

Sustainable Arable LINK:

Reducing the risks associated with autumn wheeling of combinable crops to mitigate runoff and diffuse pollution: a field and catchment scale evaluation

Introduction

This project addresses the need for practical, affordable, and targeted management of fields with combinable crops to help reduce losses of soil, phosphorus and nitrogen from land to water courses to support sustainable farming and WFD catchment management. Recent Defra-funded research (MOPS: PE0206) has shown conclusively ($P < 0.01$) over nine site-years for combinable crops that over 80% of over-winter losses of suspended and total sediment, total phosphorus and total nitrogen in surface runoff, on moderate slopes on both lighter and heavier soils, can be associated with unvegetated and compacted tramline wheelings. Exploratory work has shown, in principle, that eradicating compacted tramlines once in the autumn could represent a highly effective method for reducing runoff and associated pollutant losses. Other options also exist (e.g. use of low ground pressure tyres). Further work is now needed to review and refine a range of practical tramline management options based on robust scientific evaluations, operationalise techniques for different soil types and soil conditions, and quantify their effectiveness at a range of scales to support the inclusion of tramline management practices in CSF or Environmental Stewardship.

Project aims and objectives

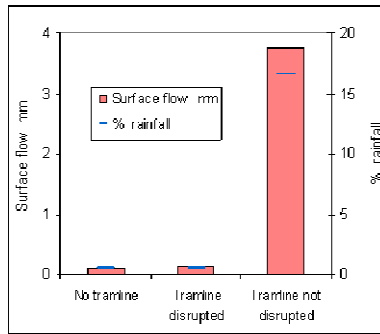
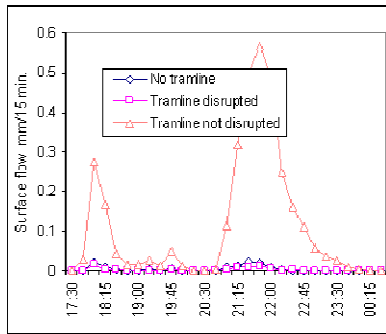
The overall aims of this four year project at four experimental sites are:

- To design, prototype and test the efficacy of practical engineering solutions for reducing runoff and associated diffuse pollution from tramline wheelings in combinable crops. These management options need to be practical, not adversely affect crop yield, and be applicable to a range of soil types and climatic conditions (e.g. low ground pressure tyres, tine/disc combinations etc).
- To use this, and other, research evidence to (i) develop, test, and refine novel modelling approaches to estimate the effectiveness of different mitigation techniques over a range of sites and environmental conditions, and (ii) to upscale mitigation results to estimate impacts of the targeted introduction of such measures at catchment scale.
- To evaluate the cost-effectiveness of integrating the use of different mitigation tools into commercial farming operations.
- To conclude on the efficacy and limitations of different approaches for tramline management, and provide guidance to the farming industry and policymakers. The most practical, cost-effective options could be included in CSF or Environmental Stewardship.



New processes or products

- The development, testing, and evaluation of individual, and combinations of, novel tyres and tramline management equipment including that from leading engineering companies. The efficacy of different units will be evaluated in terms of soil characteristics (e.g. compaction), yield, and the resulting pollution risk (e.g. impact on surface runoff, erosion, and nutrient loss to edge of field).
- This work will promote a re-evaluation of established tramline management practices in the context of environment-sensitive criteria such as reducing sediment and phosphorus loss.



Sample event:
ADAS Rosemaund
(silty clay loam)

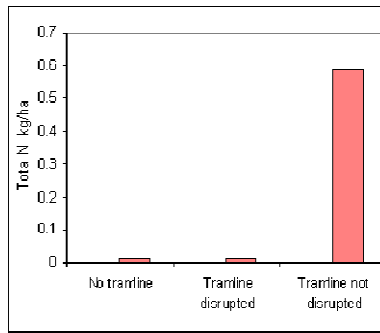
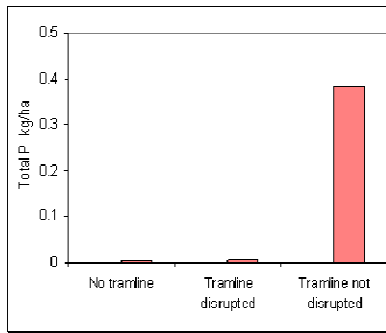
Sampled
03/01/06

Total rainfall
23 mm

Event duration
11 h

Peak rainfall intensity
6 mm/h

Peak surface runoff
22 l/min



Event-based results showing runoff, total P and total N losses from cropped areas (“no tramline”), conventional tramline wheelings (“tramline not disrupted”), and areas with disrupted tramlines (source: Defra project PE0206).

Industry benefits

The main benefit to the industry is the development, testing, evaluation, refinement and demonstration of practical engineering solutions for tramline management (including low ground pressure tyres and the development of solutions (e.g. tramline disruptors for use once in the autumn), which are both cost-effective and fully compatible with agri-environmental policy tools such as Defra’s Environmental Stewardship scheme. Further benefits include the development of guidance for farmers on the management of tramlines in cereal crops, provision of information on the cost-effectiveness of a range of different tramline management techniques including seeding tramlines, and model outputs which indicate where tramline management activities should be most effectively targeted to mitigate the risk of losses of runoff, sediment, phosphorus and other pollutants from land to water. Inclusion of the most effective techniques in agri-environment schemes would encourage uptake and offset any implementation costs.

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