Landscape features

Impact: Crop yield

Reference 18

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	Hedgerows	No hedgerows	Metric: Crop yield; Effect size: Logarithm of ratio of the considered metrics in the intervention to the considered metrics in the control	75%

Results

- All studies reported a similar trend, consisting of lower crop yield close to the HR and a gradually restoring crop yield when D/H increases.
- Based on the model, crop yield was negatively affected by the hedgerows. However, over the entire affected zone (up to D/H = 20.4), the net relative crop yield was 103%, meaning that without considering the loss of arable area, HR have an overall positive effect on crop yield.
- Hedgerow type did not significantly affect the analysis and neither did crop type or hedgerow orientation.

- NA
- NA

Factors influencing effect sizes

- Distance to field edge : Crop yield was significatively affected by the ratio between the distance from the hedgerow and the width of hedgerow, with increasing crop yield when the ratio increses. Between D/H = 0.0 and D/H = 2.1 (D/H, which is the ratio of the distance from the hedgerow to the height of the hedgerow). Average relative crop yield in this zone was 79%. At D/H = 0.5, relative crop yield was 68%; at D/H = 1, relative crop yield was 85%. Between D/H = 2.1 and D/H = 20.4, crop yield was positively affected by the hedgerow: at D/H= 2.5 (25 m from a 10- m-high HR), relative crop yield was 103% and at D/H= 5.0 (50 m from a 10-m-high HR), relative crop yield was 109%.
- NA : NA
- NA : NA

Conclusion

All studies reported a similar trend, consisting of lower crop yield close to the HR and a gradually restoring crop yield when D/H increases.