FARMING PRACTICE
LANDSCAPE FEATURES

IMPACT: NUTRIENT LEACHING AND RUN-OFF

Reference 20

Van Vooren, L; Reubens, B; Broekx, S; De Frenne, P; Nelissen, V; Pardon, P; Verheyen, K 2017 Ecosystem service delivery of agri-environment measures: A synthesis for hedgerows and grass strips on arable land AGRICULTURE ECOSYSTEMS AND ENVIRONMENT, 244 32-51. 10.1016/j.agee.2017.04.015

Background and objective

Despite the existing knowledge on the delivery of individual ecosystem services of non-crop habitats, there is an urgent need for an integrated evaluation of the simultaneous changes in multiple ecosystem services. The main objective was to quantitatively assess the impact of hedgerows and grass strips bordering parcels with annual arable crops on the simultaneous delivery of a set of ecosystem services and from there we identified synergies and trade-offs on virtual parcels.

Search strategy and selection criteria

The systematic literature search is performed conform the PRISMA guidelines. Studies were searched on the Web of Science. 1) The study region is situated within the temperate regions of the globe; 2) empirical data of the indicator of interest are available (modelling studies are thus excluded); 3) true controls are present allowing indicator comparison with and without hedgerows or grass strips and 4) interaction of hedgerowss and grass strips with arable crops.

Data and analysis

The authors applied mixed-effect models to define an effect relationship for each hedgerow or grass strip and ecosystem service indicator combination. In this relationship, the dependent variable was the natural logarithm of the ratios (ln(R)). The authors did not perform a traditional, weighted meta-analysis because most studies did not report variances. When enough data with the required statistics were available, a mixed model as well as the traditional, weighted meta-analysis method was applied and compared.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
60	Arable crops	1) Grass strips; 2) Hedgerows	1) No grass strips; 2) No hedgerows	Metric: 1) P interception; 2) Surface and subsurface N interception; Effect size: Logarithm of ratio of the considered metrics in the intervention to the considered metrics in the control	75

Results

- Average P interception by the grass strips and hedgerows was 73% and 67%, respectively.
- Nitrogen interception from the surface flow was positively affected by grass strips and hedgerows: the average N interception was 76% and 69%, respectively.
- All observations indicated a positive effect of grass strips on N interception from the subsurface flow with an average N interception of 32%. Average N interception from the subsurface flow was 34% in hedgerows.
- Grass strip width was a significant explanatory variable. For a grass strip width of 2 m, N interception of surface flow was 29% and for a width of 5 m, N interception was 58%.
- Vegetation management in hedgerows is crucial and removal of decaying plant material can increase P interception.

Factors influencing effect sizes

- Field edge width : The wider the grass strip, the more P and N were intercepted. As well, the wider the hedgerow, the more N was intercepted.

Conclusion

Both grass strips and hedgerows increased P interception as well as surface and subsurface N interception.