FARMING PRACTICE
COVER AND CATCH CROPS

IMPACT: NUTRIENT LEACHING AND RUN-OFF

Reference 24

Shackelford, GE; Kelsey, R; Dicks, LV 2019 Effects of cover crops on multiple ecosystem services: Ten meta-analyses of data from arable farmland in California and the Mediterranean LAND USE POLICY, 88, 104204. 10.1016/j.landusepol.2019.104204

Background and objective

Cover crops are considered to be beneficial for multiple ecosystem services, and they have been widely promoted through the Common Agricultural Policy (CAP) in the EU and Farm Bill Conservation Title Programs, such as the Environmental Quality Incentives Program (EQIP), in the USA. However, it can be difficult to decide whether the beneficial effects of cover crops on some ecosystem services are likely to outweigh their harmful effects on other services, and thus to decide whether they should be promoted by agricultural policy in specific situations. To quantify the effects of cover crops on five ecosystem services (food production, climate regulation, soil and water regulation, and weed control) in arable farmland in California and the Mediterranean. Here, only results regarding the effect of green manures on soil nutrients are reported.

Search strategy and selection criteria

The authors searched for relevant data in the publications from a wider review of Mediterranean farming practices (not only cover cropping) (Shackelford et al., 2017). On 7 April 2017, they also searched the Web of Science for publications from 1900 to 2016 with titles, abstracts, or keywords that included "cover crop*" or "catch crop*" or "green manure" and "Mediterranean" or the name of a country that intersects with the Mediterranean Forests, Woodlands, and Scrub biome. 1) it reported the results of an experiment in the Mediterranean Forests, Woodlands, and Scrub biome or the Central Valley of California 2) it compared a winter cover crop with a winter fallow, followed by a food crop in spring or summer (annual food crops in arable fields, including cereals, fruits, and vegetables, but not perennial food crops in orchards or vineyards) 3) it reported the mean effect on an ecosystem service metric.

Data and analysis

For each metric, if the authors had data from more than two publications, then they used the log response ratio and its variance as inputs into a random-effects meta-analysis, using the metafor package in R (Viechtbauer, 2010; R Development Core Team, 2017) and weighting the log response ratio by the inverse of its variance. They included random effects to account for non-independent comparisons within a publication, using the rma.mv function from metafor. To report the results, they transformed the effect sizes and confidence intervals from the log response ratio to the response ratio.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
57	Arable crops in Mediterranean area	Winter cover crops (legumes, non legumes, mixtures).	Bare soil	Metric: Soil nitrate leaching; Effect size: Logarithm of ratio of the considered metrics in the intervention to the considered metrics in the control	87.5

Results

- The results for soil nitrate leaching should be seen as inconclusive (plots with cover crops had significantly less nitrate leaching than plots without cover crops in 50% of the sensitivity analyses).
- Soil nitrate leaching was 53% lower (R = 0.47) in plots with non-legume cover crops, compared to plots without cover crops, but soil nitrate leaching were not significantly different between plots with legume cover crops and plots without cover crops.
- NULL
- NULL
- NULL

Factors influencing effect sizes

- No factors influencing effect sizes to report

Conclusion

Soil nitrate leaching was 53% lower (R = 0.47) in plots with non-legume cover crops, compared to plots without cover crops, but soil nitrate leaching were not significantly different between plots with legume cover crops and plots without cover crops.