

# Farming systems research; evaluation of current practice and the development of novel approaches within UK systems

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## Introduction

The requirement for sustainable, resilient and productive farming systems has never been more important, but in future production scenarios it is likely that inputs will become increasingly restricted, energy more expensive and climate ever more variable. To this end NIAB TAG is delivering a series of ongoing farming systems studies in the UK seeking to both evaluate current systems (reflecting local practice within conventional farming systems) and to develop novel approaches to farming systems. These research platforms will better enable farmers to make informed decisions regarding their rotations and the further development of their farming systems. Two of these studies are outlined in this paper.

## Method

The STAR project (Sustainability Trial in Arable Rotations) was initiated in 2005 at Stanaway Farm (Suffolk, UK) on a clay loam soil. The research is funded through the Felix Thornley Cobbold Trust and delivered through NIAB TAG. The trial is fully replicated on large plots using farm scale equipment and examines the interaction of four rotation and four cultivation methods. Cultivation techniques are annual ploughing, deep non-inversion, shallow non-inversion and a managed approach (selected annually). The rotational approaches are winter cropping (winter wheat and winter break crops), spring cropping (winter wheat and spring break crops), continuous wheat and alternate fallow (winter wheat and fallow).

Figure 1. The impact of cultivation approach on margin over years 1-6 of the STAR project. Base margin data is calculated on ‘spot prices’ for each season. Data is presented as the percentage response in each individual season; that is each cultivation approach is expressed as a percentage of the mean return for each season.

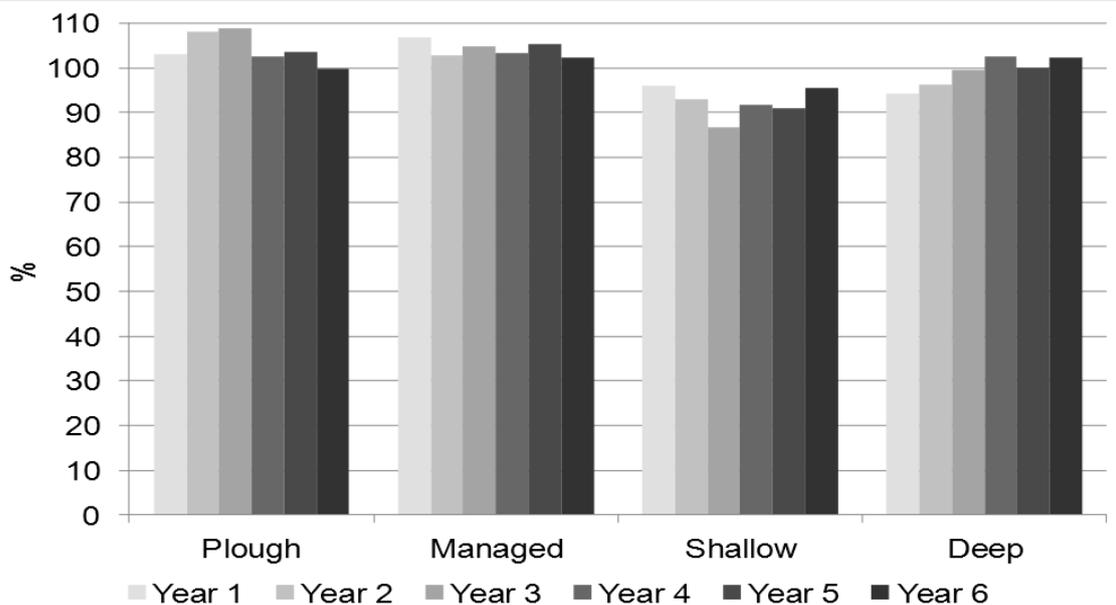


Table 1. Mean yield response (%) and cumulative margin over nitrogen (N) (£/ha) data comparing standard (local best) practice to approaches using a white clover bi-crop, a brassica cover crop or a legume mixture cover crop across a range of N doses in each crop. Responses were recorded over a break crop (spring oilseed rape) and winter wheat cycle. Based on £150/t for winter wheat, £375/t for oilseed rape and £0.75 kg N.

	Zero N	50% N	100% N	Average
<b>Yield response (%)</b>				
Standard practice	60	98	124	94
Cover crop (clover bi-crop)	66	98	124	96
Cover crop (fodder radish)	66	107	129	101
Cover crop (legume mixture)	70	108	130	103
<b>Margin over nitrogen (£/ha)</b>				
Standard practice	900	1351	1664	1305
Cover crop (clover bi-crop)	1069	1413	1685	1389
Cover crop (fodder radish)	967	1452	1701	1374
Cover crop (legume mixture)	998	1452	1718	1389

The New Farming Systems (NFS) study (funded by The Morley Agricultural Foundation and The JC Mann Trust) is being carried out through NIAB TAG at Morley (Norfolk, UK) on a sandy clay loam soil. This programme was initiated in 2007 and is re-examining approaches to rotations and inputs. Research is exploring the potential to reduce the footprint of current practice within conventional farming systems, while at the same time improving sustainability, resilience and output. The NFS programme is running a series of large scale, replicated experiments examining three related themes: fertility building, soil amendments and tillage systems.

### Results and discussion

Stobart and Morris (2011a) outlined previously key agronomic findings from the STAR project and described the principle effects of the systems on yield and margin. When, considered cumulatively across the project results demonstrate that cropping systems based on winter break crops are delivering the highest margins. With regard to cultivation systems, the difference in cumulative margin between approaches is smaller. Trends in relative responses to cultivation practice are apparent over time (Figure 1), suggesting changes in the performance of systems in the longer term.

Within the NFS project Stobart and Morris (2011b) have previously detailed aspects of the research addressing the use of cover crops (including clover bi-crops, legume and brassica cover crops) and provided summary data on crop performance, soils, yield and margins. Ongoing NFS findings are demonstrating benefits to soil structure and rotational margins from the use of cover crops. Research highlights differences in system performance and margin depending on cover cropping approach and agronomic management regime (Table 1) and also suggests that interactions between these elements are apparent.

### References

- Stobart R M & Morris N L (2011a) Sustainability Trial in Arable Rotations (STAR) project: a long-term farming systems study looking at rotation and cultivation practice, *Aspects of Applied Biology* 113, 67-74.
- Stobart R M & Morris N L (2011b) New Farming Systems Research (NFS) project: long term research seeking to improve the sustainability and resilience of conventional farming systems, *Aspects of Applied Biology* 113, 15-23.