Technical summary

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Development of a Design Manual for Agricultural Pesticide Handling and Washdown Areas

R&D Technical Summary P2-200/TS/2

Pesticide handling, mixing and spray equipment washdown areas on-farm are a potential point source of pesticide pollution to surface and groundwater. Up to 70% of pesticides in a catchment may have arisen from such point sources.

The majority of pesticide handling areas are constructed of concrete but there is a lack of understanding and guidance on the siting, construction, use and management of such areas. This project was initiated to develop practical and low-cost design criteria for pesticide handling and washdown areas in order to reduce pollution from these sources.

There were five stages to the project:

1. Initial desk studies – the current practices and procedures of farmers in the UK, Europe, USA and others in handling pesticides, washing down equipment and subsequent handling of waste pesticide arisings were reviewed. Many spray operators were found to be unaware of the environmental consequences of spills and washdown activities. Existing guidance was identified and appraised and often found to be unclear and open to interpretation. The review emphasised the need for clear and practical advice. Recommendations for improvements to current yard practice were published.

2. Field experimental surface studies – experiments were carried out on the fate of six pesticides with different physico-chemical properties following artificial application on six different surfaces:
   - hard-core;
   - porous pavement;
   - asphalt;
   - biobed; and
   - soil/grass.

   A mixture of pesticides in appropriate concentrations and volumes to represent four contamination sources (dropped foil seals from pesticide packaging, leaky hoses/nozzles, sprayer sump rinsate and sprayer washdown liquid) was applied. Assessment of losses in runoff water and throughflow were made. All the surfaces provided a substantial improvement on the losses measured from the concrete surface. The biobed and the soil/grass surface had the greatest reduction in total loss of pesticides compared to concrete (>99% and 97% respectively). These two bioremediation systems were proposed for further investigation in the subsequent stages.

3. Design development - the results from the desk and experimental studies were used to develop designs for three pesticide handling and washdown areas, based on bioremediation systems:
   - drive-over biobed;
   - concrete draining to biobed; and
   - concrete draining to soil/grass.

   Pesticide disposal, cost effectiveness, practicality

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and health and safety were taken into account in the developed designs.

4. On-farm design trial – the three surfaces were constructed and tested on-farm in Lincolnshire. The surfaces were artificially treated with the same six pesticides from Stage 2 to simulate multiple severe pollution incidents in the farmyard on one spray day. Samples were taken to assess their fate over time. The farmer also used the surfaces for day-to-day pesticide handling activities to ensure they were functional. All the bioremediation systems performed very effectively to retain and/or degrade the pesticides. Pesticide concentrations >100,000μg/l were measured in the liquid entering the bioremediation systems. Pesticide concentrations in the leachate discharged from the systems were generally <0.5μg/l and often <0.1μg/l. 87% of over 1100 leachate samples had a pesticide concentration <0.5μg/l. Some pesticide detections were >0.5μg/l but these should be viewed in the context of the extreme concentrations entering the systems and the opportunities for further retention and degradation that exist in the soil within the groundwater authorised disposal area. It was concluded that bioremediation systems offer the potential to reduce surface water pesticide pollution arising from concrete farm yards but their potential detrimental impact on groundwater must be considered.

5. Design manual and report production – information from the project was considered in the preparation of a design manual for pesticide handling and washdown areas. Due to scientific uncertainties about the risk to groundwater and long-term use of biobeds and regulatory uncertainties associated with new regulations such as Agricultural Waste, this project has not produced a design manual. Lessons learned throughout the project on the design, construction, operation and management of these areas, linked to bioremediation systems are included as design concepts in the Project Record. It is anticipated that the pesticide industry and the Voluntary Initiative will utilise this information through a technology transfer programme to produce guidance for farmers in the future. Despite the scientific and regulatory uncertainties, the potential of bioremediation systems to reduce surface water pesticide pollution, compared to current practices, is recognised. Interim guidance on the position regarding the use of biobeds on-farm has been issued and proposals for their construction will be considered on a case-by-case basis.

This project will ensure that Agency staff, external organisations and farmers are better informed about the potential risk of point source pesticide pollution from pesticide handling and washdown areas and the options for their design, including the use of biobeds. The reports provide underpinning information for Policy and Process staff involved in developing water quality, land quality and pesticides policies and guidance. Operational staff will benefit from an improved understanding of the issues of pesticide handling/washdown, the risks to surface and ground water and the ways that farmers can improve their practice. The information will be used by the pesticide industry/Voluntary Initiative to produce guidance for farmers in the future.

This R&D Technical Summary relates to information from R&D Project P2-200 reported in detail in the following outputs:-

R&D Technical Report P2-200/TR/2
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