Food and biodiversity impacts of conservation scenarios on Dutch agricultural land

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This project has received funding from the European Union's Horizon 2020 Research and Innovation Programma under grant agreement No. 689669. The present work reflects only the author's view and the Funding Agency can not be held responsible for any use that may be made of the information it contains.

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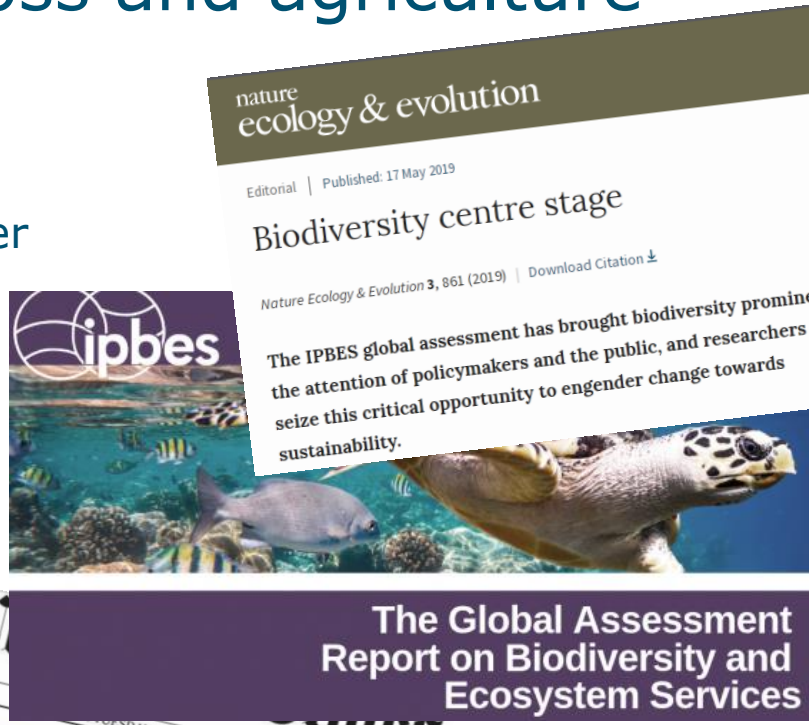
MAGIC NEXUS

Introduction – biodiversity loss and agriculture

Global biodiversity loss, agriculture main driver

Biodiversity vital for ecosystem functioning, provision of ecosystem services, and human wellbeing



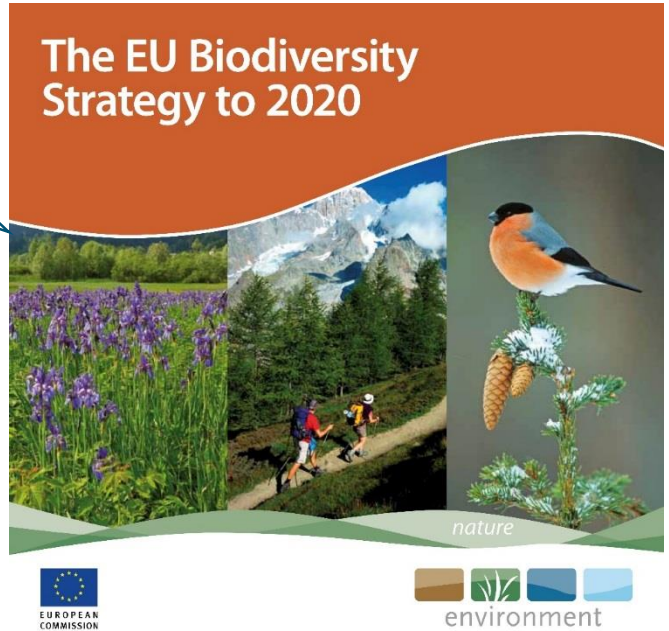
Introduction – reducing agriculture's impact

"maximise agricultural area under conservation measures"

→ Potential trade-off with food production

Research questions:

- Which measures, what scale?
- At what consequences?



Methods - outline

Which measures, what scale?

1) Consult experts on conservation measures

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At what consequences?

2) 'Apply' those measures (land-use scenarios)

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3) Assess their impact on food production and biodiversity

Case study: land on farms with grazing animals in NL

Methods (1) – consult expert on measures

Meadow Bird scenarios

Melman and Sierdsema, 2017

⇔

Wilde apen

Berendse, 2016

Targeted changes to 67,000 ha farmland

- Vegetation structure
- Soil moisture ↑
- Mowing date ↓

Generic changes across entire NL

- Ha protected nature ↑
- Feed import ↓
- Fertiliser use ↓

Methods (2) – apply those measures

Meadow Bird scenarios

Melman and Sierdsema, 2017

⇔

Wilde apen

Berendse, 2016

Targeted changes to 67,000 ha farmland

Generic changes across entire NL

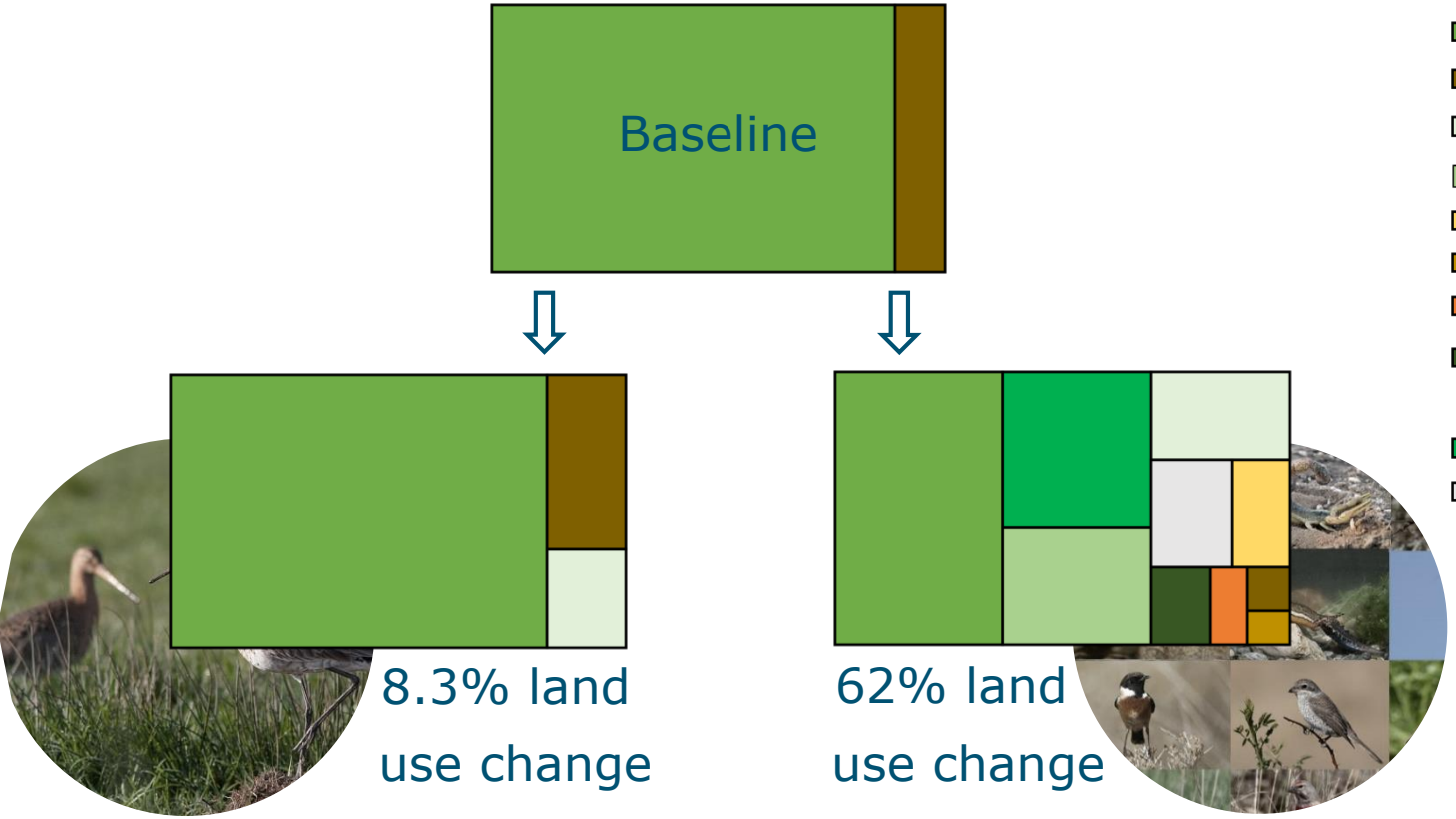
↓ ↓

Apply to case study area

Meadow Bird scenario (MB)

Generic Conservation scenario (GC)

Methods (2) – apply those measures



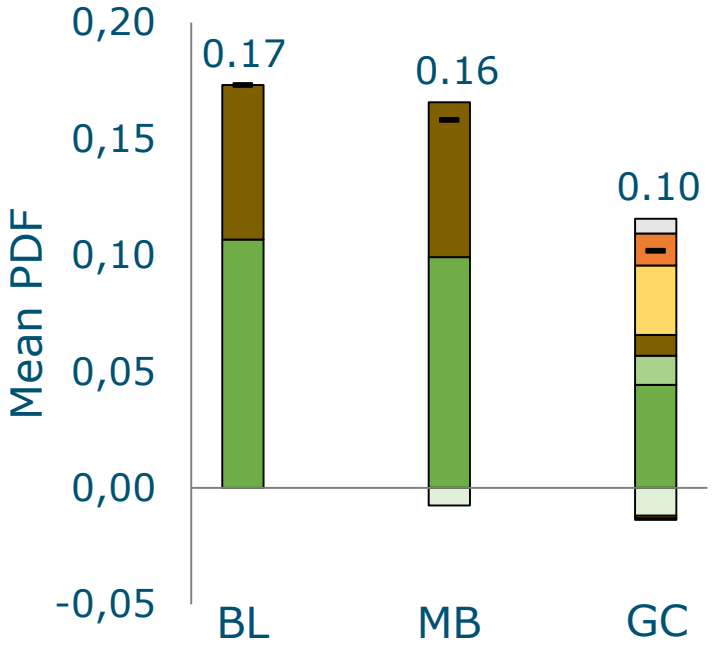
Methods (3) assess their impact

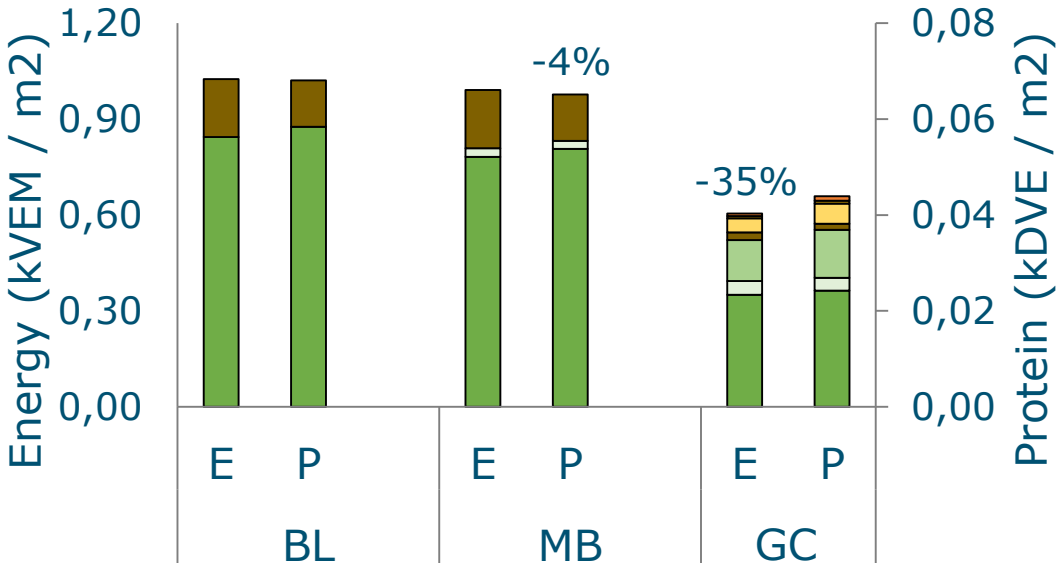
Food: energy and protein yield

Biodiversity: potentially disappeared fraction (PDF) of plant species richness

Land use category	Yield (ton)	Energy content (VEM /kg)	Protein content (DVE / kg)	Characterisation factor (PDF / m^2)
Intensive grassland	10.5 (9.2 – 11.0)	901	62	0.12
Forage maize	16.6 (16.6 -17.5)	988	53	0.60
Extensive grassland	6.2	710	44	-0.12
Etc.	..	...	...	...

Results: biodiversity ↑, but food output ↓





Discussion

Measures extreme? Some context

- GC: farmland → nature (target: 30% protected nature across NL by 2050)
  - Aichi: 17% protected nature in 2020
  - Larsen et al. (2015): Aichi insuffiecient to savegard ecosystem services

Trade-off with food production

- Adjustment production targets ...
  - 65% dairy production currently exported
- ... or burden shift?
  - Displacement missed production = displacement biodiversity impact?

Conclusion

Very diverse approaches

Conservation measures on farmland:

- Potential to increase biodiversity locally
- However, this can go at the expense of local food output

→ Higher biodiversity on farmland ≠ lower negative impact on wider biodiversity

Thanks for your attention!

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How we dealt with individual measures (additional slide)

Meadow Bird scenarios ⇔ *Wilde apen*

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- Vegetation structure → Extensive grassland
- Soil moisture ↑ → Yield reduction
- Mowing date → Reduction energy content

⇩

Meadow Bird scenario (MB)

⇩

- Ha protected nature ↑ → Conversion into nature
- Feed import ↓ → Self-sufficient cropping plan
- Fertiliser use ↓ → Grass-clover

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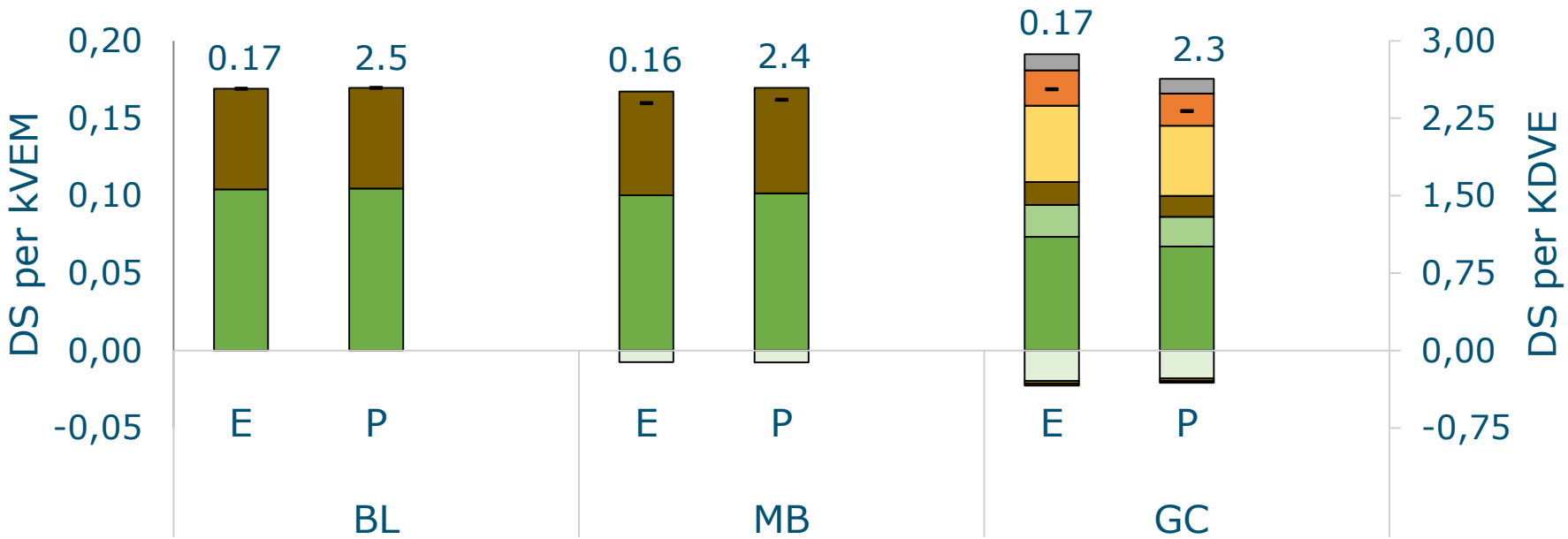
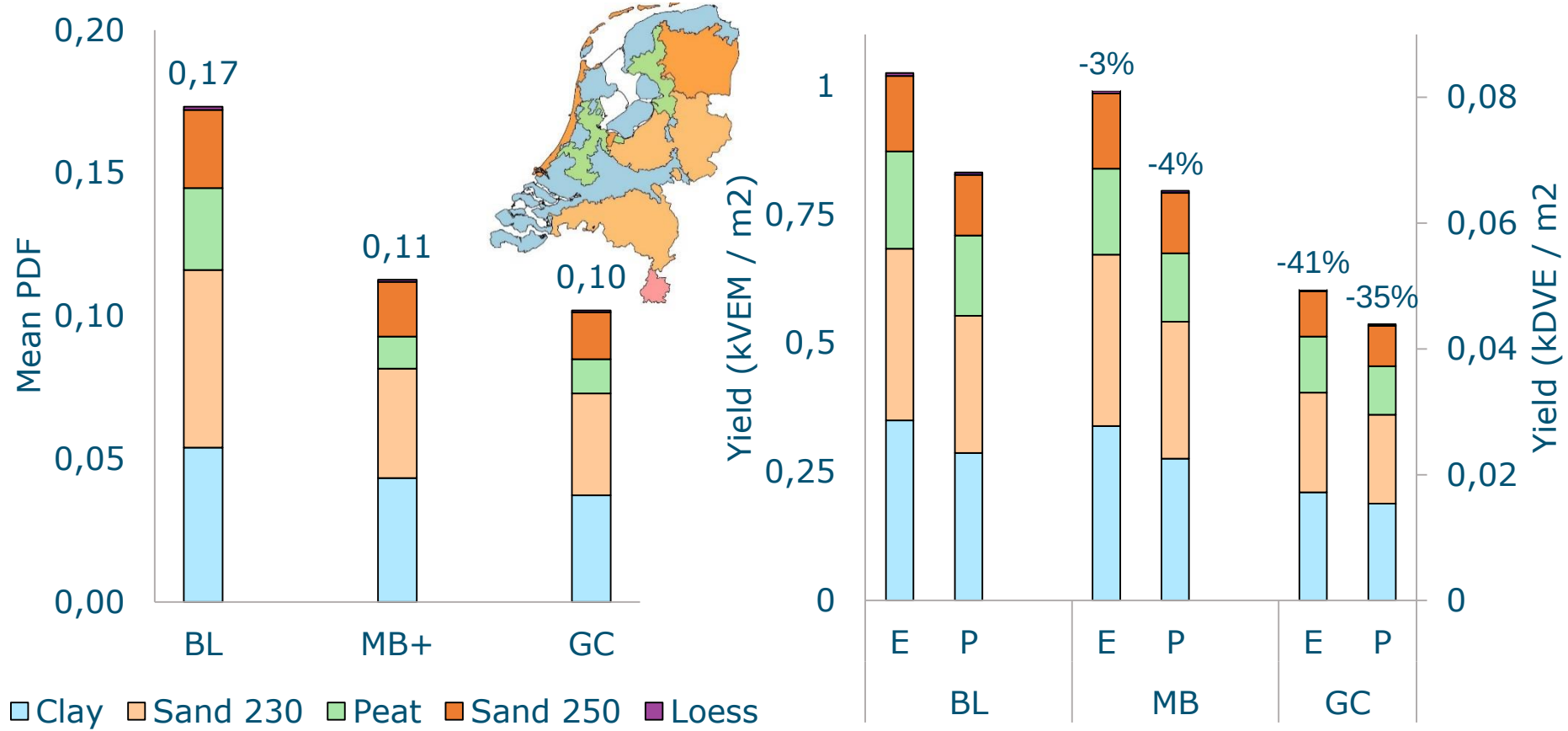
Generic Conservation scenario (GC)

DS per untit product instead of mean PDF (additional slide)



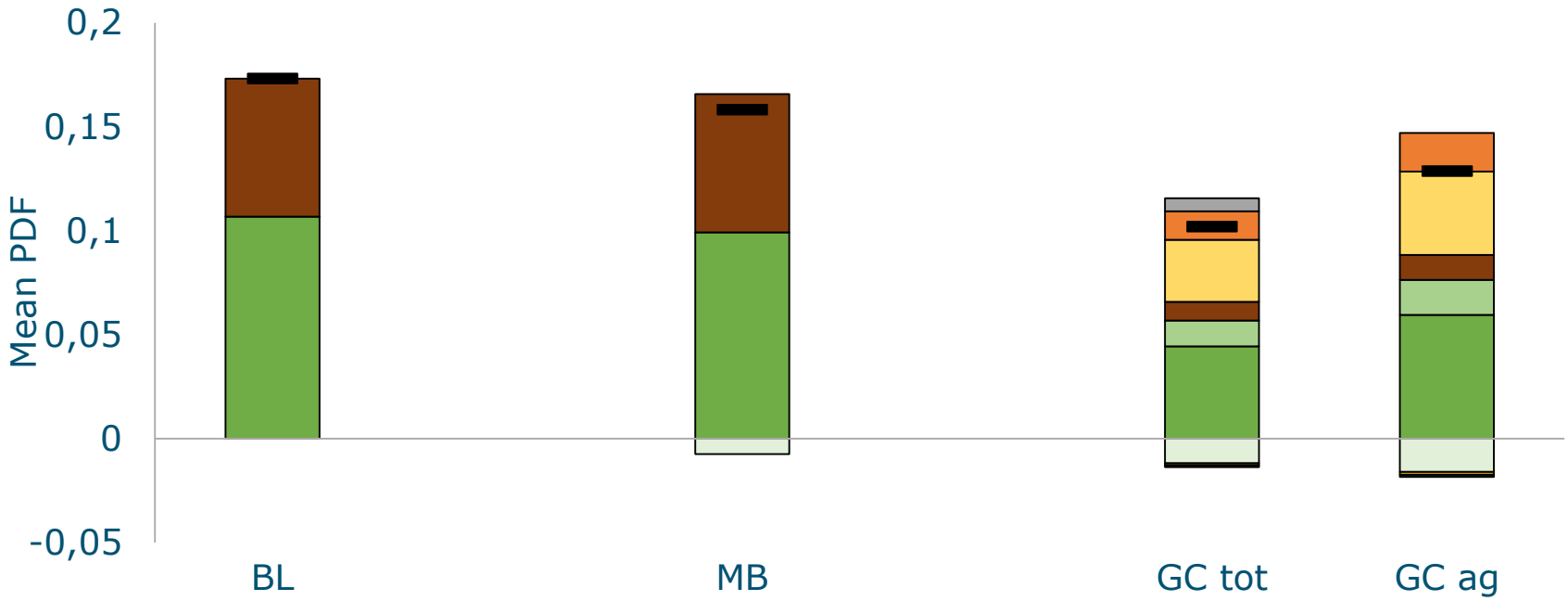
Results disaggregated over soil types

(additional slide)



Results GC seperate for remaining farmland (1)

(additional slide)



Results GC seperate for remaining farmland (2)

(additional slide)