FARMING PRACTICE
INTERCROPPING

IMPACT: CROP YIELD

Reference 12

Martin-Guay, MO; Paquette, A; Dupras, J; Rivest, D 2018 The new Green Revolution: Sustainable intensification of agriculture by intercropping Sci. Total Environ. 615, 767–772 10.1016/j.scitotenv.2017.10.024

Background and objective

Satisfying the nutritional needs of a growing populationwhilst limiting environmental repercussionswill require sustainable intensification of agriculture. Intercropping, which is the simultaneous production of multiple crops on the same area of land, could play an essential role in this intensification. The objective of this study was to determine the benefits of intercropping in terms of energetic, economic and land-sparing potential through the framework of the stress-gradient hypothesis.

Search strategy and selection criteria

Authors searched the literature published between 1975 and 2014 using the following electronic databases: CAB Abstracts, Biological Abstract, Scopus and Google Scholar. Titles, abstracts and keywords were searched using these keywords: "intercropping," "intercrop," "mixture," "polyculture," "land equivalent ratio," and "relative yield." 1) intercrops contained only two species; 2) yields for both species in the intercrop were available, as well as yields in their sole crops; 3) yields were expressed in terms of the marketable part of crops, and not their whole biomass; and 4) intercrops and corresponding sole crops received the same agricultural treatments, i.e., irrigation, fertilisation and pest management.

Data and analysis

Authors measured the land equivalent ratio (LER) and the relative land output (RLO) and were normalised through log-transformation. To test whether these distributions differed from zero, null model intercepts were computed (null models included a random effect to control for intra-study correlation). Observations were weighted by their sample sizes and bootstrapping was used to get 95% confidence interval. The differences between the distributions of LER and RLO was assessed. To test for the effect of aridity, a mixed model with the same random effect was fit to all intercrops, with LER as the dependent variable.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
126	Multiple crops	Intercropping	Monoculture	Metric: Land equivalent ratio (LER), relative land output (RLO) based upon gross energy and RLO based upon gross incomes; Effect size: Logarithm of ratio of the considered metrics in the intervention to the considered metrics in the control	93.75

Results

- The land equivalent ratio (LER) for intercrops was on average greater than one (mean:1.30, CI: 1.27, 1.32). This means that 30% more land is needed in sole cropping to achieve intercropping yields.
- For a given area of land, intercropping increases gross energy production by 38%, on average, compared with sole cropping.
- For a given area of land, intercropping increases gross incomes by 33%, on average, compared with sole cropping.

Factors influencing effect sizes

- Crop/cultivar combinations : In the 23 most common combinations (reported for more than ten occasions in the dataset), 18 had an LER significantly greater than one, but one of them also had an LER significantly lower than one (sunflower/corn).

Conclusion

Intercropping offers a great opportunity for intensification of existing agricultural lands. Irrigation and the aridity index in non-irrigated intercrops did not affect land equivalent ratio, thereby indicating that intercropping remains beneficial, both under stressful and non-stressful contexts concerning moisture availability.