



## **Soil redistribution after rainfall events in a furrow-shoulder system at field scale using iron oxides as sediment tracers**

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The potential of magnetite ( $\text{Fe}_3\text{O}_4$ ) as a sediment tracer was previously evaluated by Guzmán et al. (2010), who obtained favourable results at a small scale. However, it is desirable that this tracer may be combined with other iron oxide tracers and that it could be used at a bigger scale. For this reason, two more iron oxides, hematite ( $\alpha\text{-Fe}_2\text{O}_3$ ) and goethite ( $\text{FeOOH}$ ), have been tested together with magnetite in order to evaluate the availability of multiple tracers in several water erosion experiments at field scale.

The study took place in southern Spain (Córdoba). The field plot was conformed by cotton rows planted on the top of shoulders in a furrow system. The water erosion experiments were carried out at different stages of the cotton cycle using a portable rainfall simulator, small scale 0.81 m<sup>2</sup> area, and sprinkler irrigation under controlled conditions, field scale 2450 m<sup>2</sup>. At the small scale only magnetic iron oxide was used tagging the soil in the base of furrows to discriminate sediment source i.e. the furrow from the shoulder. At the field scale, three sections (upper, medium, and lower) of 2.9 m<sup>2</sup> were identified along the furrows. Each section was tagged using a different iron oxide. The untagged area between consecutive sections was 10.3 m<sup>2</sup>. The water erosion experiments, the soil sampling procedures and the measurement techniques were described in detail by Guzmán et al. (2010).

Experimental data were used to validate two models: a mixing model to determine the contribution of each area of the system to the sediment and EUROSEM that gives information about total runoff and total soil losses along the furrow-shoulder system. Calibration of both models was made taking into account several soil properties and measurements of tracer concentration in sediment and topsoil before and after the water erosion experiments.

The results of these experiments includes the evaluation of the combined use of the three iron oxides as unexpensive sediment tracers that can provide additional information to the traditional measurements in water erosion experiments, such as total soil losses or total runoff, with relatively simple analytical techniques. Their use, combined with model analysis, offer a solid knowledge about the behaviour of a furrow-shoulder system at different stages of a cotton crop at field scale.

### References:

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- Guzmán, G., Cañasveras, J.C., Barrón, V., Boulal, H., Gómez-McPherson, H., Conde, E., Fernández, M., Gómez, J.A. 2010. Use of rare earth oxides and iron oxides as soil erosion tracers in water erosion experiments at hillslope scale. EGU General Assembly 2010. Geophysical Research Abstracts Vol. 12, EGU2010-252-1, 2010