

IMPACT: WATER USE

Data extracted in January 2022
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Note to the reader: This fiche summarises the effects of Cover and catch crops on WATER USE. It is based on 1 synthesis paper¹ containing 99 primary studies.

1. WEIGHT OF THE EVIDENCE

CONSISTENCY OF THE IMPACT

The effect of cover/catch crops on WATER USE is reported in **Table 1**.

The table below shows the number of synthesis papers with statistical tests reporting i) a significant difference between the Intervention and the Comparator, that is to say, a significant statistical effect, which can be positive or negative; or ii) a non-statistically significant difference between the Intervention and the Comparator. In addition, we include, if any, the number of synthesis papers reporting relevant results but without statistical test of the effects. Details on the quality assessment of the synthesis papers can be found in the methodology section of this WIKI.

- Compared to the absence soil cover, cover crops have a positive effect on the plant water use efficiency of the subsequent cash crop, according to one synthesis paper.

The selected synthesis paper included studies conducted in Europe (see **Table 2**).

Table 1: Summary of effects. Number of synthesis papers reporting positive, negative or non-statistically significant effects on environmental and climate impacts. The number of synthesis papers reporting relevant results but without statistical test of the effects are also provided. When not all the synthesis papers reporting an effect are of high quality, the number of synthesis papers with a quality score of at least 50% is indicated in parentheses. The reference numbers of the synthesis papers reporting each of the effects are provided in **Table 3**.

Impact	Metric	Intervention	Comparator	Statistically tested			Non-statistically tested
				Significantly positive	Significantly negative	Non-significant	
Increase water use	Water use efficiency	Cover crops	Bare soil	1	0	0	0

QUALITY OF THE SYNTHESIS PAPERS

The quality of each synthesis paper was assessed based on 16 criteria regarding three main aspects: 1) the literature search strategy and primary studies selection; 2) the statistical analysis conducted; and 3) the evaluation of potential bias. We assessed whether authors addressed and reported these criteria. Then, a quality score was calculated as the percentage of these 16 criteria properly addressed and reported in each synthesis paper. Details on quality criteria can be found in the methodology section of this WIKI.

2. IMPACTS

The main characteristics and results of the 1 synthesis paper is reported in **Table 2** with the terminology used in those papers, while **Table 3** shows the reference numbers of the synthesis papers reporting for each of the results shown in **Table 1**. Comprehensive 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, are provided in the **summaries of the synthesis papers** available in this WIKI.

Table 2: Main characteristics of the synthesis paper reporting effects on water use.

Reference number	Population	Scale	Num. papers	Intervention	Comparator	Metric	Conclusion	Quality score
Ref7	Annual crops	Global	99	Cover crops	no cover crop (fallow)	Water-use efficiency by succeeding cash crop	Cover crop increased water use efficiency of the succeeding cash crop by 5.0% (P < 0.05) compared to no cover crop.	69%

Table 3: Reference numbers of the synthesis papers reporting for each of the results shown in **Table 1**.

Impact	Metric	Intervention	Comparator	Statistically tested			Non-statistically tested
				Significantly positive	Significantly negative	Non-significant	

¹ Synthesis research papers include either meta-analysis or systematic reviews with quantitative results. Details can be found in the methodology section of the WIKI.

Impact	Metric	Intervention	Comparator	Statistically tested			Non-statistically tested
				Significantly positive	Significantly negative	Non-significant	
Increase water use	Water use efficiency	Cover crops	Bare soil	Ref7			

3. FACTORS INFLUENCING THE EFFECTS ON WATER USE

Table 4: List of factors reported to significantly affect the size and/or direction of the effects on water use, according to the synthesis papers reviewed.

Factor	Reference number
Cover crop biomass production	Ref7
Pedo-climatic zone	Ref7
Soil type	Ref7
Termination method	Ref7

4. KNOWLEDGE GAPS

Table 5: Knowledge gap(s) reported by the authors of the synthesis papers included in this review.

Ref Num	Gap
Ref7	Although no publication bias was found in this meta-analysis (Supplementary Table S3), limited data available for PSE, SWSP, succeeding crop yield, ET, and WUE in certain climatic zones and soil texture as well as residue management practices may have resulted in inconclusive results. For example, RR of cover crop for PSE was greater in loam, but lower in all other soil textures. Residue removal increased PSE, but reduced SWSPT and SWSP ₃₀ . Similarly, succeeding crop yield and ET in response to cover crop compared to no cover crop were lower, but WUE was greater for silty clay loam soil (Fig. 5). This resulted in the reduced reliability of interpretation for certain parameters in some soil and climatic conditions and residue management Practices. Increased data availability, however, will enhance the meta-analysis of these data in the future.

5. SYNTHESIS PAPERS INCLUDED IN THE REVIEW

Table 6: List of synthesis papers included in this review. More details can be found in the summaries of the meta-analyses.

Ref Num	Author(s)	Year	Title	Journal	DOI
Ref7	Wang, J; Zhang, SH; Sainju, UM; Ghimire, R; Zhao, FZ	2021	A meta-analysis on cover crop impact on soil water storage, succeeding crop yield, and water-use efficiency	Agricultural Water Management, 256, 107085	10.1016/j.agwat.2021.107085

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