AVOID APPLYING FERTILIZER AND MANURE TO HIGH-RISK AREAS

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Description

Do not apply fertilizer, slurry or solid manure to field areas where there is a high risk of direct or very rapid flow to watercourses. Examples include:

- areas directly adjacent to a watercourse, borehole or road culvert
- shallow soils over fissured rock or cracked soils over field drains
- areas with a dense network of open (surface) drains or wet depressions (flushes) draining to a nearby watercourse.
- areas characterized by highly permeable soils, soils that have a low field capacity, shallow or sensitive aquifer recharge areas, and areas where preferential flow can occur. Such areas are particularly relevant to N losses from applied nutrients.

High risk areas also include fields with high P index soils (e.g. P Index 4 and above). Fertilizer or manure P should not be applied to these areas at any time.

Rationale, mechanism of action

Areas that have a high degree of hydrological connectivity between the field and watercourse have a particularly high risk of rapid transport of solutes or suspended material to watercourses. Applying fertilizers and manures to these areas will further increase excessive soil N and P contents and potential losses. Inputs of potential pollutants to these areas should therefore be avoided wherever possible. Avoiding applications to such areas reduces the risk of slurry contributing to overland flow or draining directly into field drains and transporting pollutants to watercourses. There is a similar risk of losses of soluble and suspended material from fertilizers and solid manures but these will generally only occur when heavy rain follows application. The method is most effective against losses of P and FIOs, where the primary mechanisms of transport are by preferential flow and in surface run-off. Losses of P on eroded soil particles and by leaching are greatest on high P index soils. With-holding fertilizer and manure applications to these soils allows soil P contents to decline, thus eventually reducing the quantities lost via erosion or leaching.

Applicability

The method is applicable to all farms applying fertilizers and manures to the hydrologically "highly connected" areas described above. Whilst high risk areas for N application may be widespread (e.g. whole aquifer recharge areas), critical source areas for P loss are generally smaller and more amenable to the application of this BMP. This management approach is of particular relevance to farms that have very dense networks of open drains. Wet depressions are most likely to occur in undulating landscapes over fissured rocks, which produce frequent spring lines. Some upland farms have significant areas of semi-improved grassland with a high density of open drains or gullies within the fields. Some resistance to uptake of this management practice can be foreseen where yields and income losses from highly valuable crops (e.g. orchards and vegetables) may be incurred.

Effectiveness, including certainty

For nitrate: Cuttle et al. [1] estimated that baseline losses on the model farms with manure would be reduced by 0-1 kg N/ha per year, averaged over the farm area [1]. The effects would be greater in the affected areas, but it was assumed that these were a

[1] Combined from two separate factsheets by R.M. Monaghan, New Zealand

relatively small proportion of the farm. Larger reductions may be expected for the targeted application of N fertilizer, although this will be highly dependent on landscape features and the proportional area of farm defined as high risk.
For phosphorus: Cuttle et al. [1] estimated that adoption of this option could potentially result in a 40% reduction in the manure component of P baseline losses, over the area to which the method is applied [1]. Large reductions may also be expected for the targeted application of P fertilizer, although this will again be highly dependent on the proportional area of farm defined as high risk.

Time frame
The largest impacts will be seen during the wet autumn/winter months when hydraulic conductivity is greatest. However, there will be a reduction in losses all year round, as a result of some of the high-risk areas being hydraulically connected during the summer months. For phosphorus, there will be longer term benefits as soil P contents are reduced, thus reducing losses of P attached to soil particles and via leaching.

Environmental side-effects / pollution swapping
The method will also reduce water pollution risks from ammonium-N, faecal indicator organisms and elevated levels of BOD. It is unlikely to increase any form of pollution.

Relevance, potential for targeting, administrative handling, control
If high risk areas can be readily defined, this management approach is easily implemented. Although most hydrologically well-connected areas are likely to be easily identified, some old yet functioning drainage networks may not be known to the farmer. Wet areas affected by spring lines are difficult to work and may already be excluded from the agricultural area. On some farms, particularly intensive dairy farms with a history of high P use and of spreading manures on the same fields, a large proportion of the farm may be classified as having high P index soils and be excluded from receiving further applications. In these circumstances, it may be necessary to export surplus manure to other farms. Regular soil testing is desirable but may be difficult to achieve in some countries. Inspectors might be required to perform spot controls to ensure applications have not been made to areas declared as high risk.

Costs: investment, labour
This is possibly a zero net cost method if land is available elsewhere on the farm to receive manure. Costs can be calculated as a balance between money saved by not buying and applying fertilizers versus income lost because of potentially lower yields. Net costs per ha will thus vary strongly according to product prices and the costs of fertilizer, labour and machinery; these will all vary from country to country. Additional costs may be incurred in dairy and pig systems if there is a need for increased manure or slurry storage.

References
[1] Cuttle, S., Macleod, C., Chadwick, D., Scholefield, D., Haygarth, P., Newell-Price, P., Harris, D., Shepherd, M., Chambers, B. & Humphrey, R. (2006) An Inventory of Methods to Control Diffuse Water Pollution from Agriculture (DWPA) USER MANUAL. Defra report, project ES0203, 115 pp. p. 49 and 67-68.
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