Strip intercropping strategy for biomass to energy production while on the same time maintaining soil fertility

BioConcens project:
www.bioconcens.elr.dk

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Background

- There is competition for land due to increased demand for biomass

- Expansion of agricultural land is one of the most significant human alterations of the global environment and very often it causes unfavourable effects on ecosystems.
  - e.g. long term soil fertility (<soil carbon)

- Climate change increase the unpredictability of weather parameter dynamics
  - Risks of crop failure and loss of product quality

- One of the aims of organic farming is to "reduce the use of non-renewable resources (e.g. fossil fuels) to a minimum".
  - However, only very little progress has been made

- **How can a sufficient large amount of biomass for energy production be grown sustainable?**

Basic intercropping definition

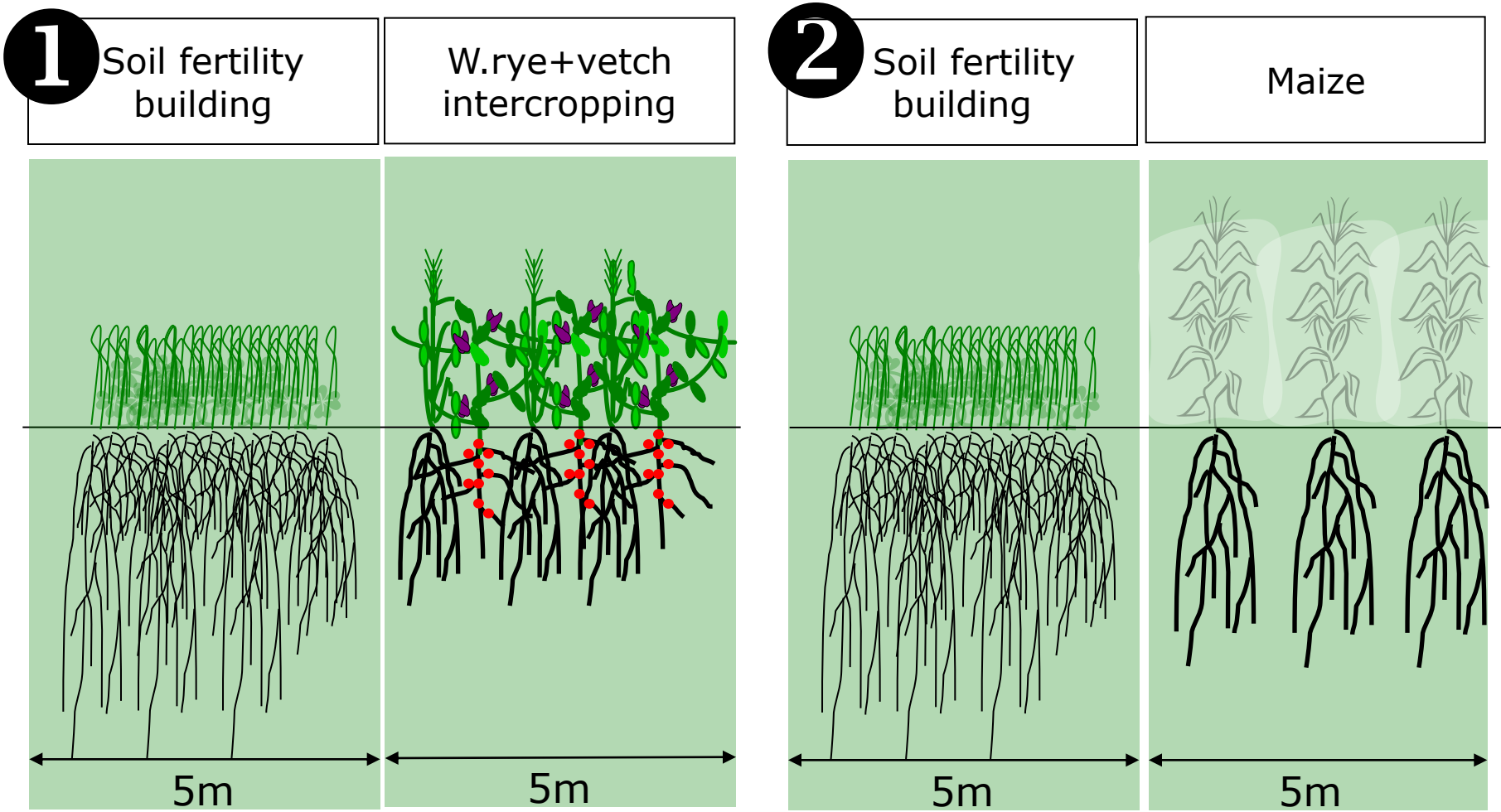
- Intercropping is the growing of two or more crops in proximity to promote interaction between them;
  - Each crop must have adequate space to maximize cooperation and minimize competition between the crops;
    - spatial arrangement

- Strip intercropping concept are inspired by highly intensive and productive maize + soybean (+other cereal) in US (e.g. Oregon, Iowa)

Strip intercropping (source:http://oregonstate.edu)

Contour farming (source: pro.corbis.com)

BioConcens strip intercropping concepts



Introduce interspecific competition to utilize plant species complementarity

Photos from the field

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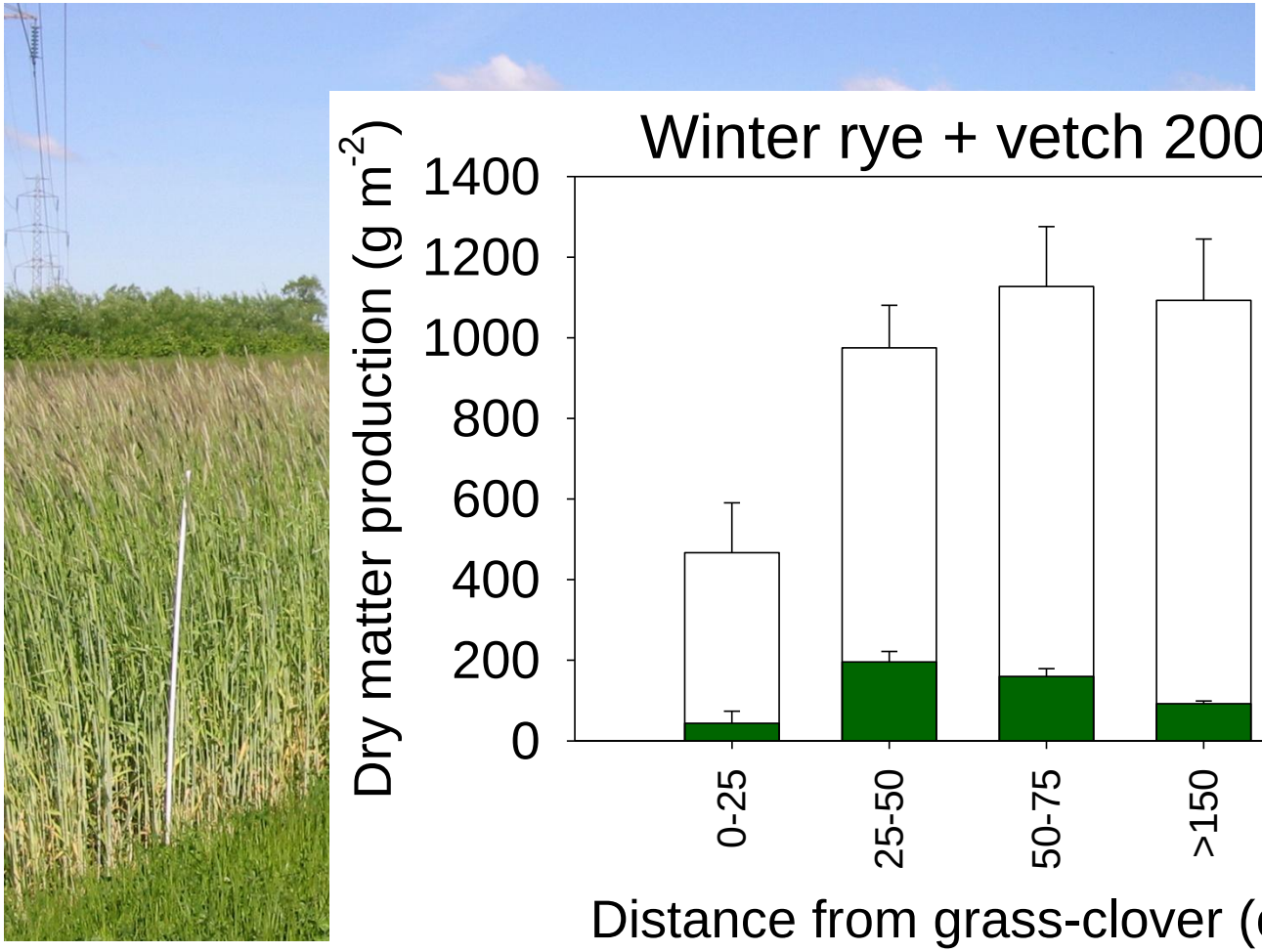
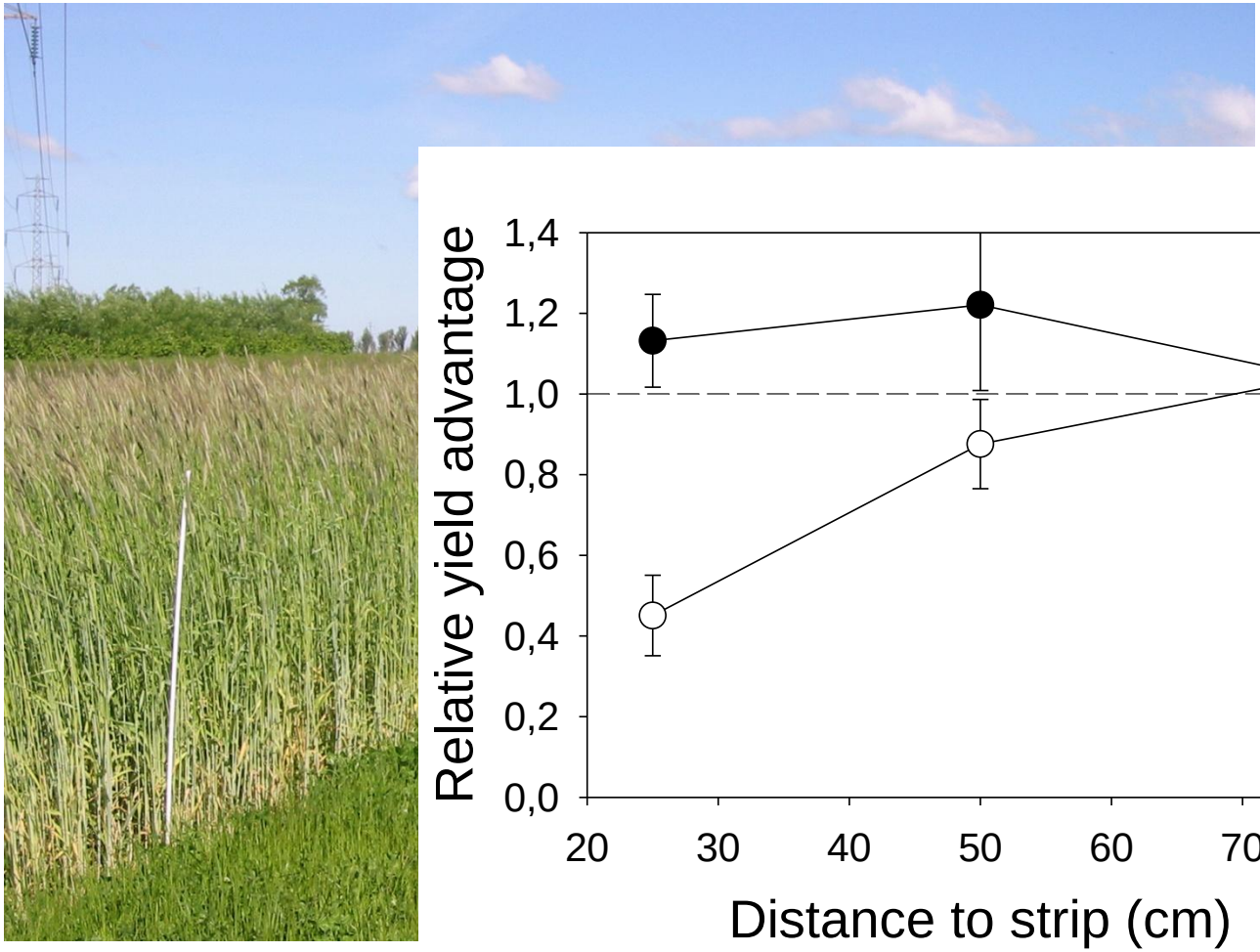
❷

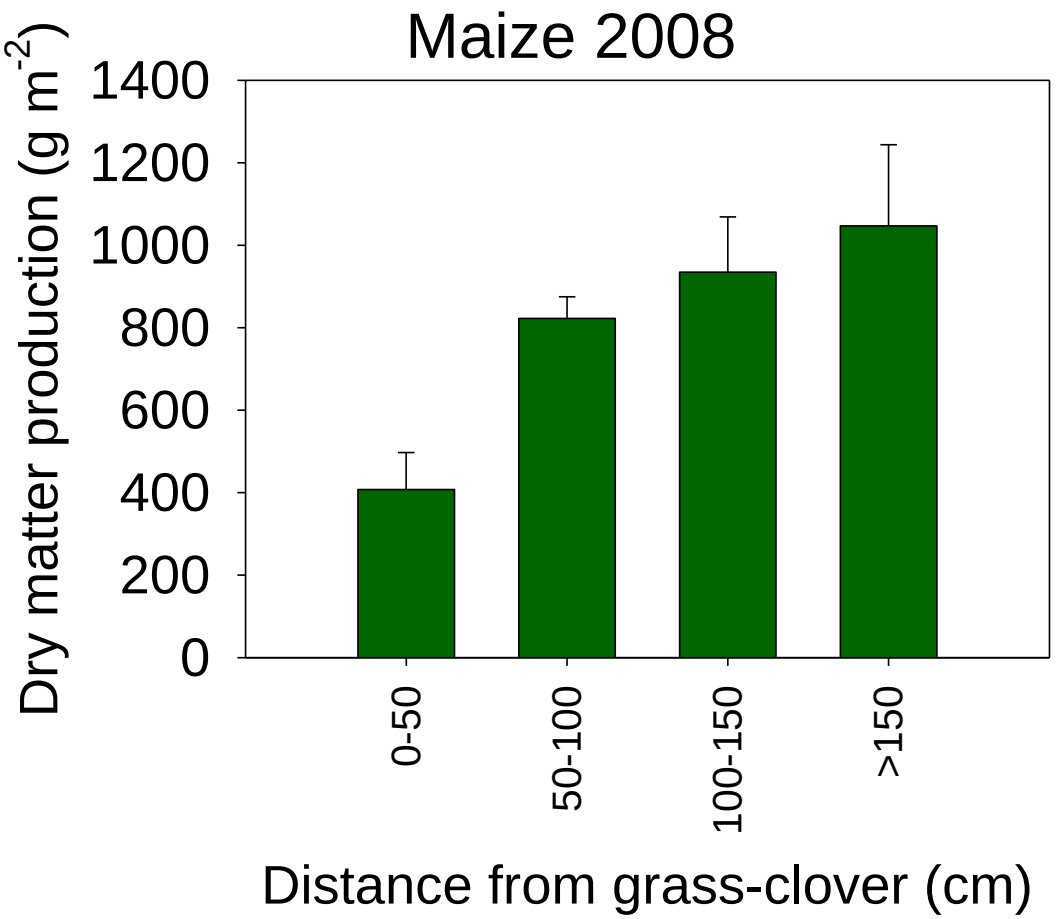
❶ Strip intercrop effect on final yield



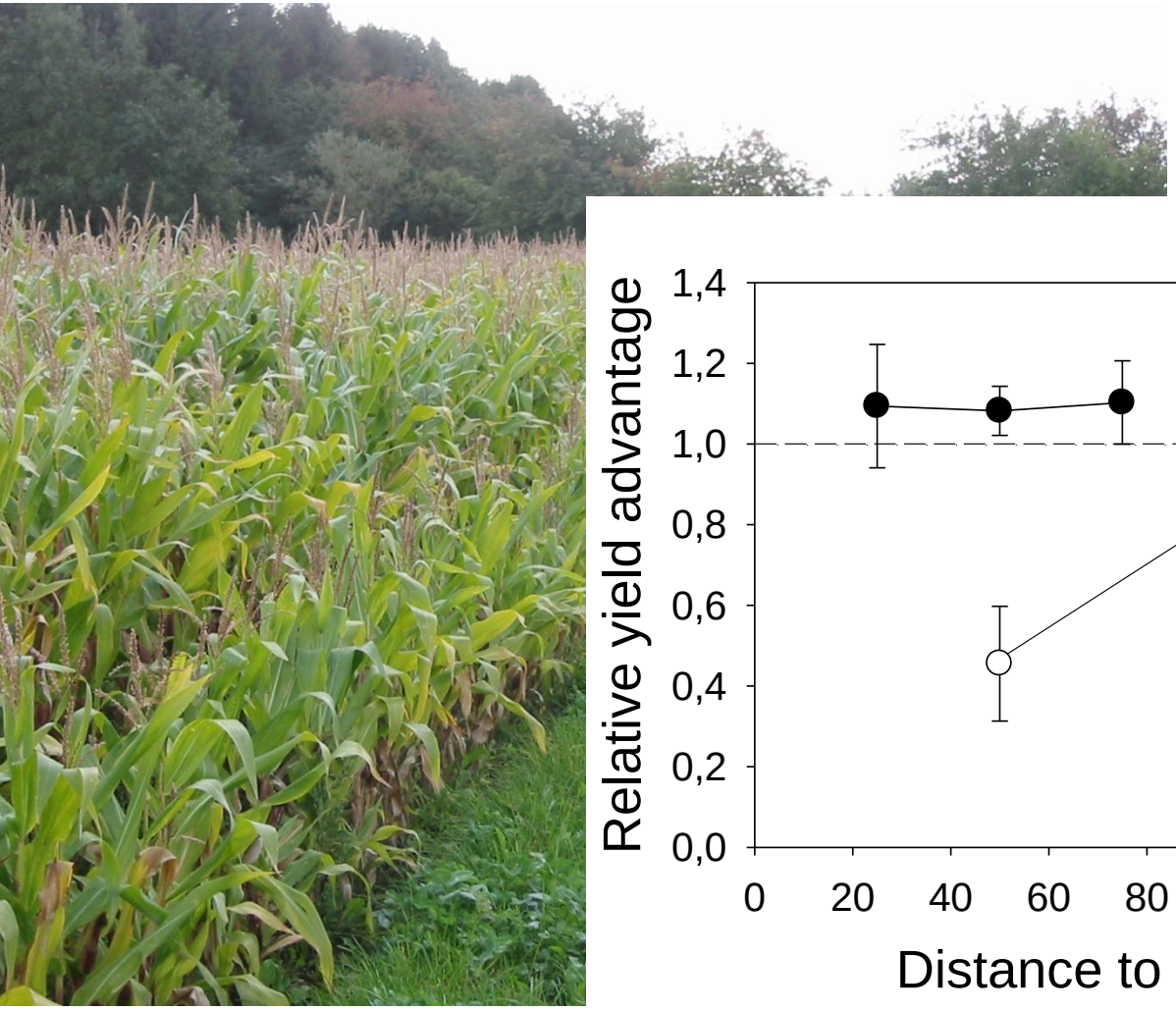
❶ Strip intercrop effect and relative yield

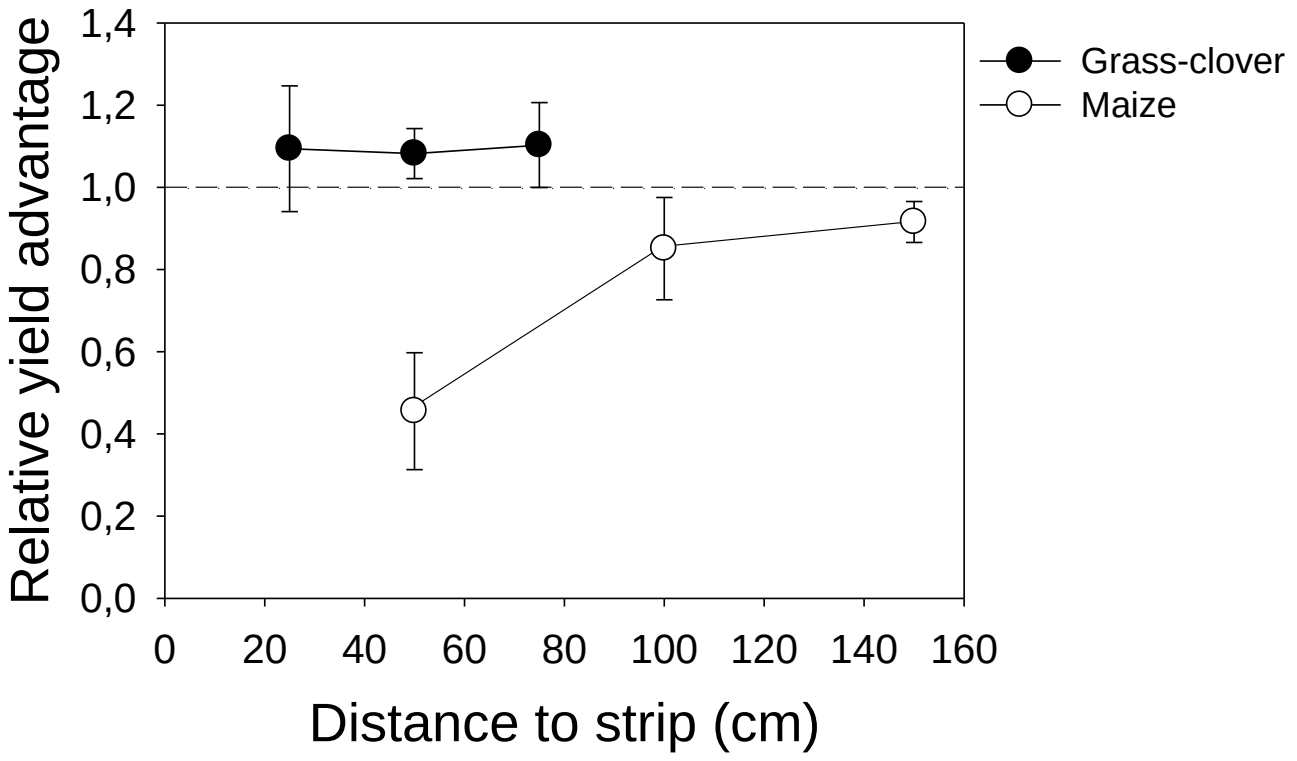


❷ Strip intercrop effect on final yield

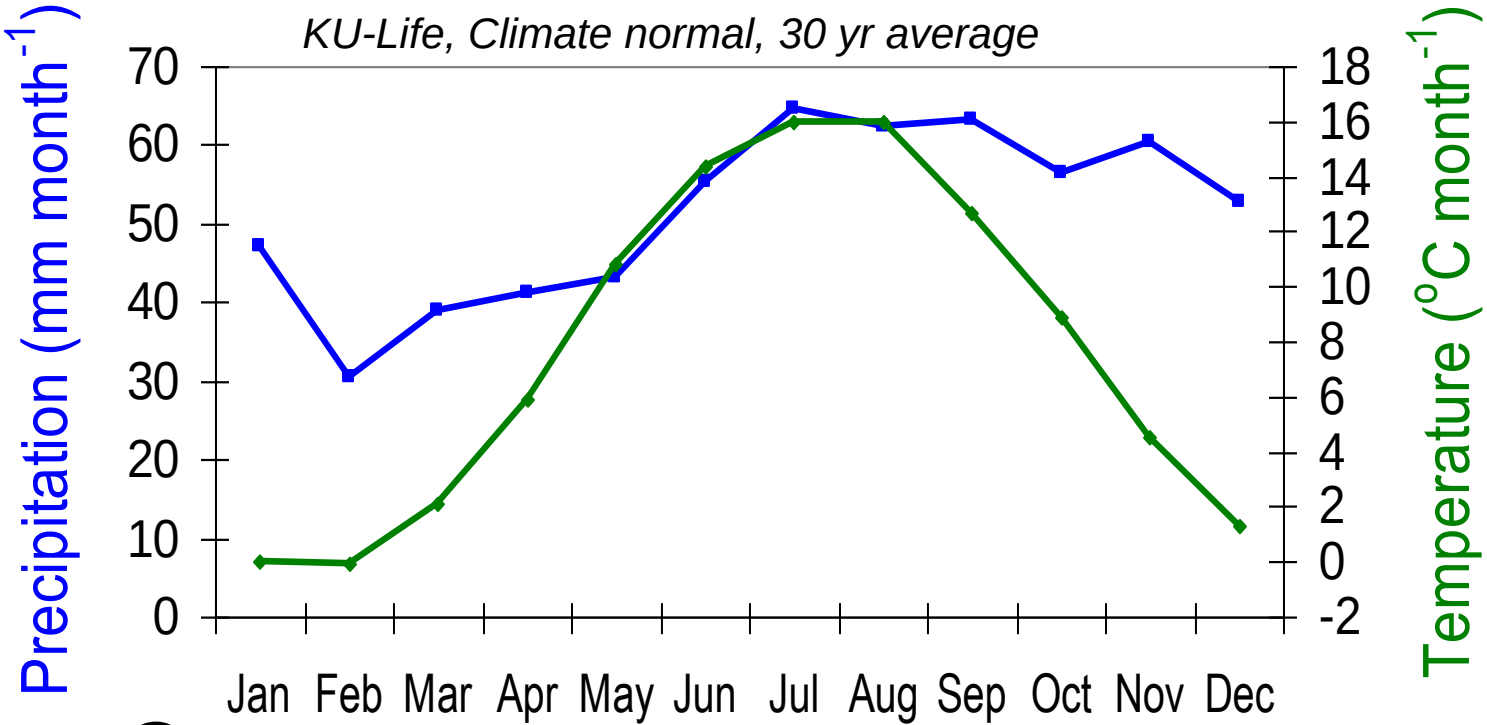


❷ Strip intercrop effect and relative yield





Two potential annual cropping systems



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W.rye+vetch

W.triticale

W.rye+vetch

W.triticale

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W.rye

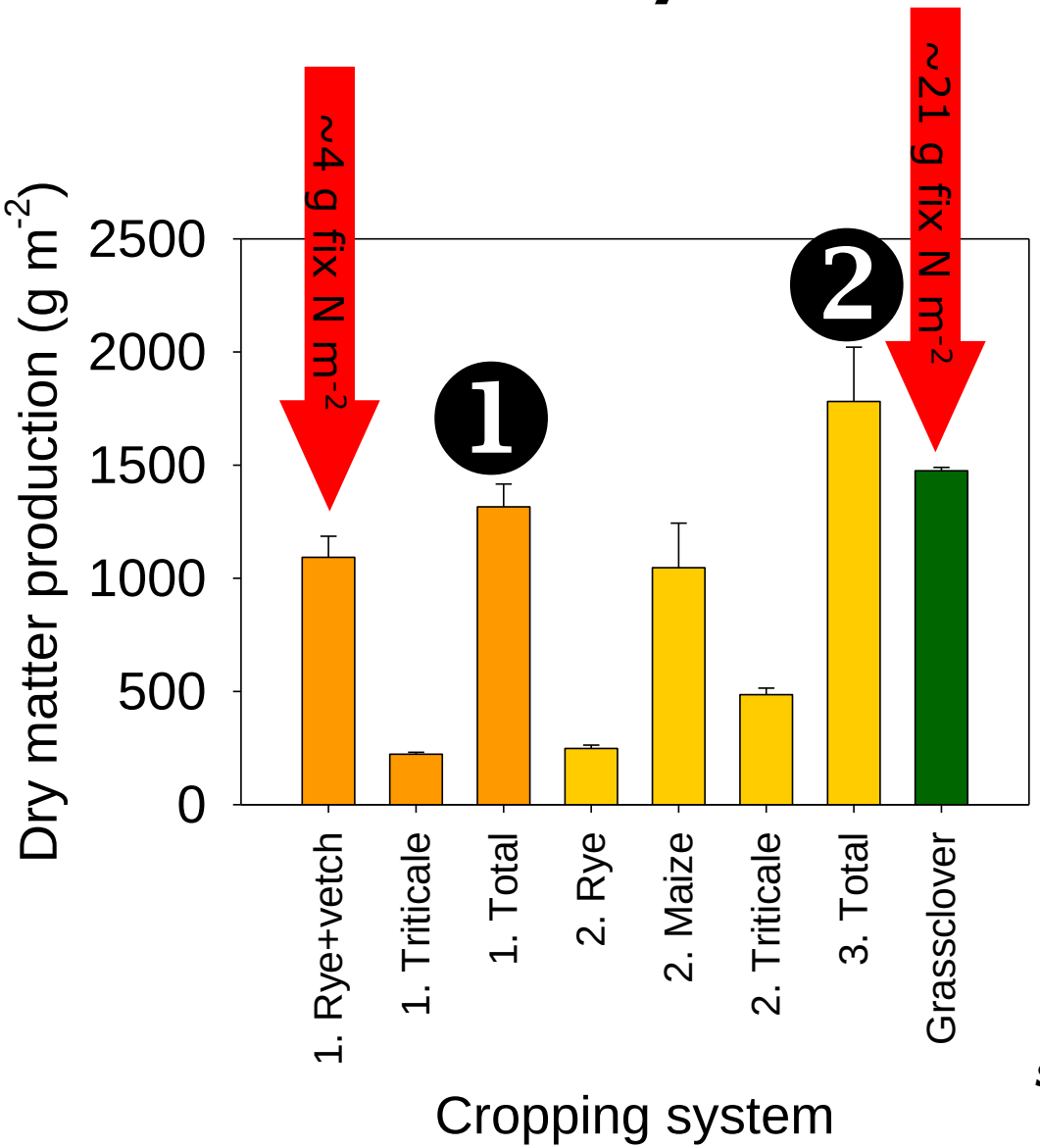
Maize

W.triticale

W.rye

W.triticale

Productivity 2007-2009



N and C in roots and stubble to reduce fertilizer requirements and sustain/improve long term soil fertility

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Source: Høgh-Jensen and Schjoerring, 1994
DeNeergaard et al., 2002
Hauggaard-Nielsen et al, 1998

Conclusion

- All field operations were conducted using traditional farm machinery and the conclusion is that the strip concept is manageable

- Diversity is a strong tool to try and develop into modern agricultural practices facing future challenges.
  - Unfortunately, bioenergy technologies often require centralized factories highly specialized to specific feedstock

- In order to create a sustainable development dynamic and flexible bioenergy technologies are required, able to utilize a wide variety of available feedstock provided by the ecosystem
  - increasing biomass for energy production have to follow the limitation of the biological system and it should not be defined by technological requirements only

Acknowledgement

- The project is linked to the Danish Research Centre for Organic Farming and funded under the research programme: Research in Organic Food and Farming, International Research Co-operation and Organic Integrity (DARCOF III 2005-2010)

Thank you for your attention