FARMING PRACTICE INTERCROPPING

IMPACT: CROP YIELD

Reference 16

Himmelstein, J; Ares, A; Gallagher, D; Myers, J 2017 A meta-analysis of intercropping in Africa: impacts on crop yield, farmer income, and integrated pest management effects Int. J. Sustain. Agric. Res. 15, 1-10 10.1080/14735903.2016.1242332

Background and objective

Poverty and hunger in Africa are prevalent and will increase in absolute terms with population growth and continued land degradation. Therefore, there is a need for sustainable agricultural strategies, such as conservation agriculture (CA) and integrated pest management (IPM). Among CA practices, intercropping holds the promise of providing benefits to smallholders through increased crop yields and income as well as improved resource use. Authors reviewed intercropping's effects on crop yield, income, and output of IPM practices in Africa.

Search strategy and selection criteria

An extensive literature search was conducted to compile effect size estimates and associated variables to perform a robust meta-analysis. Searches were performed in Agricola, the Wiley Online Library, AGRIS: FAO, the Sustainable Agriculture and Natural Resource Management Knowledge Base, the Agriculture, Life Science and Natural Sciences database, and Google Scholar. Search terms included 'intercropping', 'conservation agriculture', 'companion planting', 'mixed planting','mixed farming systems', alone or in combination with 'Africa', and/or 'development'. Study data were included in the meta-analysis only if the study met five pre-established criteria. The study had to provide information on (1) treatment means (μ), (2) the standard deviation (SD), or the standard error of the means (SE), the standard error of the difference (SED), least significant difference (LSD), or the variance, and (3) the number of treatment replicates (n). The study had to (4) include a randomized experimental design and (5) utilize control plots.

Data and analysis

Authors used the Comprehensive Meta-Analysis software (Biostat, Englewood, NJ) for the analysis of the pooled effect sizes. This software runs an adjustment of the effect sizes for sampling errors, which is particularly important for a collection of studies with sample sizes. The effect sizes were combined via a random-effects model, which takes into account the between-study and within-study variation. A moderator analysis was performed (i.e. mixed-effects analysis that indicates the extent to which the relationship between the dependent and independent variable relies on the moderator's value).

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
58	Multiple crops	Intercropping	Monoculture	Metric: Total LER (land equivalent ratio) and gross income (USD); Effect size: Sum of the fractions of the intercropped yields divided by the sole-crop yields	75

Results

- Intercropping practices have a significantly positive impact on both yield (by 23%, on average, P = .002) and gross income (P < .001).

Factors influencing effect sizes

- Fertiliser application : Fertilizer application decreased the positive effect of intercropping on gross income.
- Pesticide use : Pesticide application decreased the positive effect of intercropping on yield and gross income.
- Tillage : Adoption of minimum or reduced tillage decreased the positive effect of intercropping on yield and gross income.
- Crop/cultivar combinations : Intercropping plots that contained a leguminous intercrop had lower yield and gross income differences than those that did not.
- Herbicide use : Herbicide application increased the positive effect of intercropping on yield and gross income.

Conclusion

Intercropping can increase gross income and yield in Africa.