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## **Recycling of Agricultural, Municipal and Industrial Residues in Agriculture**

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## IMPACT OF FARM MANURE MANAGEMENT PRACTICES ON BATHING WATER QUALITY

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85% of Scotland's 60 identified bathing waters passed the EC Bathing Water Directive's mandatory standard in 2000. Sewage effluent from combined sewer outfalls was, by far, the main cause of polluted coastal waters. However on-going remedial action to reduce sewage pollution may be insufficient to guarantee a mandatory pass in parts of southwest Scotland due to diffuse pollution of faecal indicator organism (FIO) bacteria from agriculture. The objective of this study was to investigate the potential risk of FIO and pathogen contamination of watercourses from farm manure management practices and to develop best management practices (BMPs) to reduce the risk.

128 farmers and waste contractors were surveyed and a risk assessment of 117 farms was carried out in two river catchments in Southwest Scotland. Waste storage facilities, farming practices, field conditions and risks to watercourses were assessed on each farm. GIS datasets of catchment characteristics were used to carry out a risk assessment. River samples at 33 locations were regularly taken and analysed for FIO.

43% of all farmers and 75% of waste contractors were unaware of the pollution prevention advice given in the Scottish Executive code of good agricultural practices and as a result point discharges of effluents and FIOs into watercourses were found in the majority of farms in the catchments. One contributory factor to this was the insufficient or unsatisfactory waste storage facilities on many farms. 21% of farms had less storage than 1 month of the farm's manure production, while 71% had less than 5 months storage

Diffuse discharges of FIOs via run-off and field drainage, particularly from areas of poorly managed slurry application and intensive grazing, was another potential source of FIO. 11% of farmers spread manures in conditions likely to result in run-off (e.g. very poorly drained or steeply sloping soils). The stream FIO data backed up these observations of pollution risks associated with some intensive farms. The concentrations of FIO in the streams of two sub-catchments of high livestock intensity was 4 to 8 times higher compared to the two sub-catchments which had a low livestock intensity

In conclusion, the study demonstrated that the available waste storage capacity and farm management practices are inadequate on a high proportion of farms and that FIO contamination of watercourses from farms could be the result of:

- Faecal contaminated effluent transported into watercourses by non-collection, no containment or poor containment facility (leakage).
- Surface run-off following land application of manure in adverse conditions (e.g. high rainfall during and following land application).

The majority of potential risks to bathing water quality may be eliminated through

improved manure/dirty water management, forward planning of land spreading activities and improved operational procedures. Where a potential risk to bathing water was identified, the majority of farmers could significantly reduce the risk of water pollution by FIOs through limited expenditure and sound management advice.