Organic compared to conventional soybean yielded similarly as an entry crop, similar in the 2nd year (red clover-maize), but 6% higher in the 3rd year (soybean-wheat/red clover-maize) when organic crops are eligible for the organic premium. Yield correlated with grain N% (r=0.81, n=48), weed (r=-0.78), and crop densities (r=0.42) in 2015, crop densities (r=0.46) in 2016, and grain N% (r=0.68, n=84)) and crop densities (r=0.42) in 2017.

Organic compared to conventional maize yielded 32% lower as an entry crop, similar in the 2nd year (red clover-maize), but 6% higher in the 3rd year (soybean-wheat/red clover-maize) when organic crops are eligible for the organic premium. Yield correlated with grain N% (r=0.81, n=48), weed (r=-0.78), and crop densities (r=0.42) in 2015, crop densities (r=0.46) in 2016, and grain N% (r=0.68, n=84)) and crop densities (r=0.42) in 2017.

We planted treated (fungicide and insecticide) GMO maize, soybean and wheat (non-GMO) varieties at recommended and high seeding rates; applied synthetic N at recommended and high rates to maize and wheat; applied herbicide for weed control; and applied a fungicide to the high input treatment in conventional. In organic, we planted maize and soybean isolines and the same wheat variety at the same seeding and N rates (maize and wheat), and cultivated maize and soybean for weed control.

We calculated partial returns using variable (seed, fertilizer, herbicide, fungicide, labor, repair/maintenance, fuel/lubricant, hauling) and fixed (tractor/equipment) costs. We used conventional prices to estimate revenue for 2015 and 2016. We find that yields in organic horticulture are on average 10 to 32% lower than those in conventional horticulture. The variance of yields was not significantly different between organic and conventional systems, hence we find no evidence of a larger inter annual variability in organic versus conventional horticulture. However, the coefficient of variation is significantly higher for organic yields vs. conventional ones reflecting the yield gap between these systems.

We find no significant effect on yield ratios of type of crop, type of product nor type of climate. However, data on tropical zones were scarce.

As a conclusion, despite lower yields, productivity of organic systems is not more instable that productivity of conventional ones, an important result for farmers and future development of organic horticulture.

**Keywords:** Meta-analysis, organic farming, organic agriculture, horticulture, vegetable, fruit, yield ratio, yield variability

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**Abstract:** More growers contemplate transitioning from conventional to organic cropping systems. The USDA requires a 36-month prohibiting use of GMOs, pesticides, etc. before certifying the land as organic. Growers must thus grow maize, soybean, and wheat during the transition with lower yield, higher cost, and no price premium. Identification of the best crop rotation is critical for profitability during the transition.

The experimental design is a split-split plot with cropping systems (conventional and organic) as whole plots, rotations (red clover-maize-soybean; soybean-wheat/red clover-maize; and maize-soybean-maize) as sub-plots, and management (recommended and high inputs) as sub-subplots.

We find no significant effect on yield ratios of type of crop, type of product nor type of climate. However, data on tropical zones were scarce.

As a conclusion, despite lower yields, productivity of organic systems is not more instable that productivity of conventional ones, an important result for farmers and future development of organic horticulture.

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INNOVATIVE CROPPING AND FARMING SYSTEMS FOR HIGH QUALITY FOOD PRODUCTION SYSTEMS

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