Effect of conservation agriculture on weed infestation in rainfed rice
Lake Alaotra region and Conservation agriculture

- Limited land availability in irrigated plain
- Expansion of rainfed agriculture:
  - Low fertility
  - Erosion risk
  - Weed constraints
- Erratic rainfall distribution

⇒ Low crop productivity

Conservation Agriculture as technical solutions
Conservation agriculture and weeds

Conservation Agriculture (CA):
- Minimum soil disturbance
- Permanent soil cover
- Crop rotations or associations

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<tr>
<th>Favorable</th>
<th>Unfavorable</th>
<th>Favorable or unfavorable</th>
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<tbody>
<tr>
<td>Decreasing light transmittance to the soil</td>
<td>Crop competition</td>
<td>Vertical weed seed distribution</td>
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<td>Physical constraints to weed growth</td>
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<td>Competition between cover crop and weeds</td>
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</tbody>
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(Adapted from Chauhan et al, 2012)
Two types of crop rotation:
- Maize + Dolichos / Rice (MD)
- Maize + Stylosanthes / Stylosanthes / Rice (MS)

Soil and residue management:
- No tillage and residue retention (CA)
- Tillage and no residue retention (CV)

Rice plot under four treatments
- Weed emergence
- Weed biomass
- Rice yield

Installation since 5 years ago
Effect of CA system on weed emergence

- Season 2013 – 2014: No significant difference between CA and CV system
- Season 2014 – 2015: More weed emergence with MS crop rotation under CV system

→ Weed seed emergence variation due to cover crop seed emergence on CV system and a rainy year
Effect of CA system on weed growth

Lower weed biomass under CA system than CV system. 

→ CA system has limited weed growth

For a year with a high rainfall: No significant difference

→ CA system effect on weed growth highlighted with a season with a low rainfall
Effect of different level of soil cover on weed control

Weed biomass quadrate
Rice yield
Weed emergence quadrate

4 growing seasons:
- 2010 – 2011
- 2011 – 2012
- 2013 – 2014
- 2014 - 2015
Weed emergence as function of type and quantity of mulch

- Same trend for S and MD for each cropping season
- Weed emergence decreases with increasing amount of mulch
- A high amount of mulch is needed to reduce weed emergence
  → CA with a low amount of mulch did not affect weed emergence
Weed biomass for different types and levels of soil cover

Weed growth significantly reduced at 70% (3.2 t/ha S and 4.79 t/ha for MD)

Except for stylosanthes during rainy year

➔ Mulch effect on weed growth related to quantity of mulch during rainy year
Rice yield as function of weed biomass

- Negative relationship between rice yield and weed biomass

- Complex relationship when crop rotation and soil management were integrated

→ Other factors than weed biomass interfere with the rice yield
Crop rotation and CA system with low amount of residue cover did not affect weed seed emergence

CA system can limit weed growth depending on rainfall

A high amount of residue cover is necessary to significantly reduce weed emergence and weed growth

Weed emergence or biomass are not directly related with the crop yield

Dynamic modelling of competition between crops and weeds for light, nutrients and water
Thank you