Does Mulching Increase Maize Yields in the Tropics? A Systematic Review
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Methods
Systematic review in Web of Science done in March 2020: TS = (mulch OR “green manure” OR “cover crop” OR “ground cover” OR groundcover or “legume” cover OR “plant residue” OR “crop residue” OR “soil cover” OR “soil conservation” OR “climate smart” OR climate-smart) AND TS = (experiment* OR study OR trials OR research* OR plot*) AND TS = (tropic* OR “tropical country” OR “tropical zone” OR “tropical climate” OR “tropical soil”) AND TS = (maize) NOT TI = (review*)

345 hits, 150 of which were trials on mulching maize in Tropics. 30 more papers were retrieved from sources cited in 150 papers. Inclusion criteria: in Tropics, sole maize, mulch is biomass applied on soil surface, unmulched control: 54 papers selected (Fig. 1).

Information extracted: Rainfall, Trial length, Soil fertility level, Additional fertilizer, Soil preparation, etc., Grain yield and converted to yield ratios:

\[
\text{grain yield ratio} = \frac{\text{yield of mulch treatment}}{\text{yield of control treatment}}
\]

> 1: mulch with higher yield
< 1: mulch with lower yield

Data analysis
Arcsine sqrt transformation. Multiple regression in R.

Results
Mulch increases maize yield: mean ratio > 1.77 (Table 1)

<table>
<thead>
<tr>
<th>Mean</th>
<th>Median</th>
<th>Minimum</th>
<th>Maximum</th>
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<tbody>
<tr>
<td>1.768</td>
<td>1.310</td>
<td>0.110</td>
<td>7.250</td>
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</table>

17 Variables with > 70 data points (Fig. 2). Multicollinearity so some variables were removed

Conclusions
Mulching does increase grain yield in the tropics.
Highest increases when mineral fertilizer also added, so synergistic rather than substitutional.
At higher maize densities, mulching less effective, probably due to its impact on controlling weeds at low densities.
Mulching recommended for intensified systems including mineral fertilizer.

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