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## Mixed Cropping with Desmodium Companion Crop Increases Crop Yield by Suppressing Weeds

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### Abstract

Feeding the growing global population requires agricultural innovations that improve crop yield and provide higher economic returns to farmers. Although global agricultural production has risen over the last few decades, there are still cases of poor productivity of crops in many farming systems. The majority of these cases revolve around the ravages caused by factors such as weeds. Mixed cropping is one of the strategies used to control weeds, and has potential to increase crop yield. However, studies investigating effects of mixed cropping on weeds give generality of conclusions, suggesting that results are context specific. A meta-analysis was conducted on 320 data points (171 on weed density, 38 on weed biomass and 111 on crop yield) from 31 different papers meeting the selection criteria. Mixed cropping resulted in lower weed density in 98 % of the data points, lower weed biomass in 74 %, but lead to higher crop yield in 86 % of the data points. Intercropping with desmodium companion crops strongly reduced weeds (effect size: -4.123,  $p < 0.001$ ) and lead to higher crop yield (effect size: 4.107,  $p < 0.001$ ) compared to monoculture. Non-legumes (other than desmodium) reduced weeds more strongly than legumes (effect size: -1.548,  $p < 0.001$ ) but they lead to lower crop yields compared to legumes (effect size: 1.881,  $p = 0.003$ ). Differences in results of mixed cropping with desmodium, other legumes and non-legumes suggest that knowledge of specific weed flora in a particular area can help farmers to decide on the companion crop that reduces weeds while maintaining or increasing crop yield. This is important particularly in smallholder farming systems where mixed cropping is a common practice, and adoption of agricultural innovations is increasingly being driven by the commercial value of increased crop yield and higher economic returns.

**Keywords:** Agricultural productivity, Agroecology, Intercropping, Weed biomass, Weed density