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What is the potential of using service crops for crop protection?

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SLU

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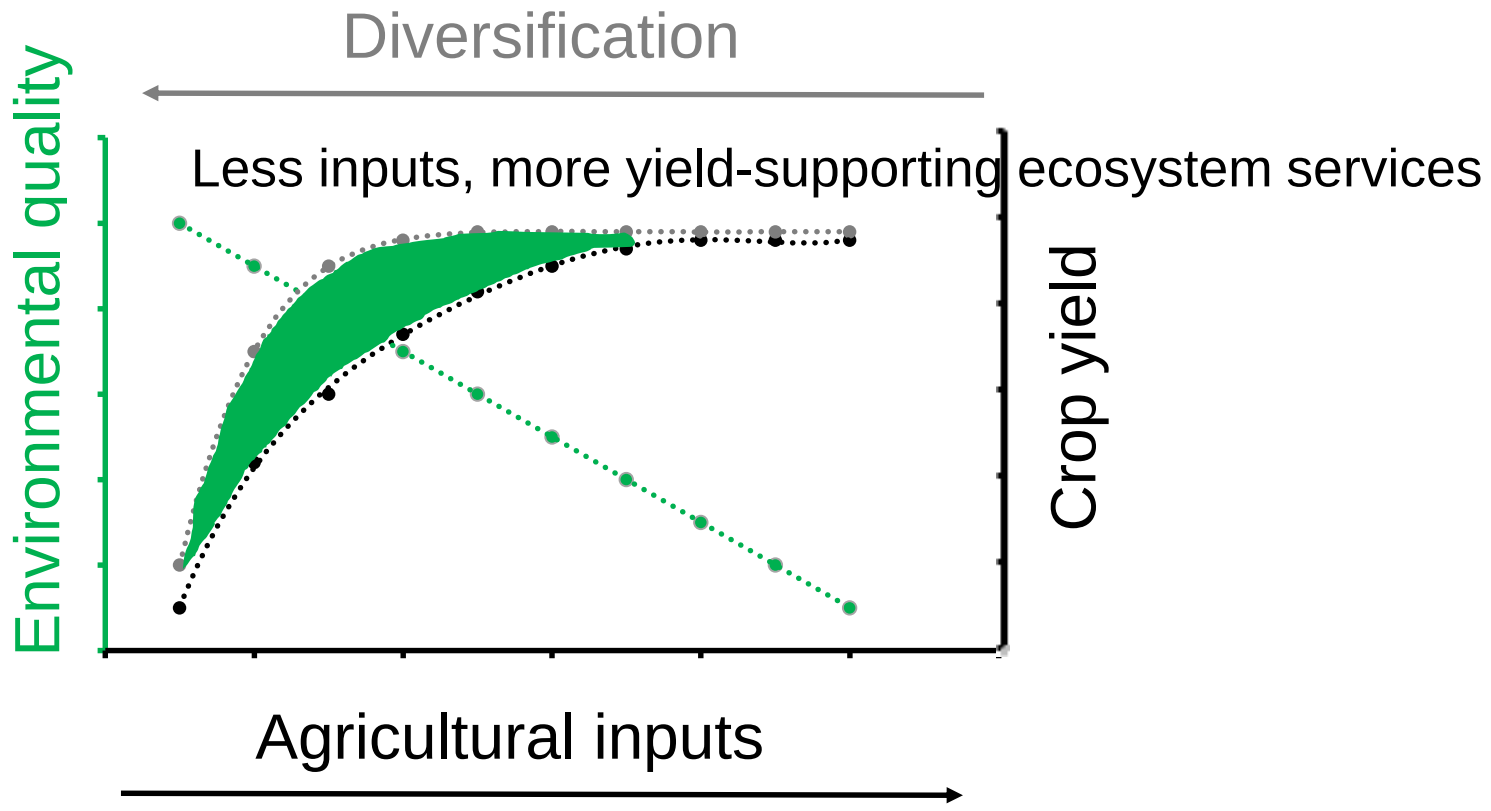
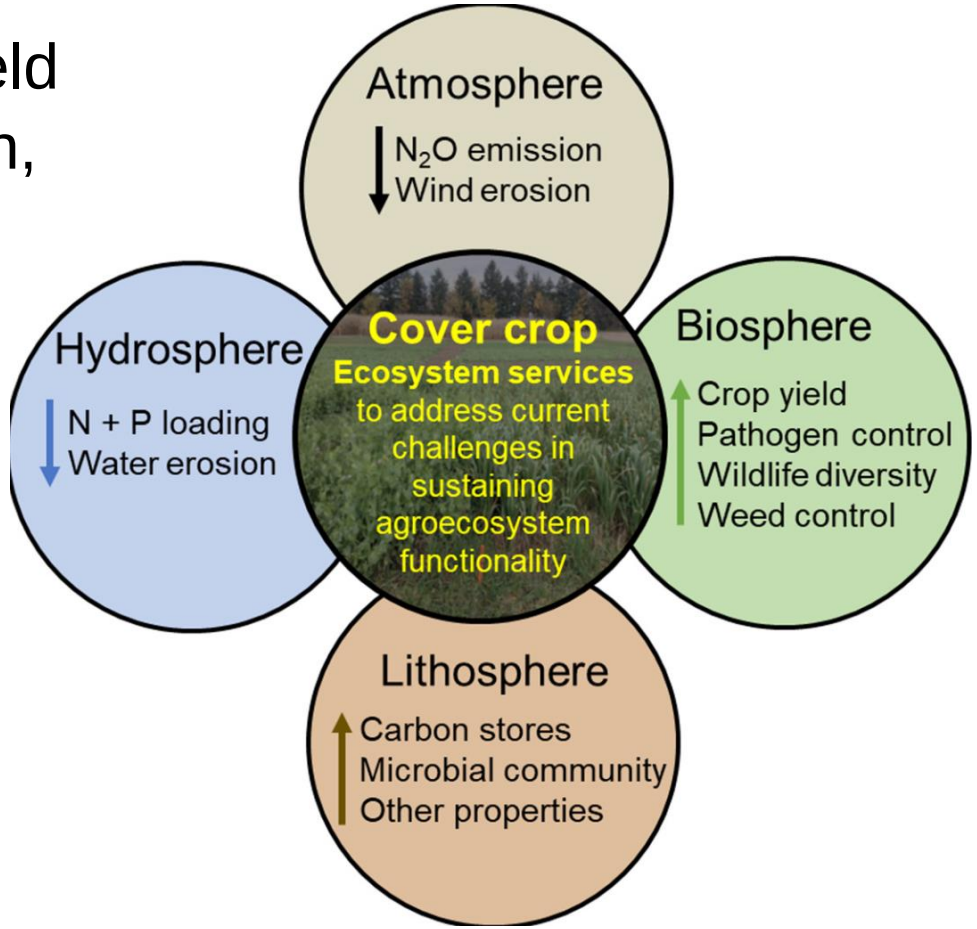
Replacing agricultural inputs with ecosystem services promising for more sustainable agriculture



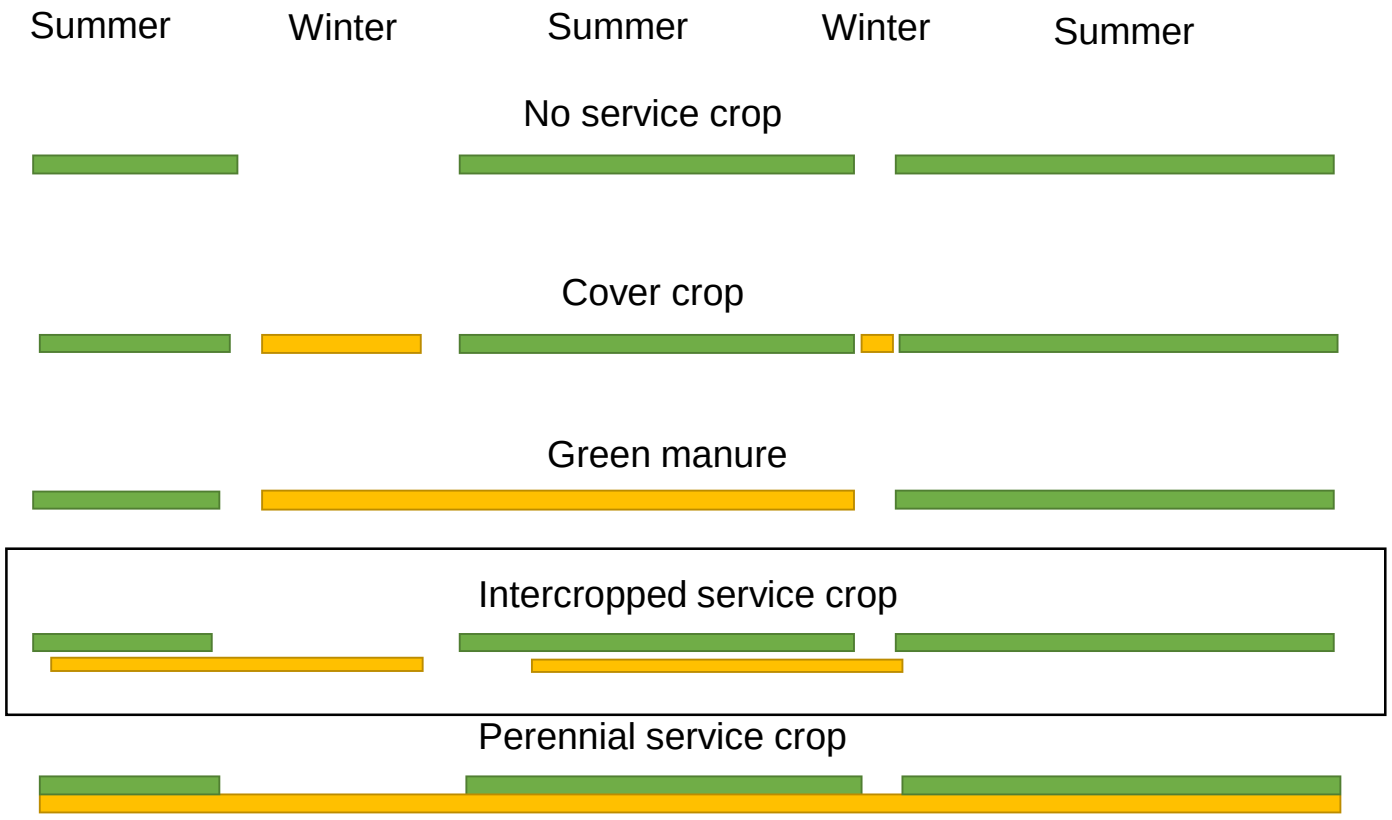
Service crops

- Main purpose not harvestable crop yield
- Multiple benefits: carbon sequestration, reduced nitrogen leaching, soil cover



Van Eerd et al. (2023). *Science Total Environ*

Incorporating service crops in temperate annual cropping systems



Main crop

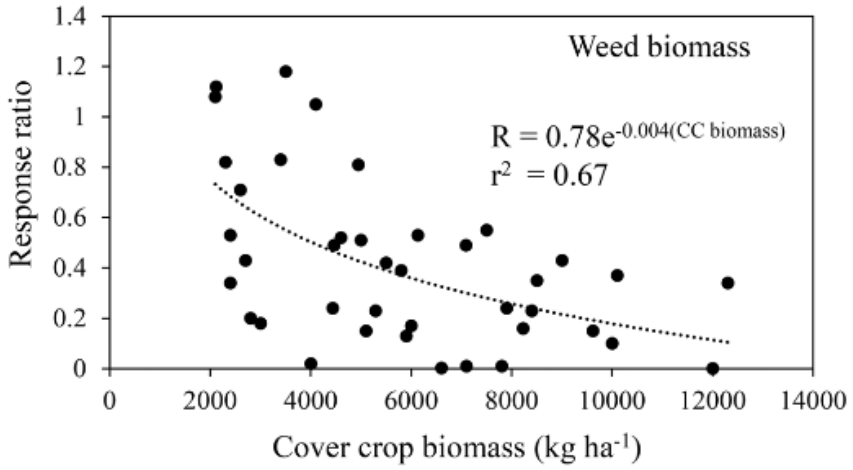
Service crop

See also Gardarin et al. 2022.

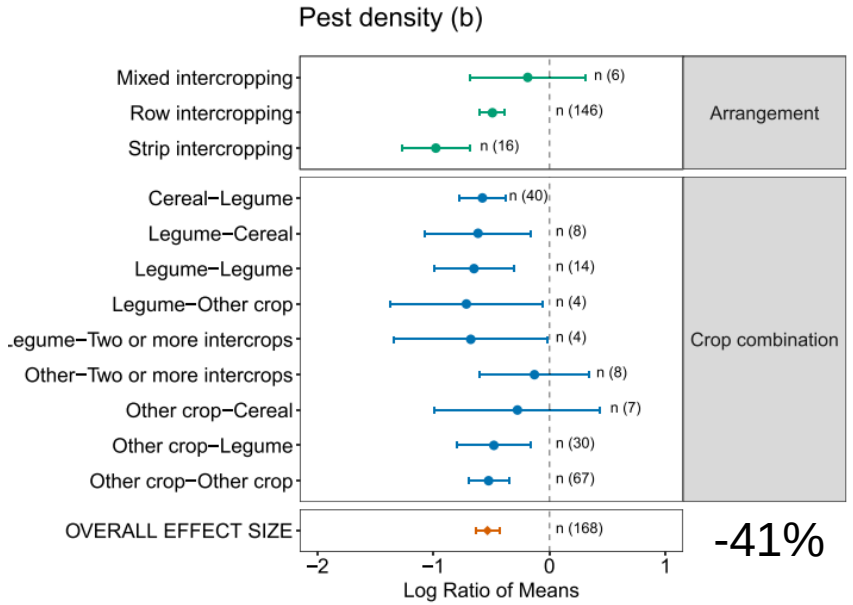
Agron Sust Develop

Service crops and crop protection

- Weed suppression
- Can suppress (and occasionally promote) plant pathogens
- Limited knowledge regarding insect pests and service crops – but guidance from intercropping literature



Osipitan et al. 2019. Crop Science



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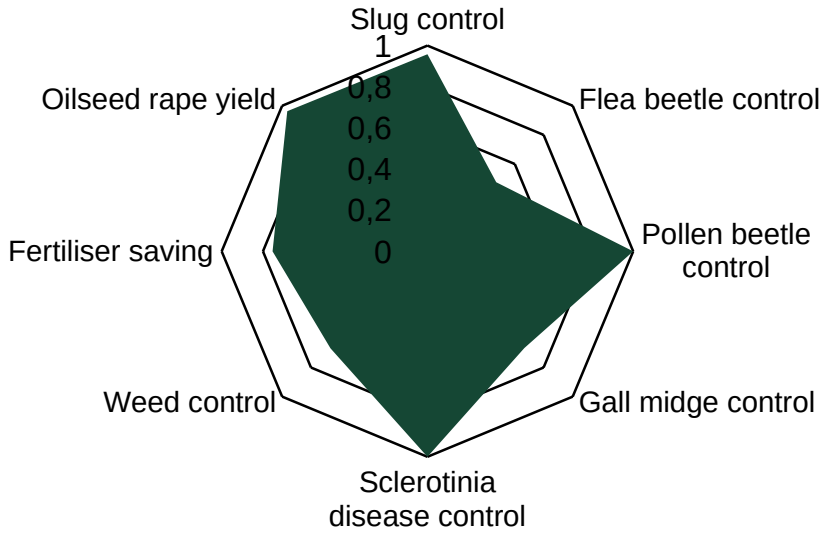
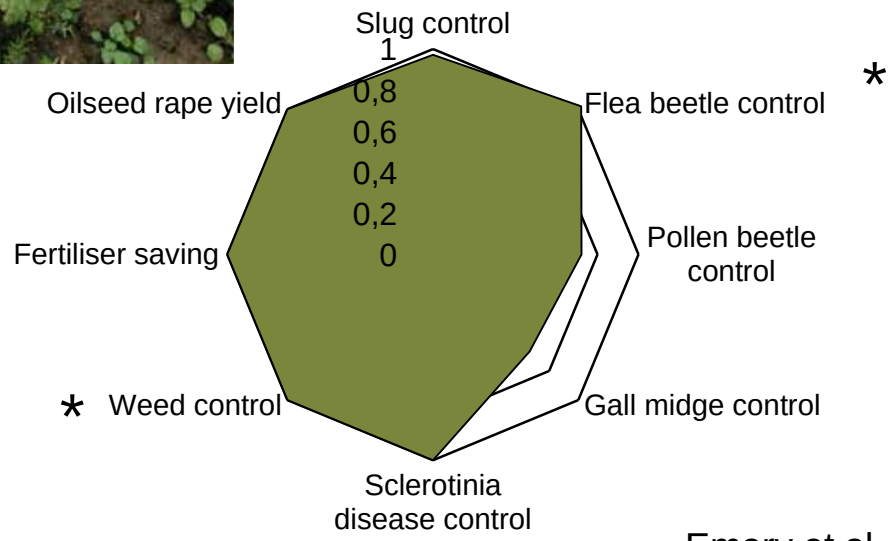
Rakotomalala et al. 2023. Agric Ecosyst Environ

Intercropping oilseed rape with legume service crops

Winter oilseed rape (WOSR)



WOSR + faba bean



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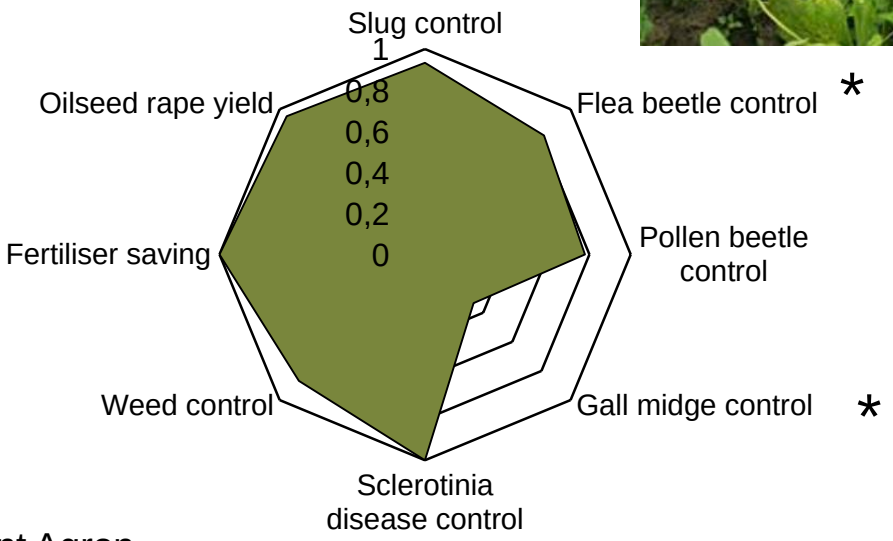
* Weed control

WOSR + clover



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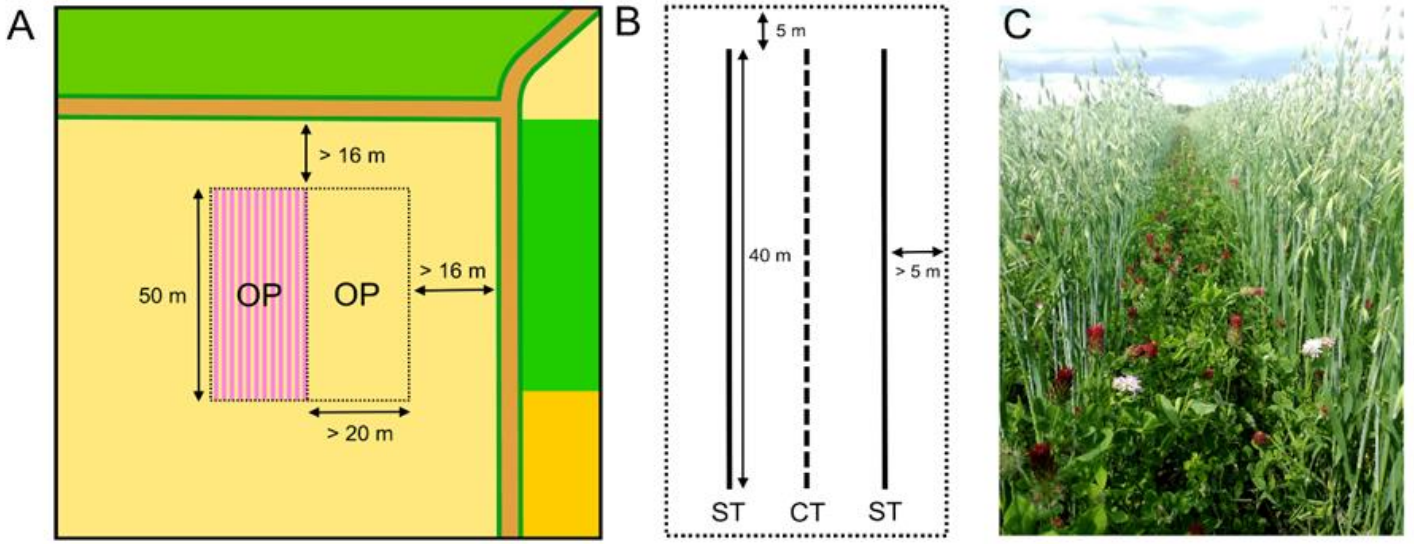
* Gall midge control

Emery et al. 2021. Front Agron

More multifuntional cereal production through undersown service crops?



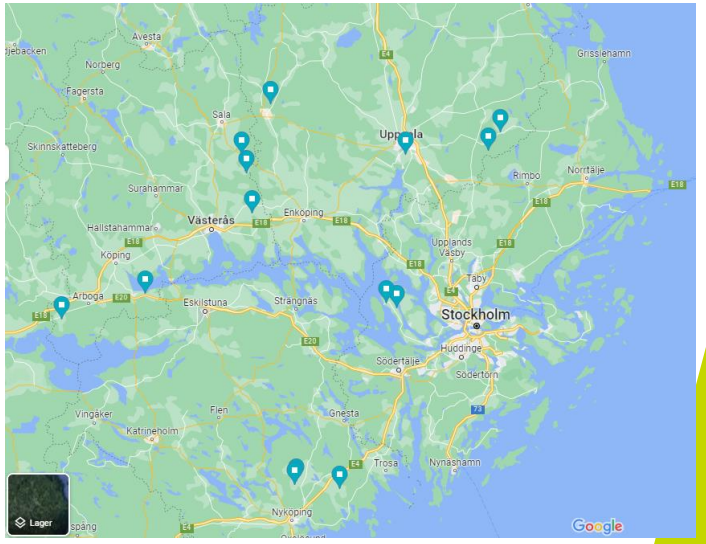
Trifolium incarnatum, resupinatum and squarrosum

central transect (CT):

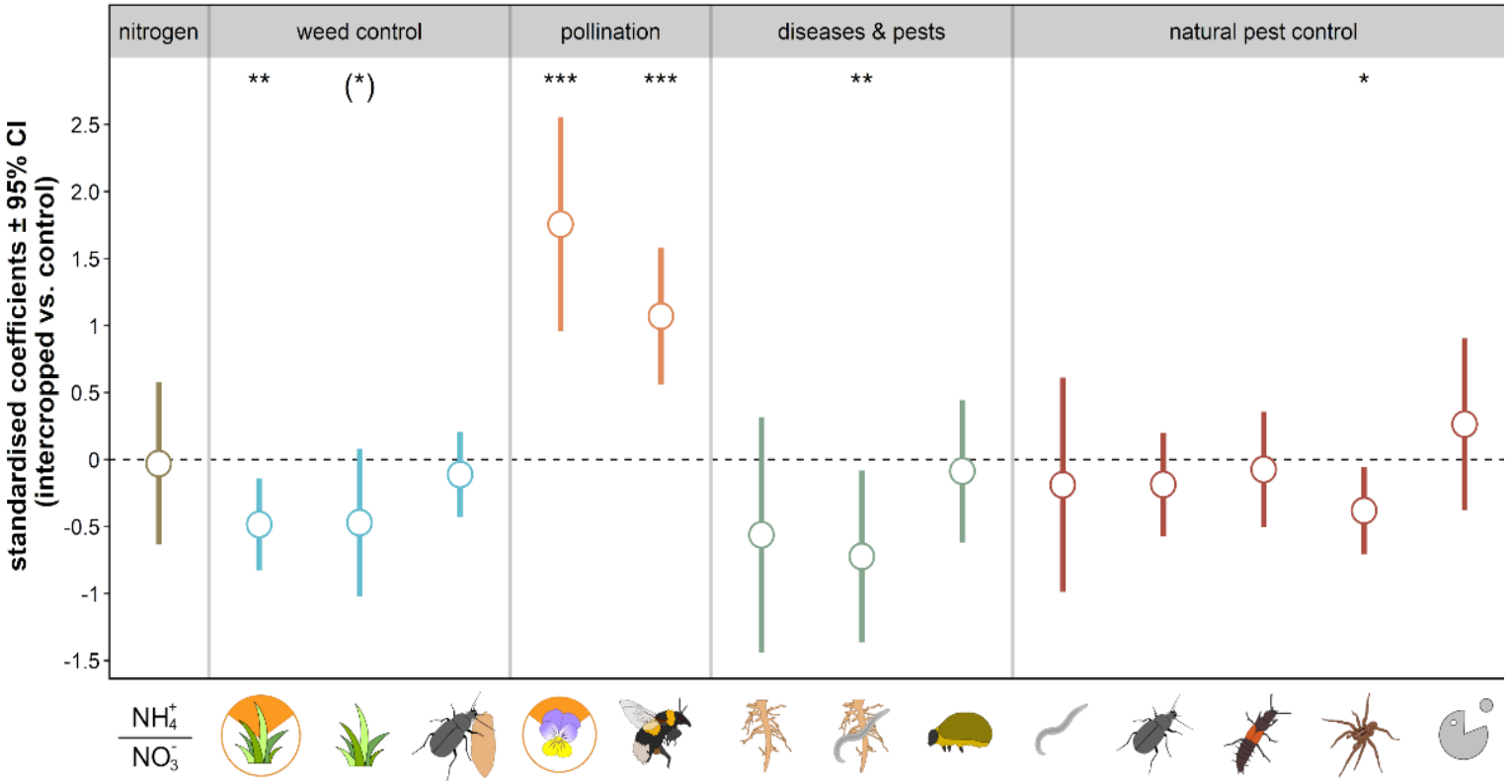
- NH_4^+ / NO_3^- soil mineral nitrogen
- root disease severity
- predatory nematodes
- root feeding nematodes
- granivorous carabid beetles
- predatory carabid beetles
- staphylinid beetles
- spiders
- predation rates

side transects (ST):

- arable weed cover
- arable weed biomass
- cereal leaf beetle damage
- flower cover
- pollinator density
- oat yield
- oat yield nitrogen content (N)



Multiple benefits of undersown clovers

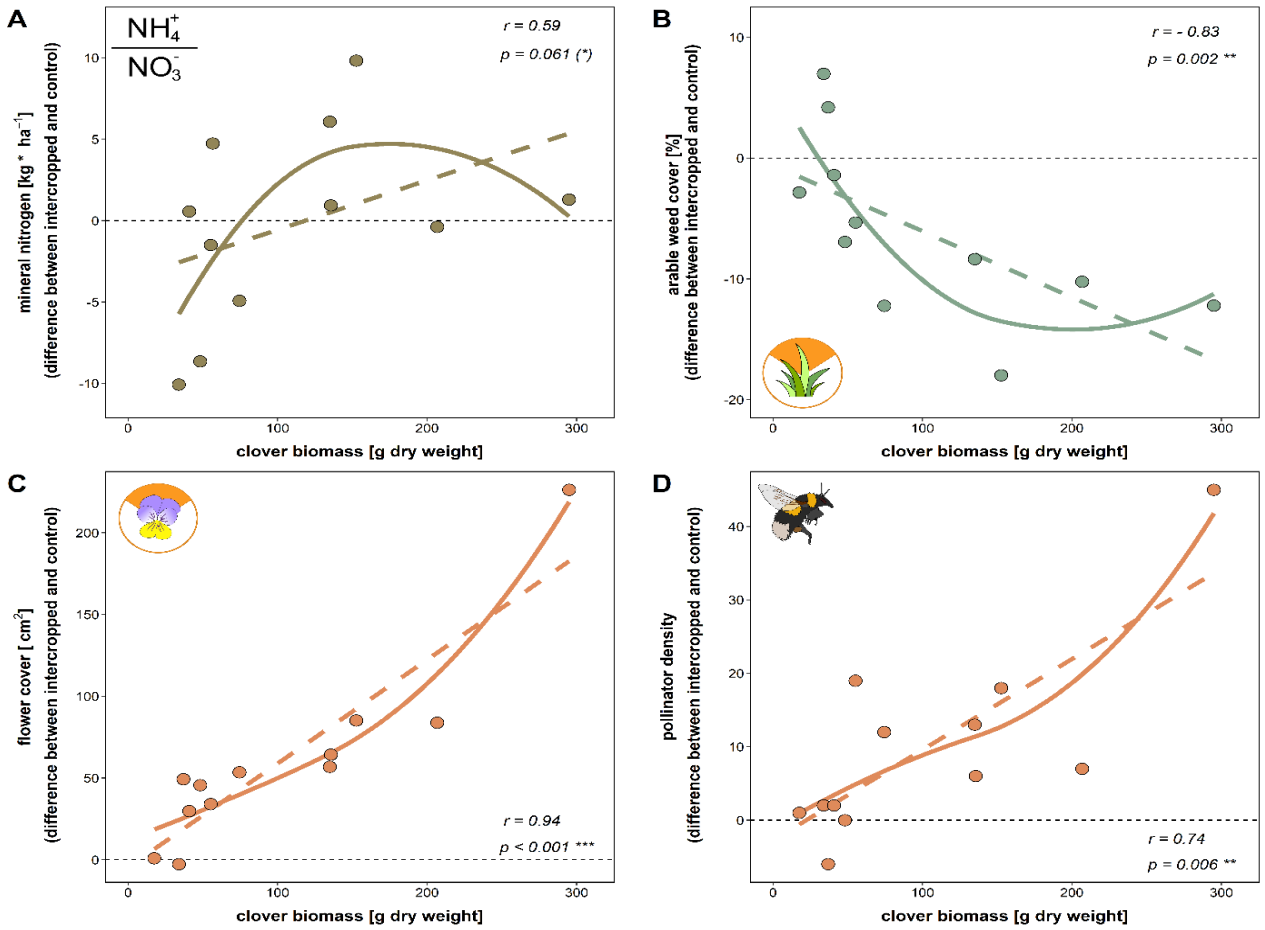


higher with undersown clovers

higher without undersown clovers

Boetzl et al. 2023. J Appl Ecol

Higher service crop biomass led to less weeds and more pollinators (and nitrogen)



Boetzl et al., 2023. J Appl Ecol

Conclusions

- Service crops can provide multiple benefits including improved crop protection
- Service crops that provide multiple benefits (and limited costs/risks) more likely to be implemented
- A more mechanistic understanding that can guide implementation is yet to be gained

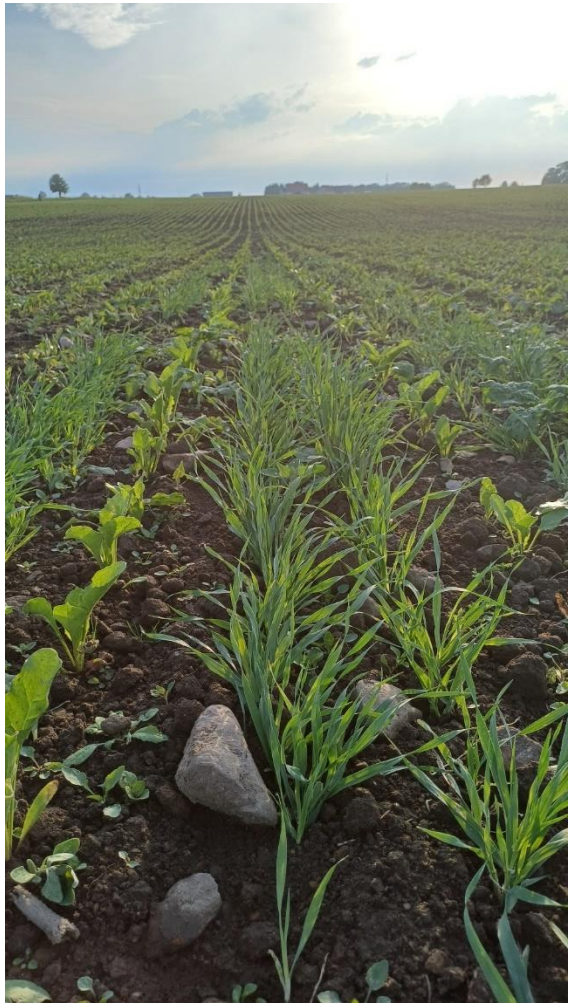
Our next steps

Ongoing

- Frost sensitive service crops in winter oilseed rape – across Swedish geographic contexts and production systems
- Service crops in sugar beet with a main focus on early season insect pests

Future

- Perennial service crop in annual cropping system?



Barley service crop in sugar beet

Co-authors and funding

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Thank you

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