The implementation and effectiveness of vegetative barriers to regulate fluxes of runoff and sediment in open agricultural landscapes (Flanders, Belgium)

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Abstract:
Vegetative barriers are narrow strips of plants or plant residues that are increasingly being used as measures to reduce the connectivity of catchments in terms of water and sediment fluxes (Frankl et al., 2021a). They can mostly be found at plot edges where they do not hinder farming activities too much. Their principal function is to reduce sediment export from cropland and thus mitigate negative off-site effects of erosion (e.g. muddy floods, pollution of rivers). Being implemented in concentrated flow zones where ephemeral gullying is recurrent, they also prevent their development (Frankl et al., 2018). Although vegetative barriers are increasingly being implemented in open agricultural areas, little information is available on the effectiveness of vegetation barriers at buffering the flows of water and sediment. Here, we focus on vegetative barriers that are widely implemented in Flanders (Belgium) and which are made of straw bales, wood chips or bales of coconut fibre. Based on three simulated runoff experiments performed in the field, we calculated the hydraulic roughness and sediment deposition ratio. Our experiments show that the barriers made of coconut-fibre bales performed markedly better than those of straw bales or wood chips (Frankl et al., 2021b). However, as vegetative barriers have to be renewed every few years because of the decomposition of organic material, barriers made of locally available materials are more sustainable as a nature-based solution to erosion. We conclude that the vegetative barriers are an effective way of mitigating the negative effects of soil erosion. While barriers made of coconut-fibre bales are superior in their regulation of flows of runoff and sediment, barriers made of locally sourced materials are more sustainable.

Keywords: agriculture, erosion control, hydrological connectivity, runoff, sediment
References:

