

## Soil carbon sequestration under *Miscanthus x giganteus*

### A large scale survey

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## Miscanthus

### *Miscanthus x giganteus*

- Ligno-cellulosic or „second generation“ bioenergy crop
- Rhizomatous perennial grass with a C<sub>4</sub> photosynthesis pathway
- Originates in Asia (tropics and subtropics)
- Remarkable adaptability to cool temperate climates
- Introduction subsidised in Ireland

Soil carbon sequestration potential due to physiological features and management practices

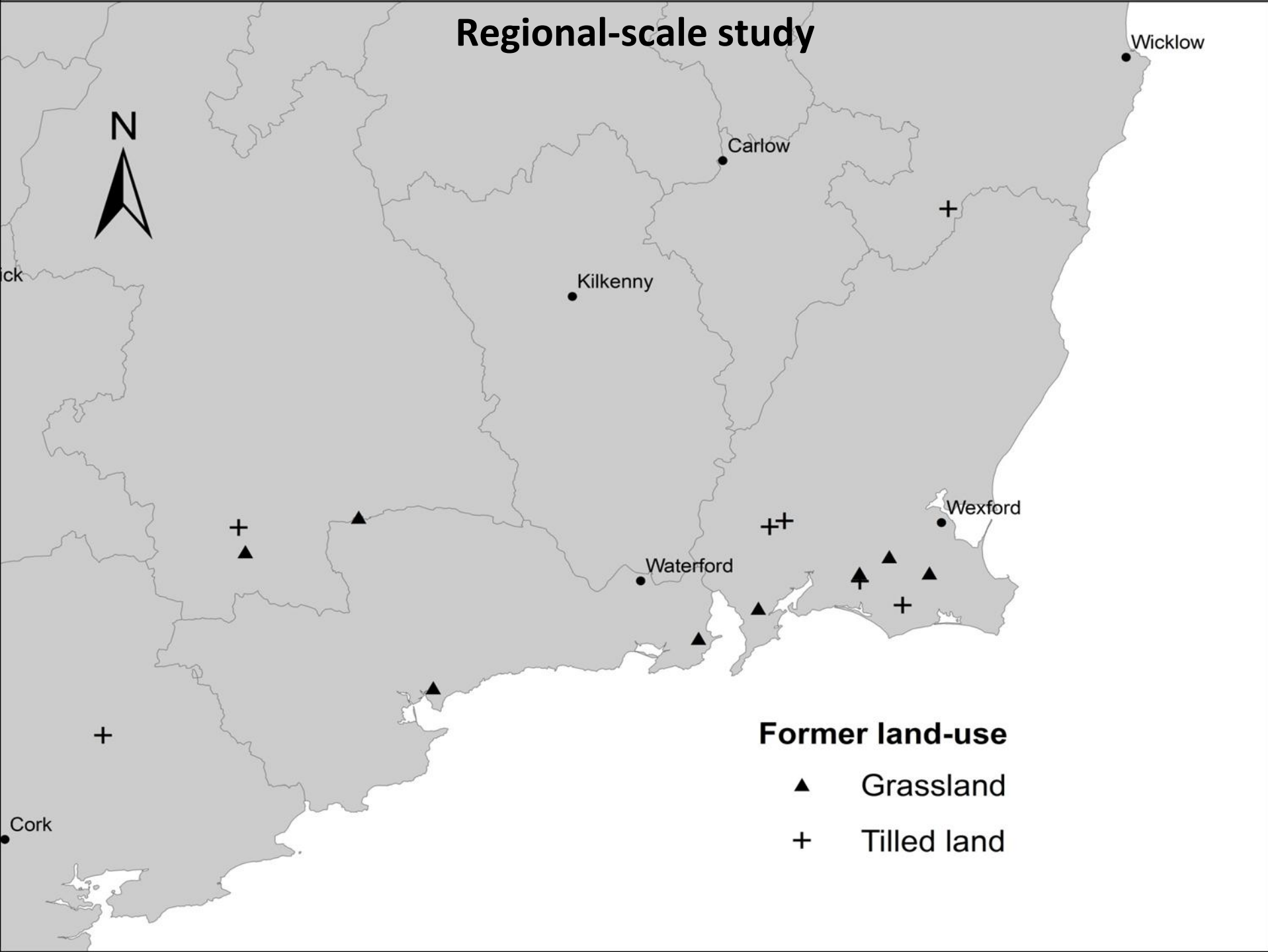
## Research questions

Research on carbon sequestration mainly on experimental fields, however differences can be expected in commercial plots

This study is focused on commercial large-scale *Miscanthus* fields in south east Ireland, looking at:

- Soil carbon sequestration
- Initial soil carbon loss
- What is influencing the processes?

# Regional-scale study



## Materials & Methods



### Sampling

Nested sampling design

A number of soil cores taken at three subplots in a *Miscanthus* field and an adjacent control site representing the former land-use

Cores divided into three depth and bulked over the sub plot.

Additional cores taken for bulk density

## Materials & Methods



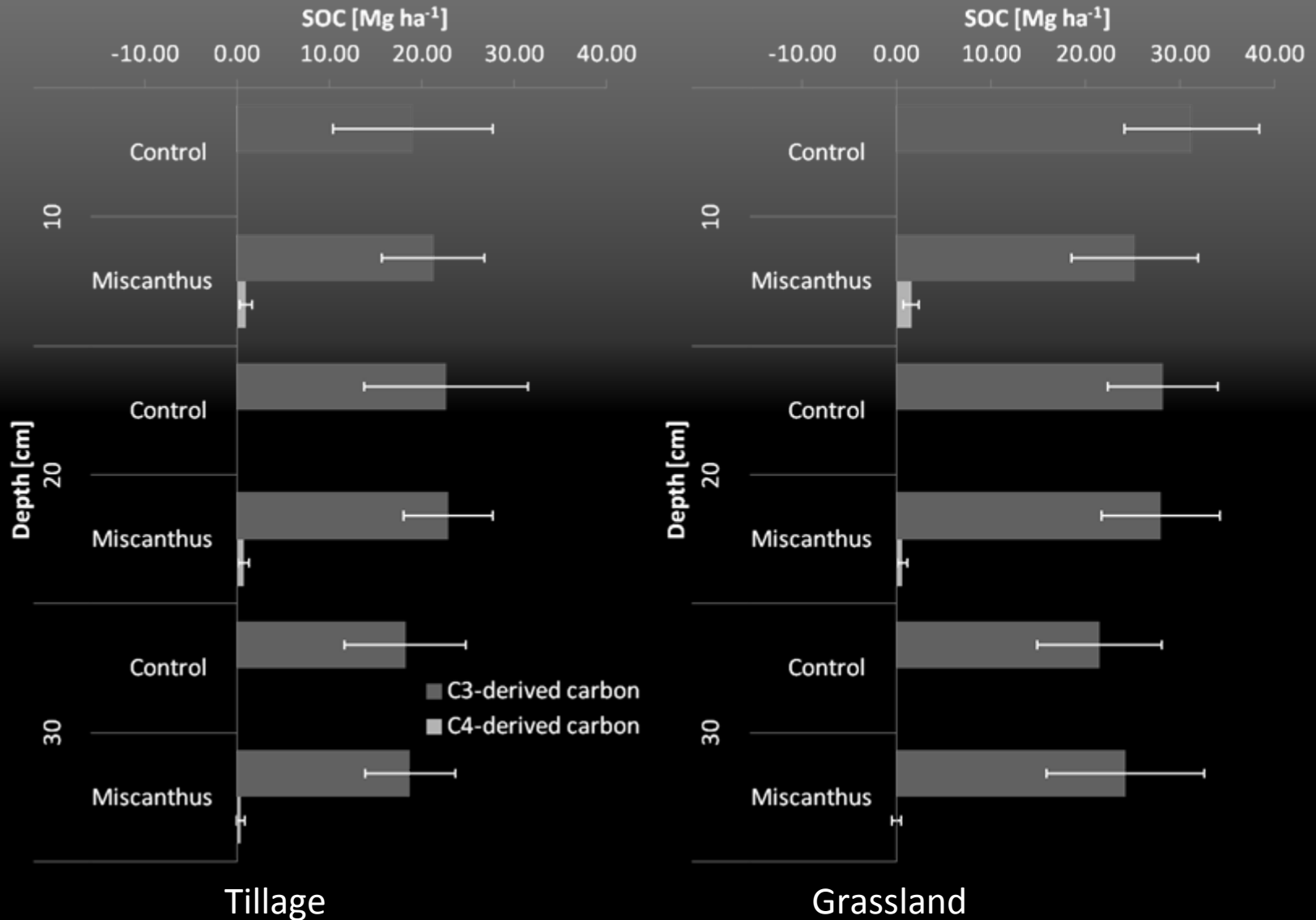
### Analyses

The bulked samples were processed in the lab and following measurements were taken:

#### Total organic carbon

$^{13}\text{C}/^{12}\text{C}$  stable isotope ratio to determine the *Miscanthus*-derived carbon ( $^{13}\text{C}$  natural abundance method)

Soil bulk density, particle size distribution, and pH





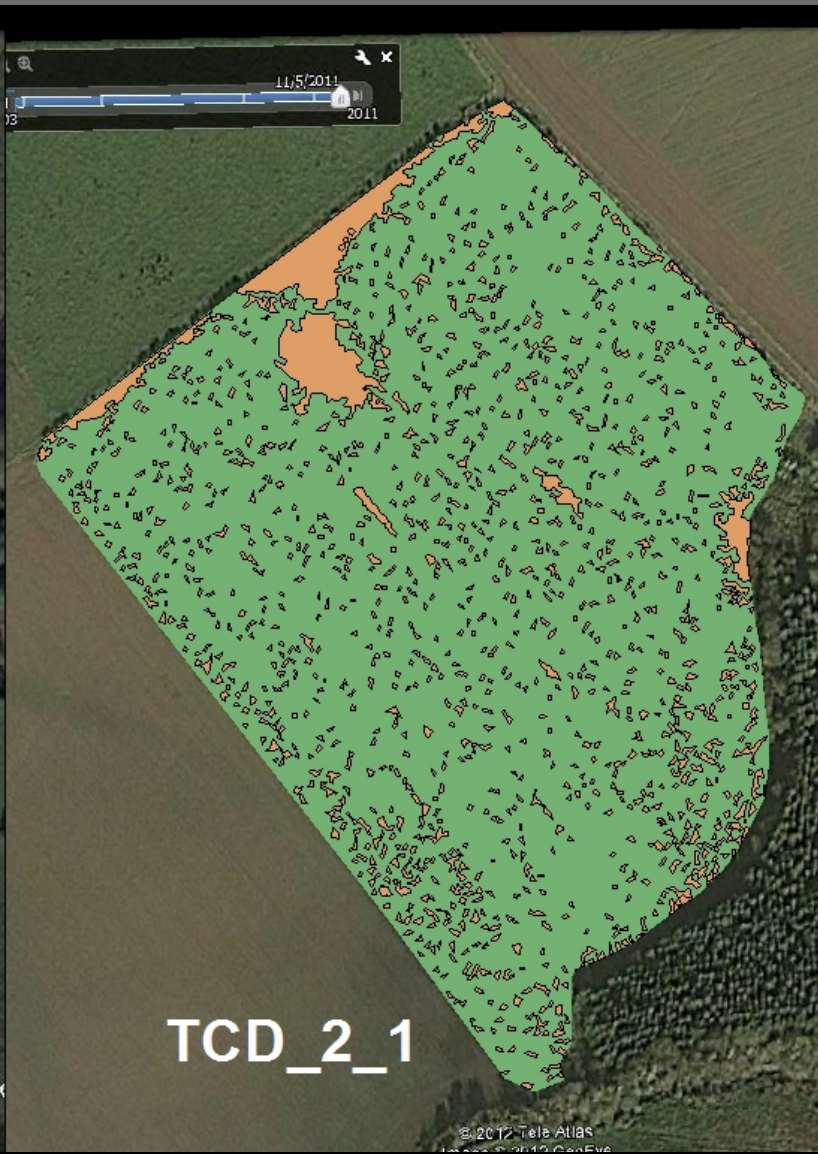
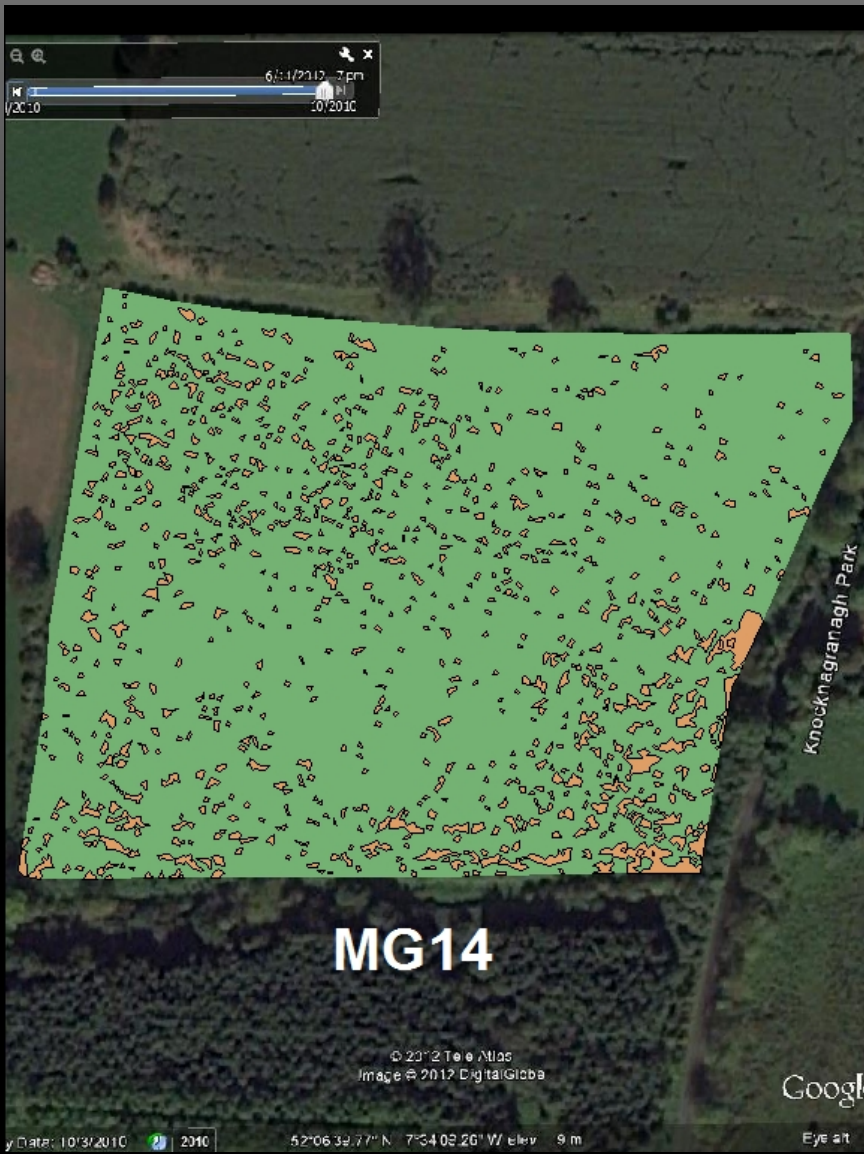
# Sectoral Impacts on Biodiversity and Ecosystem Services

## Field-scale study







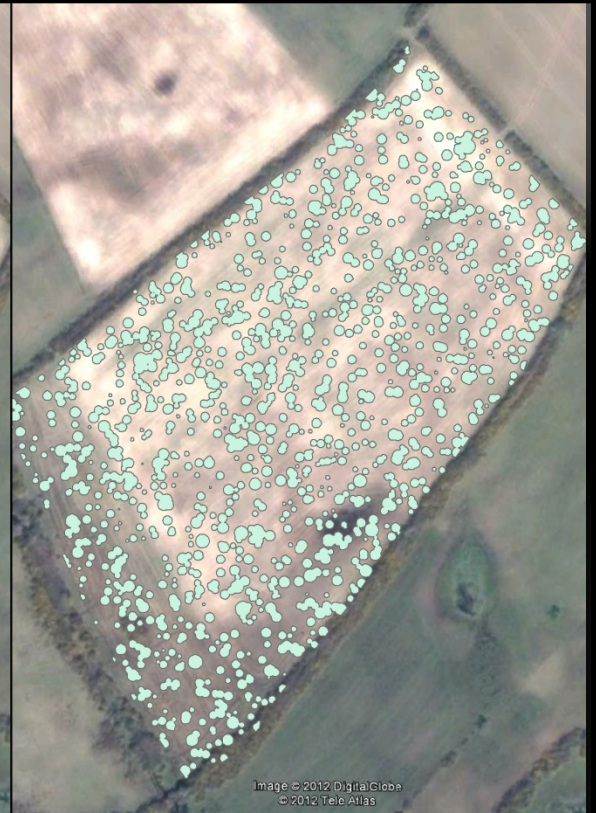
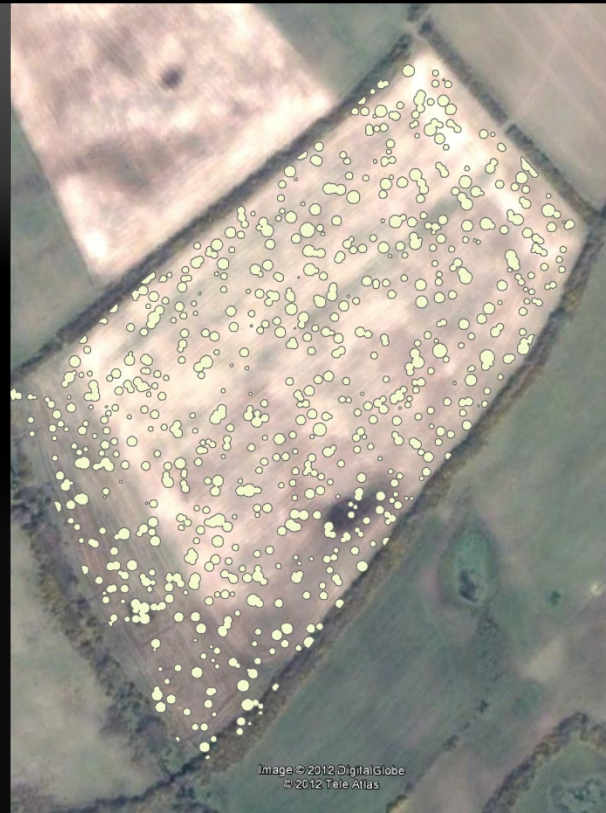


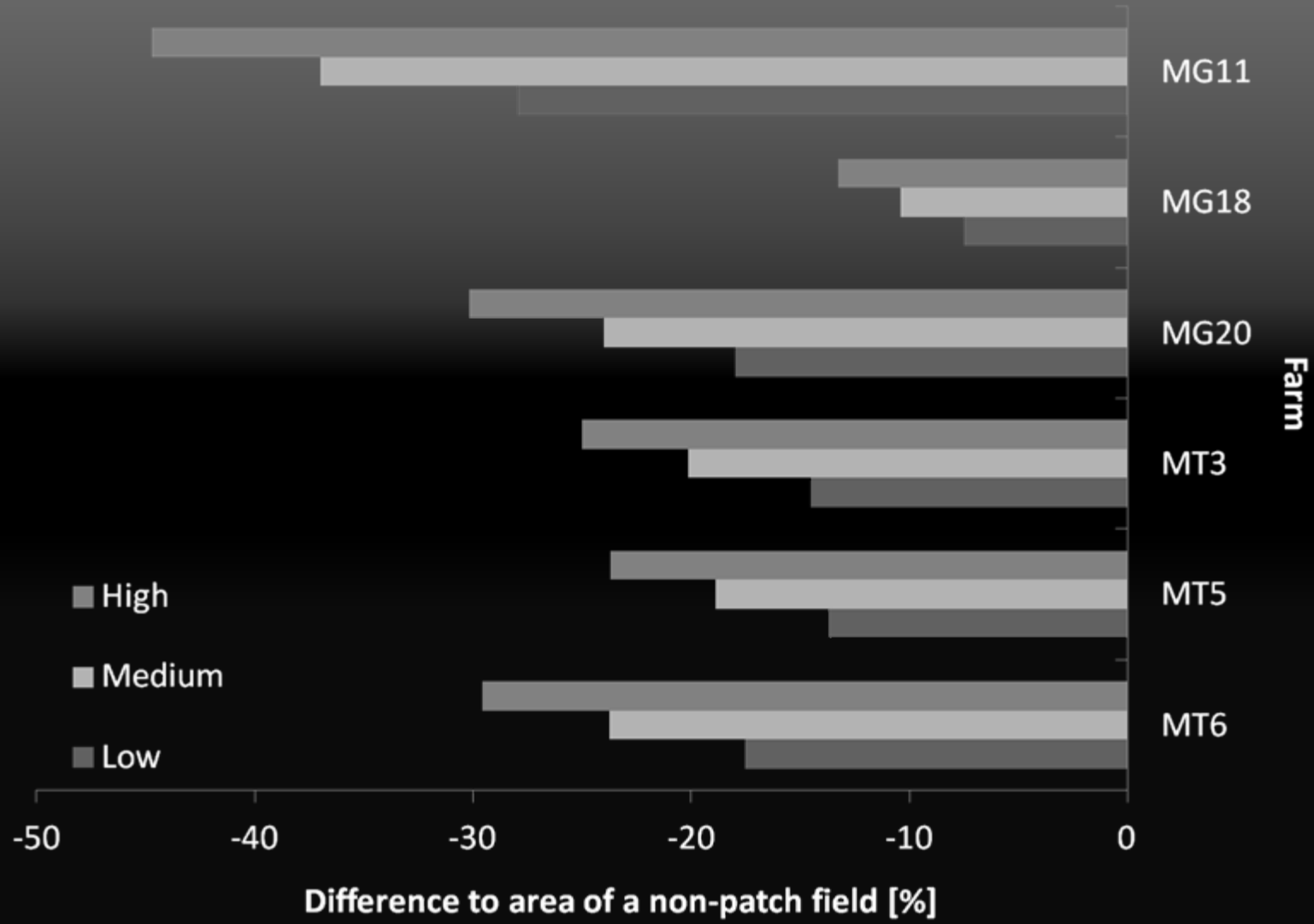
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	<b>MG14</b>	<b>TCD_2_1</b>
Average patch area	4.357 m <sup>2</sup>	3.710 m <sup>2</sup>
Standard deviation	8.702	25.245
No. Patches	901	1243
Sum of patch area	0.393 ha	0.461 ha
Overall field size	4.390 ha	3.982 ha
Share of field	8.95 %	11.58 %

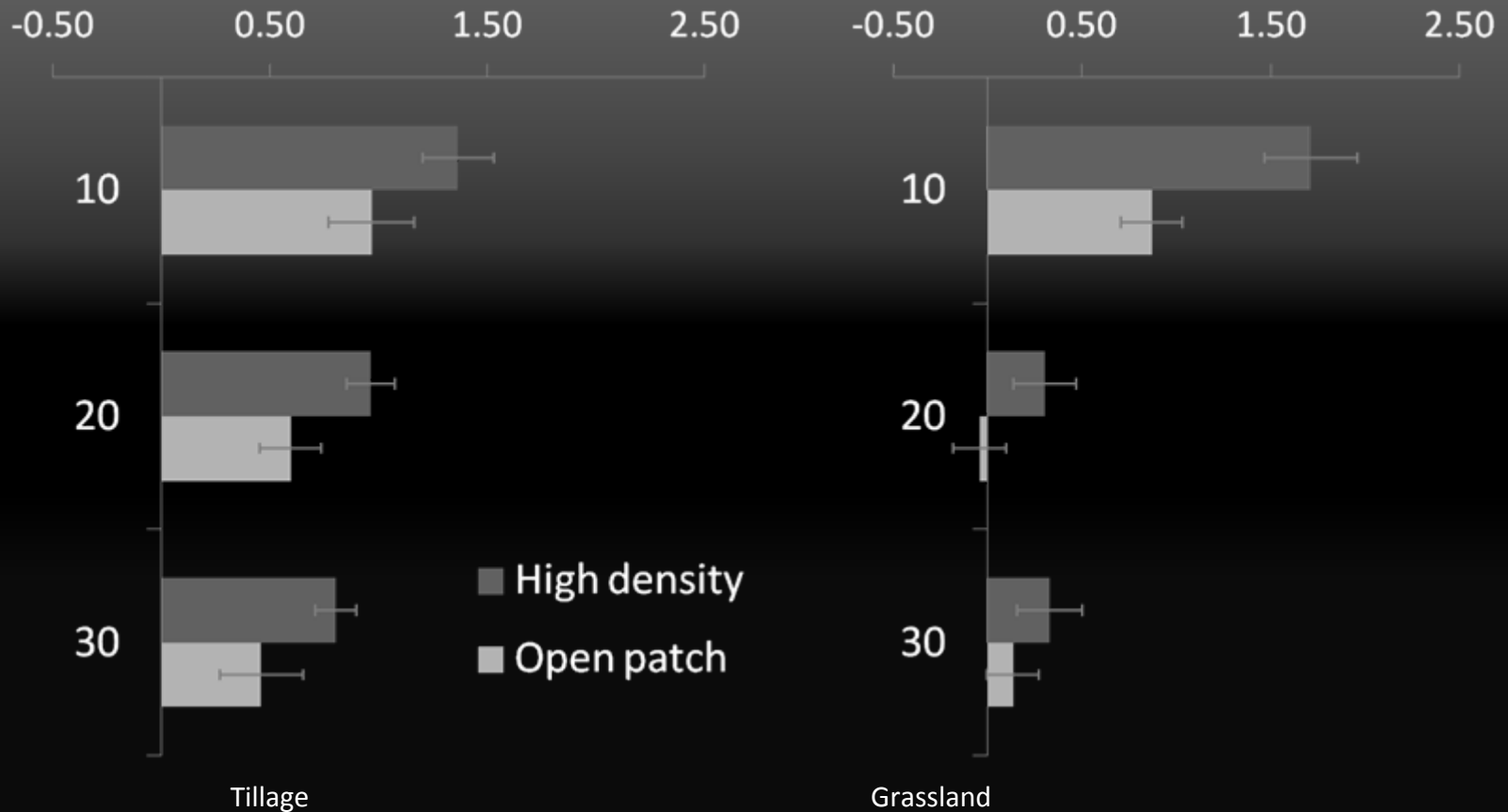
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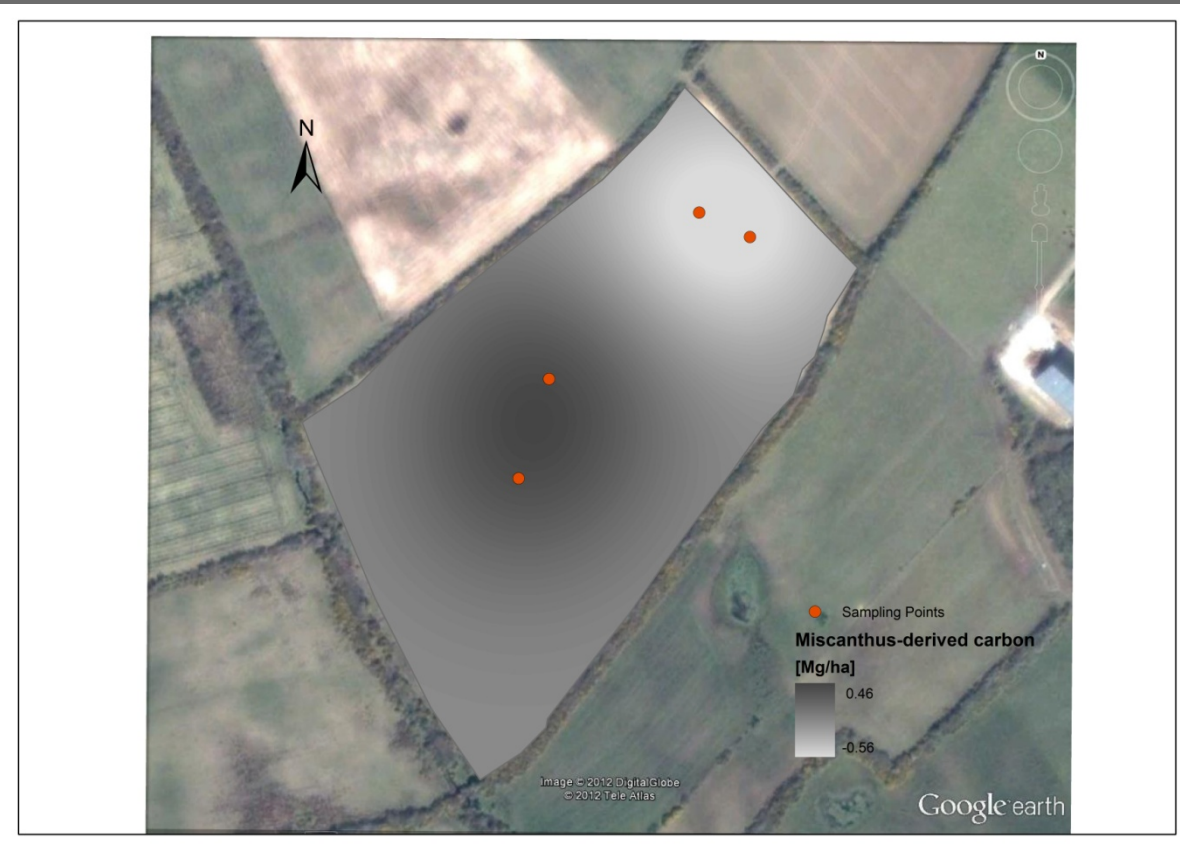
Farm	Area [m <sup>2</sup> ]	SD	Radius [m]	SD
MT3	8.672	6.287	1.519	0.691
MT5	8.151	4.111	1.570	0.372
MT6	10.595	6.028	1.772	0.496
MG11	18.185	14.109	2.233	0.923
MG18	4.329	1.965	1.146	0.264
MG20	10.488	6.335	1.751	0.537



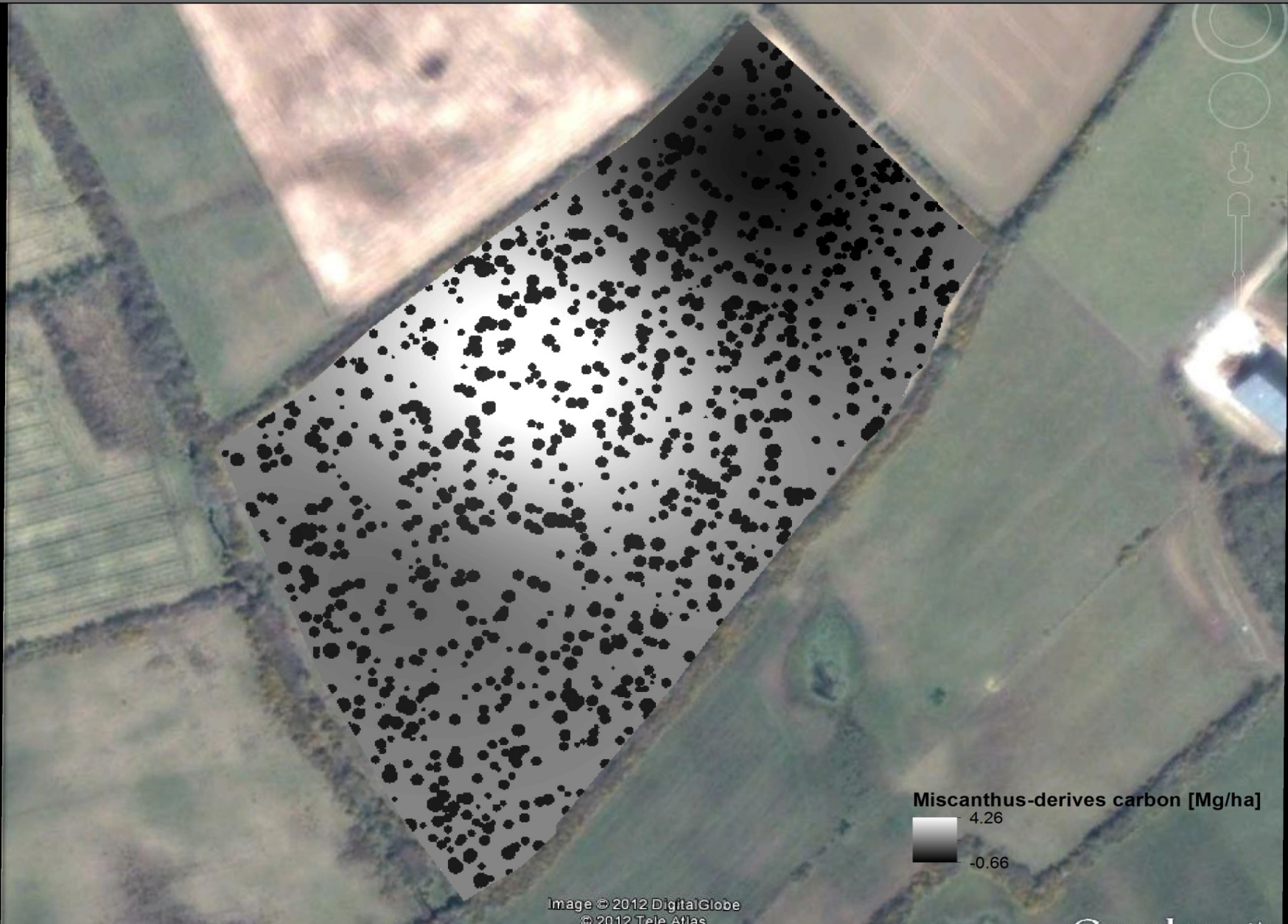


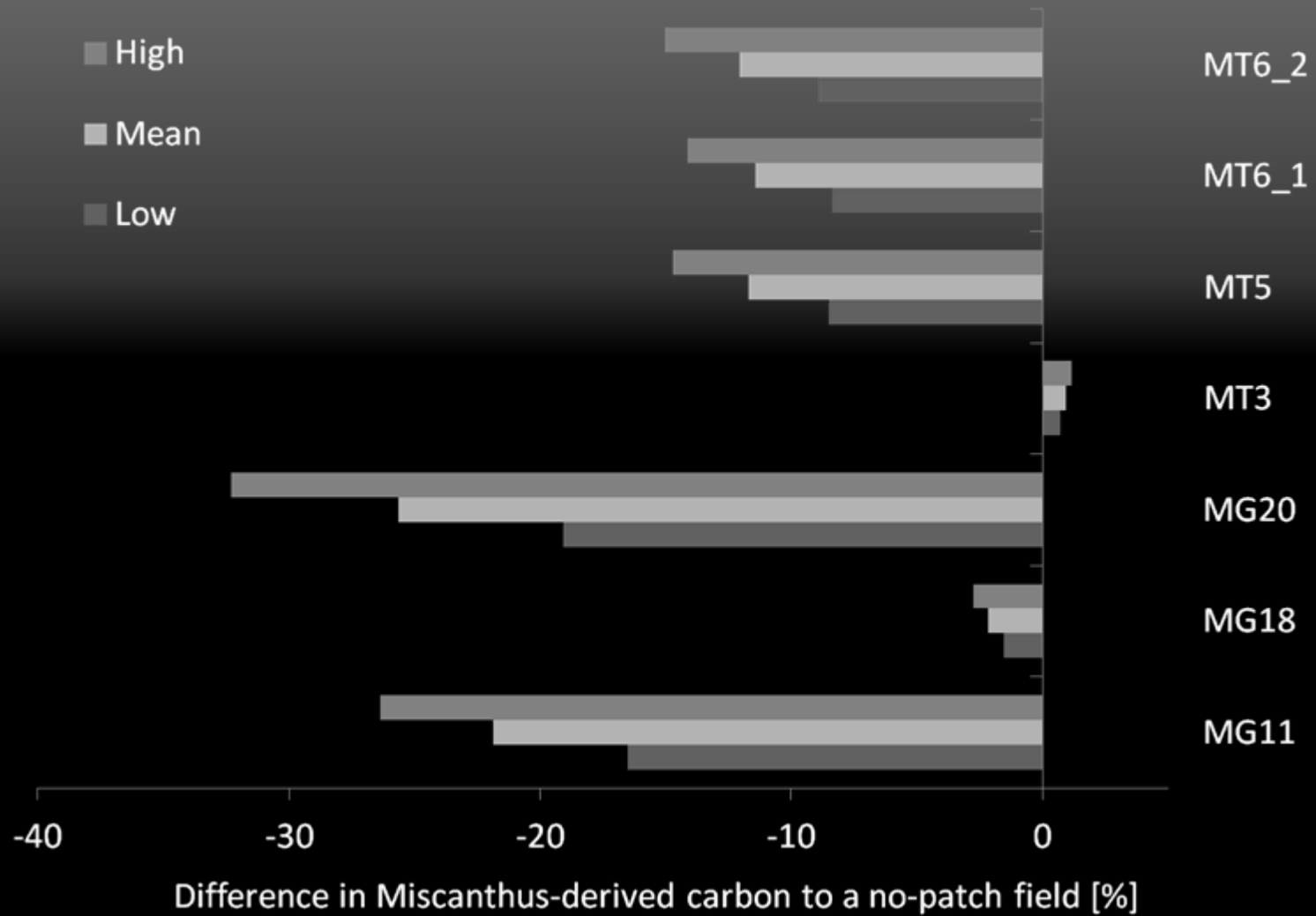
## Miscanthus-derived carbon [Mg ha<sup>-1</sup>]











## Conclusions

Measurable soil carbon sequestration even 2 to 3 years after planting Miscanthus

No significant loss of soil organic carbon due to plantation

High variability between farms

Crop patchiness has significant impact on yield and soil carbon sequestration

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