Financial and N_2O effects of soil management measures on arable farms

SRUC

The Challenge

Producing crops with increasing financial returns while reducing the impact on the environment is a main goal of sustainable arable farming. This paper presents financial and N_2O emission impacts of four soil management practices, which are not widespread in Scotland (cover crops, residue management, tillage management), modelled on arable farms.

Policy Implication

Tillage management measures are financially beneficial for all farm types as all farms show an increase in farm net profits under these measures. Both of the tillage management options are also N_2O emission neutral. The residue management measure has financial (due to the losses in revenue associated with the additional operational costs and straw sales) as well as environmental consequences on all arable farms. The cover crop measure which includes extra seed and management costs on a farm is projected to reduce farm net profit but this measure reduces N_2O emissions due to binding of N in soil. This could be the choice of soil measure for the farmers who are more environment protection oriented than profit maximisers.

Research

Farm level data from 151 specialist cereal farms (Scottish Farm Business Survey, 2016), grouped into four size categories were used to create a representative farm type for each farm size. The major arable crops grown in Scotland were included in the modelling. The long-term yield effects and costs of the measures were based on Glenk et al. 2017, The soil N_2O calculations were based on the IPCC 2006 guidelines (IPCC 2006) considering the UK country specific calculations in the latest UK Greenhouse Gas Inventory (Brown et al. 2017).

Results

Tillage management options are financially beneficial to all farm types, and result in no change in N_2O emissions. The positive financial impact of tillage management are higher over longer terms as minimal soil disturbance is projected to have higher crop yields in later years. In contrast, cover crops and residue management practice are expected to have a negative impact on farm profits for all four farm types.

Cover crops management options reduce the emissions slightly in all farm groups, except in very large farms (which is due to small re-allocation of wheat/barley area to more profitable oats). Residue management is projected to produce larger emissions in all farm groups.

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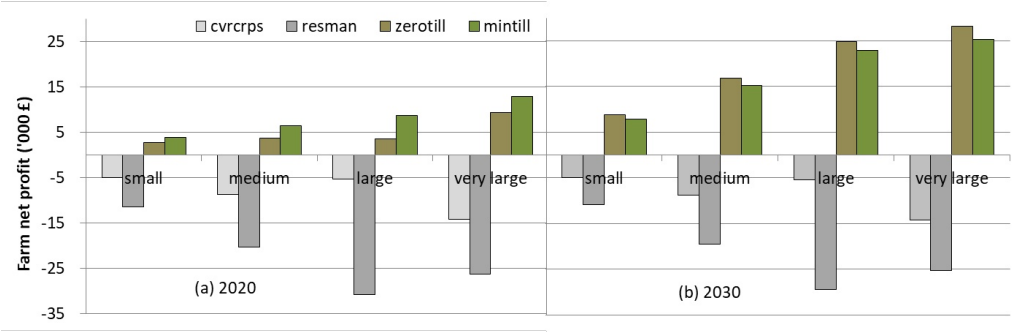

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About

The Land Economy, Environment and Society (LEES) Research Group is one of the largest groupings of economists and social scientists working in the rural, agricultural and land based sectors in the UK. Our vision is to be recognised as one of the leading centres for agricultural and wider rural economic and social research globally, benefiting the land use sector, the environment and rural communities.