

Project overview

The NFS fertility building and cover crops study is a long-term rotational systems experiment examining how novel approaches to cover cropping might contribute to fertility building in arable systems.

This fully replicated experiment contains three crop rotation approaches, based around winter cereals with differing break crop approaches, three nitrogen (N) regimes and four cover crop management systems.

The cover crop management approaches specifically explore the use of long term clover bi-crops, as well as brassica and legume mix based cover crops, sown ahead of spring sown crops in the rotations.

Recent findings have demonstrated improvements in soil structure (e.g. reduced bulk density and improved water infiltration rates) from cover crop approaches. Maintaining a clover bi-crop within an arable rotation has proven the challenges of integrating fertility-building elements whilst maintaining crop productivity.

Research findings, up until 2014, have indicated improved yield and margin over nitrogen responses from specific cover crop approaches. We plan to update these findings once a further period of cover cropping iterations have been completed.

Publications include:

- European Society of Agronomy (2012) *Farming systems research; evaluation of current practice and the development of novel approaches within UK systems*
- Aspects of Applied Biology (2013) *Approaches to cover cropping and the impact on soils and farming systems*
- Aspects of Applied Biology (2014) *The impact of cover crops on yield and soils in the New Farming Systems programme*
- Aspects of Applied Biology (2021) *The impact of clover intercropping on yield, margin and soil properties in a long running UK field experiment*



New Farming Systems

Further information

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The New Farming Systems Project

is managed by NIAB TAG in conjunction with an independent advisory group and supported by The Morley Agricultural Foundation and The JC Mann Trust. The NFS project also contributes to a range of other research programmes.



NEW FARMING SYSTEMS

Fertility building and cover crops

The New Farming Systems (NFS) project is a series of experiments and system demonstrations. The project aims to explore ways of improving the sustainability, stability and output of conventional arable farming systems. The research is being undertaken on a sandy loam soil at Morley in Norfolk and started in 2007.



New Farming Systems

Fertility building and cover crops

This study uses a fully replicated factorial design and is undertaken on large plots (12 m x 36 m) using farm scale equipment and techniques.

The main plot areas are 12 m x 36 m, with each plot subdivided into three 12 m x 12 m areas to examine nitrogen dose interactions; in total the experiment has 10 treatments. The experiment uses a shallow non-inversion establishment technique. The specific method varies according to season and crop but typically targets 15 cm depth using disc and/or tine based approaches.

Four management systems

1. Current – rotations 1-3 run as standard for inputs and husbandry;
2. Legume (clover bi-crop) – rotations 1-3 using clover as a legume bi-crop to augment fertiliser;
3. Current plus a brassica-based cover crop (radish/radish+oats) – rotations 2 and 3 only, with autumn cover crops prior to a spring sown crop;
4. Current plus a legume cover crop (legume species mixture) – rotations 2 and 3 only, with autumn cover crops prior to a spring sown crop.

Three nitrogen (N) management

N doses are applied across treatments as a banded 12 m x 12 m sub-sections and each sub-section receives one of the following N doses:

1. Untreated (0% of standard dose) for the crop being grown.
2. Half dose (50% of standard) for the crop being grown.
3. Full dose (100% of standard) for the crop being grown.



Treatment and rotational progression details

		Cropping and harvest year														
Rotation		2008 (Year 1)	2009 (Year 2)	2010 (Year 3)	2011 (Year 4)	2012 (Year 5)	2013 (Year 6)	2014 (Year 7)	2015 (Year 8)	2016 (Year 9)	2017 (Year 10)	2018 (Year 11)	2019 (Year 12)	2020 (Year 13)	2021 (Year 14)	Comments
1	Winter break	wwt	wosr	wwt	wbns	wwt	wbly	wosr	wwt	woat	wwt	wbly	wosr	wwt	wbly	Conventional approach (benchmark for current systems)
2	Spring break	wwt	sosr	wwt	sbns	wwt	sbly	wosr	wwt	soat	wwt	sbly	wosr	wwt	sbly	Maximising spring crops for cover crop use in the systems
3	Mixed cropping	wwt	sosr	wwt	wbns	wwt	sbly	wosr	wwt	soat	wwt	sbly	wosr	wwt	sbly	A mixed rotation with spring and winter cropping

Cropping key: wwt (winter wheat), wosr (winter oilseed rape), sosr (spring oilseed rape), wbns (winter beans), sbns (spring beans), wbly (winter barley), sbly (spring barley), woat (winter oat), soat (spring oat)

