading are likely to be lower. Some N is bound into organic forms and some is lost to the atmosphere as ammonia and nitrous oxide. Turning of the pile allows mixing and the further degradation of material and ensures that all parts of the pile are treated. Composting has no effect on the proportion of readily available N in poultry manure.

Relevance, applicability & potential for targeting

Applicable to farms with solid manures, particularly in areas where there is a high risk of pathogen transfer to water systems. This option can be easily incorporated into normal farm operations using standard farmyard machinery.

Effectiveness, including certainty

N: Cuttle et al. [1] based their effectiveness estimates on a Beef model farm system in which FYM is stored for three months. Assuming FYM is applied one year in three, they estimated that the option would only have small effect on nitrate leaching.
P: There will be no effect on P losses.
FIOs: No change. This reflects the small difference between the effects of composting and static piling on FIO viability.

Time frame

The nitrate effect would be seen in the winter following implementation.

Environmental side-effects / pollution swapping

It should be noted that many of the benefits of a managed composting process can also be achieved by simply batch storing solid manure. Composting typically results in 30-50% of the total N in farmyard manure being lost to the atmosphere, either as ammonia, nitrous oxide or dinitrogen gas. For poultry manures, losses are more typically 20%. It is possible to reduce ammonia emissions from composting by

reducing aeration intensity and by increasing the amount of straw relative to the amount of dung (i.e. providing a higher carbon:nitrogen ratio) [2, 3, 4]. However, if the aeration intensity is too low, emissions of nitrous oxide and methane would most likely increase [2].

Administrative handling, control
A degree of education and guidance is necessary in the first few months of operation.

Costs: investment, labor
The costs will include operational costs of turning manure per tonne. It is assumed that normal agricultural machinery could be used to turn the manure. The construction of a concrete pad, if required, would entail additional investment costs.

References
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[3] Csehi, K. (1997) Ammoniakemission bei der Kompostierung tierischer Exkremente in Mieten und Kompostqualitat. (Ammonia emissions during composting of animal manures in windrows and compost quality) Forschungsbericht Agrartechnik des Arbeitskreises, Forschung und Lehre der VDIMEG, Nr. 311, Germany.
[4] Trewavas, A. (2004) A critical assessment of organic farming-and-food assertions with particular respect to the UK and the potential environmental benefits of no-till agriculture. Crop Protection 23, 757–781.