

Effect of agricultural measures on CO₂-sequestration, N₂O emissions and soil functions

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Goal of the study

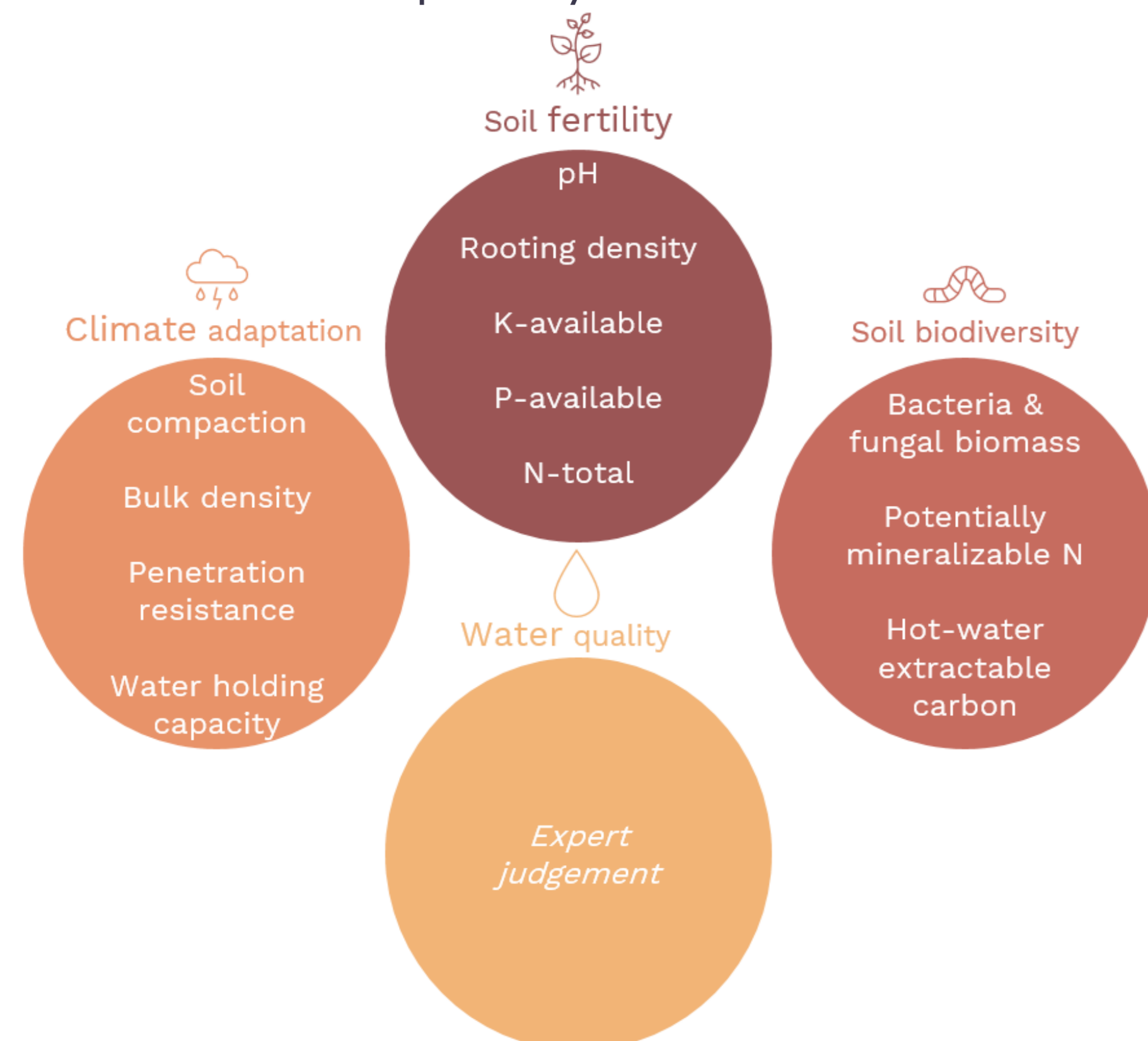
Determine to what extent it is possible to additionally store 0,5 Mton CO₂-eq per year in Dutch mineral soils, while simultaneously managing the soils sustainably.

Research question

- ❖ How much carbon can additionally be stored in Dutch mineral soils per year?
- ❖ To what extent result measures for carbon sequestration in an increase in soil N₂O emissions?
- ❖ What effect do measures have on soil functions?

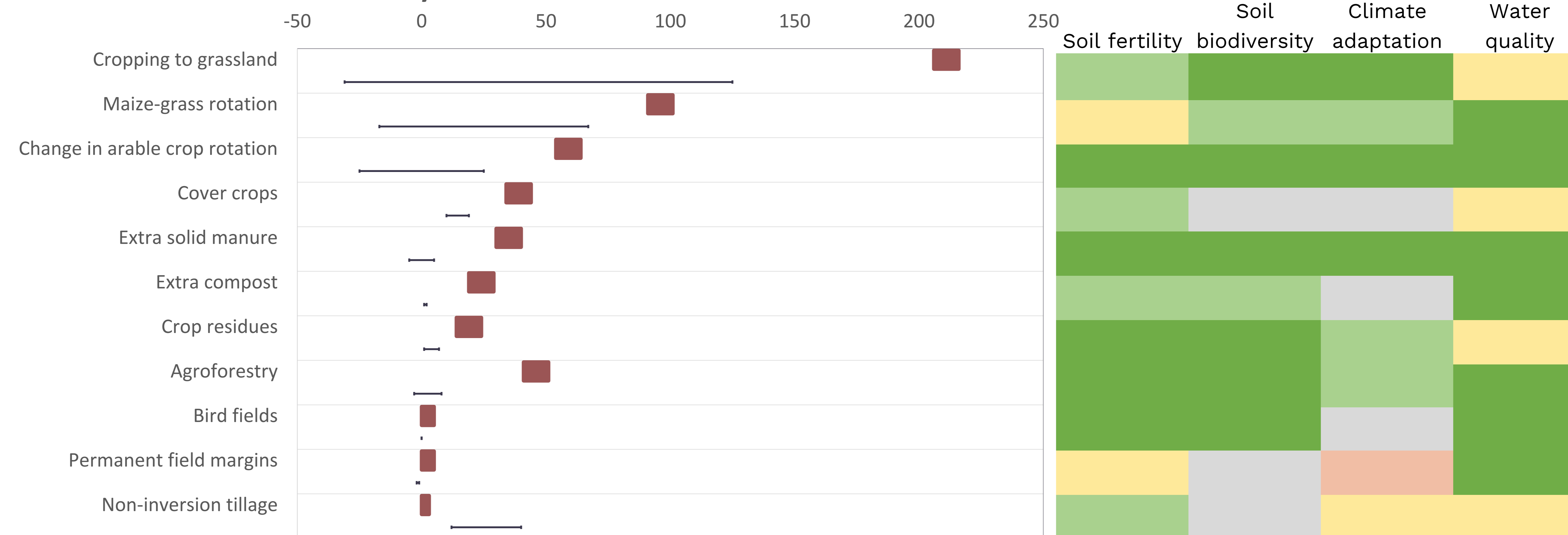
Methods

Effect on CO₂-sequestration, N₂O emissions and soil functions were determined for 11 measures on both sandy and clay soils in the Netherlands. To determine the national potential for CO₂-sequestration we used the model MITERRA-NL, in which the RothC-model is integrated (Lesschen et al., 2021, Slier et al., 2022). N₂O emissions were estimated by experts, based on results from field experiments in the Netherlands, results from the national emission-inventory and scientific literature (Slier et al., 2022). A qualitative score for the soil functions is based on field measurements in long term field experiments and expert judgement. See the figure below for the indicators used to quantify the soil functions.

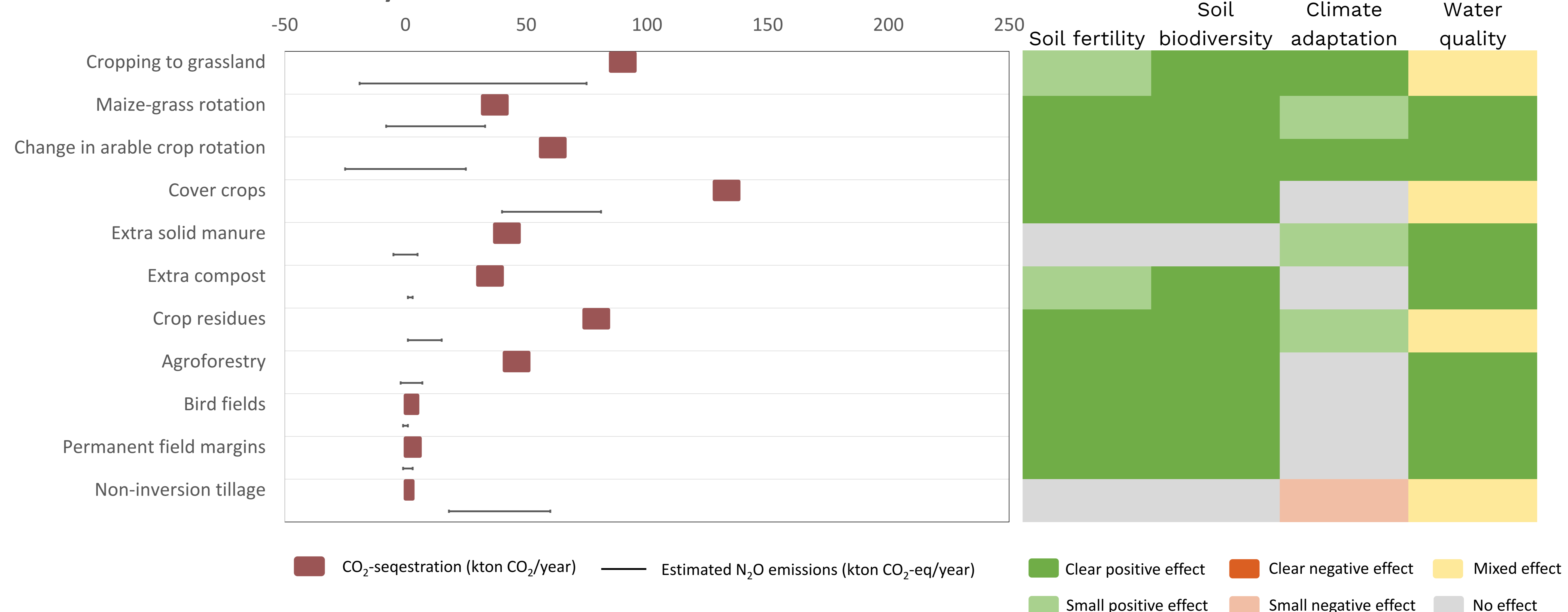


Results

Effect of measures on Dutch sandy soils



Effect of measures on Dutch clay soils



Conclusions

- Implementing the measures in the Netherlands can result in an additional CO₂-sequestration potential of 0,9 Mton CO₂ per year.
- Increased N₂O emissions as a result of the measures are not expected to exceed the CO₂ sequestration, which means that implementing the measures results in a net climate mitigation effect. Non-inversion tillage might lead to an increase in N₂O emissions, while the impact of the measure on CO₂ sequestration is uncertain.
- To reach the goal of storing an additional 0,5 Mton CO₂-eq per year, implementation of measures by farmers is of great importance. A proper revenue model for farmers leads to an increase in implementation.
- Generally, measures lead to a moderately positive effect on the soil functions soil fertility, soil biodiversity and climate adaptation. To determine the effect of measures on water quality additional indicators should be added to the study.

References

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