Trial Title: The potential of companion cropping in oilseed rape.

Centre: Morley and Sutton Scotney **Trial Code:** WOR14-9503 **Variety**: Cabernet

Objective: To examine a range of companion cropping approaches in oilseed rape and to ascertain any impact on crop performance and yield.

NAC theme: Agronomy (best practice & system resilience)

Summary: Companion crops are short duration cover crops that (in this case) are sown in an oilseed rape (OSR) crop. These cover crops should senesce over the winter period. This research examined a limited range of options currently commercially available as companion crops in the UK. These selections followed the screening of a wider range of potential materials in the 2012/13 season. These selections were examined at wide and narrow OSR row spacings, in combination with selected herbicide management strategies. While some yield differences were apparent, there were no statistically significant yield benefits to companion crop use in these studies. These NAC funded studies are being repeated during 2014/15.

Table 1. Treatments list - Morley

Treatments (kg/ha)					
	Companion crop	*Seed rate*	*Row space*	*Herbicide (pre-em)*	*Herbicide (post-em)*
1.	No cover crop		Narrow row	-	Kerb 1.5l/ha
2.	Chlorofiltre Profil	25 kg/ha	Narrow row	-	Kerb 1.5l/ha
3.	Chlorofiltre Symbiosis	10 kg/ha	Narrow row	-	Kerb 1.5l/ha
4.	Chlorofiltre Profil	25 kg/ha	Narrow row	Butisan 1.0l/ha	Kerb 1.5l/ha
5.	Chlorofiltre Symbiosis	10 kg/ha	Narrow row	Butisan 1.0l/ha	Kerb 1.5l/ha
6.	No cover crop		Wide row	-	Kerb 1.5l/ha
7.	Chlorofiltre Profil	25 kg/ha	Wide row	-	Kerb 1.5l/ha
8.	Chlorofiltre Symbiosis	10 kg/ha	Wide row	-	Kerb 1.5l/ha
9.	Chlorofiltre Profil	25 kg/ha	Wide row	Butisan 1.0l/ha	Kerb 1.5l/ha
10.	Chlorofiltre Symbiosis	10 kg/ha	Wide row	Butisan 1.0l/ha	Kerb 1.5l/ha

Table 2. Treatments list – Sutton Scotney

Treatments (kg/ha)			
	Companion crop	*Seeding rate*	*Row space*
a)	No cover crop		Narrow row
b)	Chlorofiltre Profil	25 kg/ha	Narrow row
c)	Chlorofiltre Symbiosis	10 kg/ha	Narrow row
d)	No cover crop		Wide row
e)	Chlorofiltre Profil	25 kg/ha	Wide row
f)	Chlorofiltre Symbiosis	10 kg/ha	Wide row

- In this study a companion crop refers to a short duration cover crop that has been sown between the rows of a main (OSR) crop in the autumn and would be expected to senesce over the winter period. This technique has been used in France with a view to (among other goals) augmenting nutrient provision, soil conditioning and weed suppression. While there is commercial interest in the UK this remains relatively untested in our climate and systems.

- This research examined a limited range of options this are currently commercially available as companion crops in the UK; other companion crop options are available and the specific choice will influence the result achieved. These selections followed the screening of a wider range of

This trial was funded by NIAB TAG National Agronomy Centre Initiative

NIAB TAG National Agronomy Centre, Huntingdon Road, Cambridge, CB3 0LE
Tel 01223 342200, Fax 01223 277602, Email info@niab.com

materials in the 2012/13 season. The companion crop choices selected could equally be used as cover crops.

- The companion crop mixtures used are as outlined beneath and treatments are set out in Tables 1 and 2. These were sown at the same time as the OSR crop which was established on two row spacings narrow (ca. 12.5 cm rows) and wide (ca. 50 cm rows). The mixes used were as follows:
  - Chlorofiltre Profil: containing vetch, clover and phacelia
  - Chlorofiltre Symbiosis: containing vetch, berseem clover, crimson clover and persian clover.

- While the experiments at Morley and Sutton Scotney used the same companion crop mixes and analogous row spacings, Sutton Scotney received a low input herbicide programme (targeting mainly grass weeds and cereal volunteers rather than broadleaf weeds), whereas the study at Morley received incremental herbicide inputs. In addition to those described in the treatment listing the Morley study also received an additional Galera based overall weed control application in the early spring to augment the level of weed and companion crop control achieved.

- Plant populations at Sutton Scotney were around 12 plants per meter row on the narrow rows and 25 plants per meter row on the wide rows in November. At Morley populations were lower at around 5 plants per meter row on the narrow rows and 4 plants per meter row on the wide rows in October.

- The oilseed rape crop Green Area Index (GAI) was assessed at both Sutton Scotney and Morley in the autumn and early spring (Tables 3 and 4); GAI is a measure of the ratio between the total area of all green tissues and the area of ground from which they come. At Sutton Scotney there was relatively little difference between treatments with GAI scores generally in the range of 1.0-1.2 at both timings. At Morley GAI scores tended to be higher on the narrow rows (0.7-0.8) compared to the wide rows (0.2-0.5) in October. There was an increase in oilseed rape GAI in the February assessment at Morley (*cf*. October) and while differences were still apparent between wide (0.5-1.0) and narrow (1.0-1.7) these ranges were overlapping.

- With regard to companion crop GAI scores, at Sutton Scotney for both narrow and wide rows GAI scores were higher with the 'Profil' mix (0.9) compared to the 'Symbiosis' mix (0.1), although there was some evidence of a reduction in companion crop GAI overwinter for the 'Profil' mix. At Morley, again the 'Profil' mix (0.9-1.1) tended to have a greater GAI score compared to the 'Symbiosis' mix (0.1-0.2) from the October assessment. The GAI score of both Profil' mix (1.2-1.8) and 'Symbiosis' (0.4-0.7) mix companion crops had increased by the February assessment at Morley regardless of the row spacing. It was apparent that both mixes at Sutton Scotney and Morley survived the winter period, albeit that the Profil' mix had survived with much more vigour than the 'Symbiosis' mix; perhaps suggesting this mix is less suited to use as a companion crop in the UK. Assessment of companion crop plots post winter indicated that particularly the phacelia had not succumbed to substantial winter kill.

- With regard to the interaction of oilseed rape and companion crop at Sutton Scotney, there was little suggestion that the companion crops were impacting on oilseed rape GAI scores in February. At Morley there was some suggestion of a reduction of companion crop GAI in February associated with increased herbicide regimes. At this timing on either the narrow or wide rows the largest reductions in oilseed rape GAI were associated with treatments where the 'Profil' mix had been used; these reductions were most pronounced on the wide row crops.

This trial was funded by NIAB TAG National Agronomy Centre Initiative

NIAB TAG National Agronomy Centre, Huntingdon Road, Cambridge, CB3 0LE
Tel 01223 342200, Fax 01223 277602, Email info@niab.com

- Yield data from both studies did not indicate any yield advantage from the use of these companion crops in this study (Figures 1 and 2). In general use of the 'Symbiosis' mixture resulted in similar yield to treatments where no companion crop had been used, but the 'Profil' mix tended to be more competitive and reduce oilseed rape yields. Where companion crops had not been used oilseed rape yields were similar on wide and narrow rows at both sites.

- An analogous NAC funded companion crop study at Morley in 2012/13 indicated much higher degrees of winter senescence and some small (non-significant) yield responses associated with both the 'Symbiosis' and 'Profil' mixtures. The difference between seasons is potentially related to growth the specific conditions experienced by the crop over the winter; this reinforces the need to choose companion crop options carefully. This research is continuing, with a slightly modified protocol, through the support of the NAC initiative over the 2014/15 season. Further consolidated results will be reported in due course.

Table 3. The impact of companion crop and row spacing on green area index at Morley

Treatment	OSR		Companion crop	
	Oct 13	Feb 14	Oct 13	Feb 14
	Narrow row			
1	0.8	1.7	0.0	0.0
2	0.8	1.0	1.1	1.4
3	0.7	1.6	0.2	0.7
4	0.7	1.5	0.9	1.2
5	0.7	1.6	0.1	0.4
	Wide row			
6	0.3	0.7	0.0	0.0
7	0.5	0.5	1.1	1.8
8	0.4	1.0	0.1	0.6
9	0.4	0.9	0.9	1.6
10	0.2	0.8	0.2	0.6
LSD	0.17	0.39	0.22	0.26

Table 4. The impact of companion crop and row spacing on green area index at Sutton Scotney

Treatment	OSR		Companion crop	
	Nov 13	Feb 14	Nov 13	Feb 14
	Narrow row			
a	1.1	1.1	0.0	0.0
b	1.2	1.1	0.9	0.5
c	1.1	1.1	0.1	0.1
	Wide row			
d	1.2	1.2	0.0	0.0
e	1.1	1.0	0.9	0.6
f	1.0	1.1	0.1	0.1
LSD	0.29	0.34	0.37	0.17

This trial was funded by NIAB TAG National Agronomy Centre Initiative

NIAB TAG National Agronomy Centre, Huntingdon Road, Cambridge, CB3 0LE
Tel 01223 342200, Fax 01223 277602, Email info@niab.com

Figure 1. The effect of companion crop and row spacing on yield at Morley 2013/14 (t/ha)

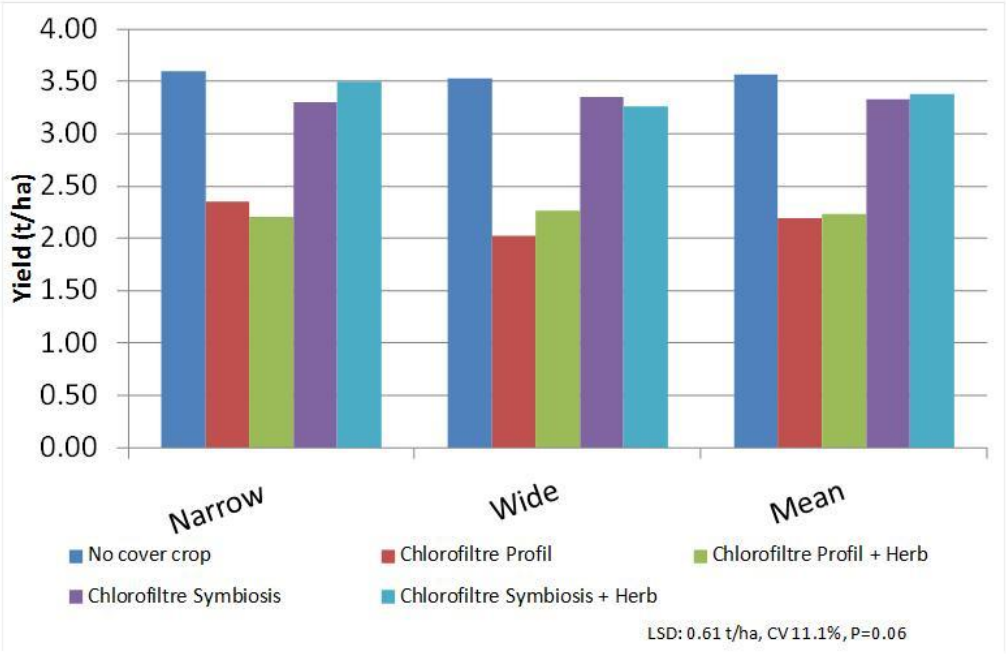
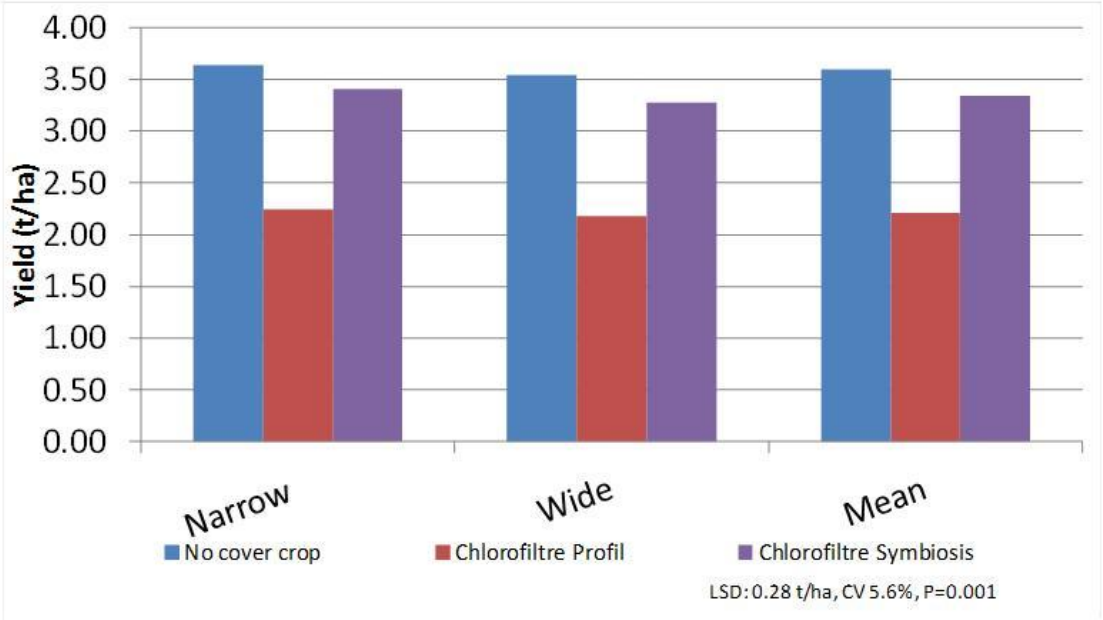


Figure 2. The effect of companion crop and row spacing on yield at Sutton Scotney 2013/14 (t/ha)



Field details & overall applications to crop

Crop:	Winter Oilseed Rape
Trial ID:	WOR14-605
Location: Name	Morley, Brockholes
Soil type:	Ashley series, sandy loam
Soil analysis:	P-24.8 mg/l, K-69 mg/l, Mg-71 mg/l, pH-7.2

This trial was funded by NIAB TAG National Agronomy Centre Initiative

NIAB TAG National Agronomy Centre, Huntingdon Road, Cambridge, CB3 0LE
Tel 01223 342200, Fax 01223 277602, Email info@niab.com

Previous crop:	Winter Barley
Drill date: dd/mm/yy	12.09.13
Drilled plot size: m2	25
Replicates:	3

Input type	Product	Product rate	Date
Fertiliser:	Turkey Muck	*as 'starter fertiliser'*	31.07.13
	Liquid N 22+S	N 81 kg/ha, SO3 46 kg/ha	04.03.14
	Multitrace	2.7 kg/ha	14.03.14
	Liquid N 27+S	N 100 kg/ha, SO3 18.5 kg/ha	28.03.14
PGR:	Caryx	0.66 l/ha	14.03.14
Insecticide:	Revolt	0.2 l/ha	12.04.14
Fungicide :	Capitan 25	0.4 l/ha	08.10.13
	Galileo	0.8 l/ha	12.04.14
	Roller (Adj)	0.1 kg/ha	12.04.14
	Recital	0.6 l/ha	28.04.14
	Kinetic	0.1 l/ha	28.04.14

Trial name:	Companion Crops
Crop:	Winter Oilseed Rape
Location:	Hill Farm, Sutton Scotney
Trial code:	WOR14-9503
Soil type:	Andover Series 1 (Silty clay loam)
Soil analysis:	P- 25 mg/l, K- 177 mg/l, Mg 44 mg/l, pH-8.2
Previous crop:	Spring Barley
Drill date:	05/09/2013
Seed rate:	70 seeds m²
Variety:	DK Cabernet
Drilled plot size:	2 x 10m
Replicates:	3

Individual applications to crop

Input type	Product	Product rate	Date
Herbicide	Laser	1.0l/ha	01/10/13
Fungicide	Proline	0.4l/ha	02/10/13
	Proline	0.36l/ha	10/12/13
	Proline	0.5l/ha	10/04/14
	Amistar	0.5l/ha	10/04/14
Insecticide	Hallmark	50ml/ha	02/10/13
Fertiliser	Nitram (34.5%N)	30Kg N/ha	01/10/13
	Double Top	60Kg N/ha	05/03/14
	MOP	100Kg/ha/ha	07/03/14
	Nitram (34.5%N)	190Kg N/ha	10/04/14

This trial was funded by NIAB TAG National Agronomy Centre Initiative

NIAB TAG National Agronomy Centre, Huntingdon Road, Cambridge, CB3 0LE
Tel 01223 342200, Fax 01223 277602, Email info@niab.com