

SINGLE-IMPACT FICHE

LANDSCAPE FEATURES

IMPACT: SOIL NUTRIENTS

Data extracted in October 2021

Note to the reader: This fiche summarises the impact of two landscape features (hedgerows, and terraces¹) on SOIL NUTRIENTS. It is based on 2 peer-reviewed synthesis research papers², including 53 and 300 individual studies.

1. WEIGHT OF THE EVIDENCE

• CONSISTENCY OF THE IMPACT:

Hedgerows and terraces have differing effects on soil nutrients when compared to cropland without these landscape features (see **Table 1**):

- Hedgerows have differing effect depending on soil nutrients, compared to cropland with no hedgerows depending on the soil nutrient. 1 synthesis paper reported a positive effect (i.e. increase of total nitrogen, total phosphorus, alkali nitrogen, available phosphorus, and available potassium), while 1 reported no effect on soil total potassium concentrations.
- Terraces have an uncertain effect on soil nutrients compared to cropland with no terraces. 1 synthesis paper reported relevant results, but without statistical test of the effects and it is labelled as uncertain. Details are provided below in Table 2 and in the summary reports.

Both the 2 reviewed synthesis papers include data collected in Europe (see **Table 2**).

Table 1. Summary of effects. The effect with the higher score is marked in bold and the cell coloured. The numbers between parentheses indicate the number of synthesis papers with a quality score of at least 50%. Details on quality criteria can be found in the next section. The synthesis paper on hedgerows reported two effects.

Impact	Intervention	Positive	Negative	No effect	Uncertain*
Increase soil nutrients	Hedgerows	1 (1)	0	1 (1)	0
	Terraces	0	0	0	1 (0)

* Number of synthesis papers that report relevant results but without statistical test comparison of the intervention and the control.

QUALITY OF THE SYNTHESIS PAPERS: *The quality score summarises 16 criteria assessing the quality of three main aspects of the synthesis papers: 1) the literature search strategy and studies selection; 2) the statistical analysis; 3) the potential bias. Details on quality criteria can be found in the methodology section of this WIKI.*

¹ Described in the General Fiche.

² Research synthesis papers include a formal meta-analysis or systematic reviews with some quantitative results. Details can be found in the methodology section of the WIKI.

2. IMPACTS

The main characteristics and results of the synthesis papers are summarised in **Table 2**. Summaries of the meta-analyses provide fuller information about the results reported in each synthesis paper, in particular about the modulation of effects by factors related to soil, climate and management practices.

Table 2. Main characteristics of the synthesis papers reporting impacts of landscape features on soil nutrients. The references are ordered chronologically with the most recent publication date first.

Reference	Population	Scale	Num. papers	Intervention	Comparator	Metric	Conclusion	Quality score
Zheng, YL; Wang, HY; Qin, QQ; Wang, YG 2020	Cropland	Global	53	Hedgerows	No hedgerows	Soil total nitrogen, phosphorus, and potassium concentrations, Soil alkali nitrogen, Soil available phosphorus, Soil readily available potassium	Hedgerows showed significant positive effects on total nitrogen, total phosphorus, alkali nitrogen, available phosphorus, and available potassium but no significant effects on soil total potassium concentrations.	81%
Wei, W; Chen, D; Wang, LX; Daryanto, S; Chen, LD; Yu, Y; Lu, YL; Sun, G; Feng, TJ 2016	Human-made terraces world wide (including crops of rice, grain, coffee, potato, viticulture or ancient cultivation)	Global	300	Terraces	No terraces	Soil nutrients (e.g., total nitrogen (N), total potassium (K), total phosphorus (P), available P, available K, ammonium, and organic matter)	This global synthesis suggested that diverse terracing practices played a positive role in ecosystem services provisions, particularly nutrient enhancement. <i>Reviewers' note: We labelled the results as uncertain due to the lack of statistical testing.</i>	44%

3. KNOWLEDGE GAPS

- Zheng et al., 2020** Given the heterogeneity of specific nutrient indicators, subgroup analyses must be performed in future studies to explore the source of heterogeneity.
- Wei et al., 2016** There is insufficient knowledge regarding design, construction and maintenance alternatives of terraces.