

Interreg 
EUROPEAN UNION

France (Channel
Manche) England

Channel Payments for Ecosystem Services

European Regional Development Fund



Field Trial demonstrating exploring the effectiveness of different cover crop establishment methods and seed choice at reducing nitrate leaching: 2019-20

Overview:

This field trial aims to demonstrate the feasibility of cover crop establishment on shallow chalk soils within Portsmouth Water's catchment zones, while highlighting the impact they have on over winter nitrate-N losses. The trial will also take into account the impact that cover cropping has on the yield of the following spring cereal and its gross margins.

1. Control (bare stubble)
2. Broadcast into standing crop (Nitrogen uptake mix)
3. Broadcast into standing crop (Farmers choice of seed mix)
4. Traditionally Drilled (Nitrogen uptake mix)

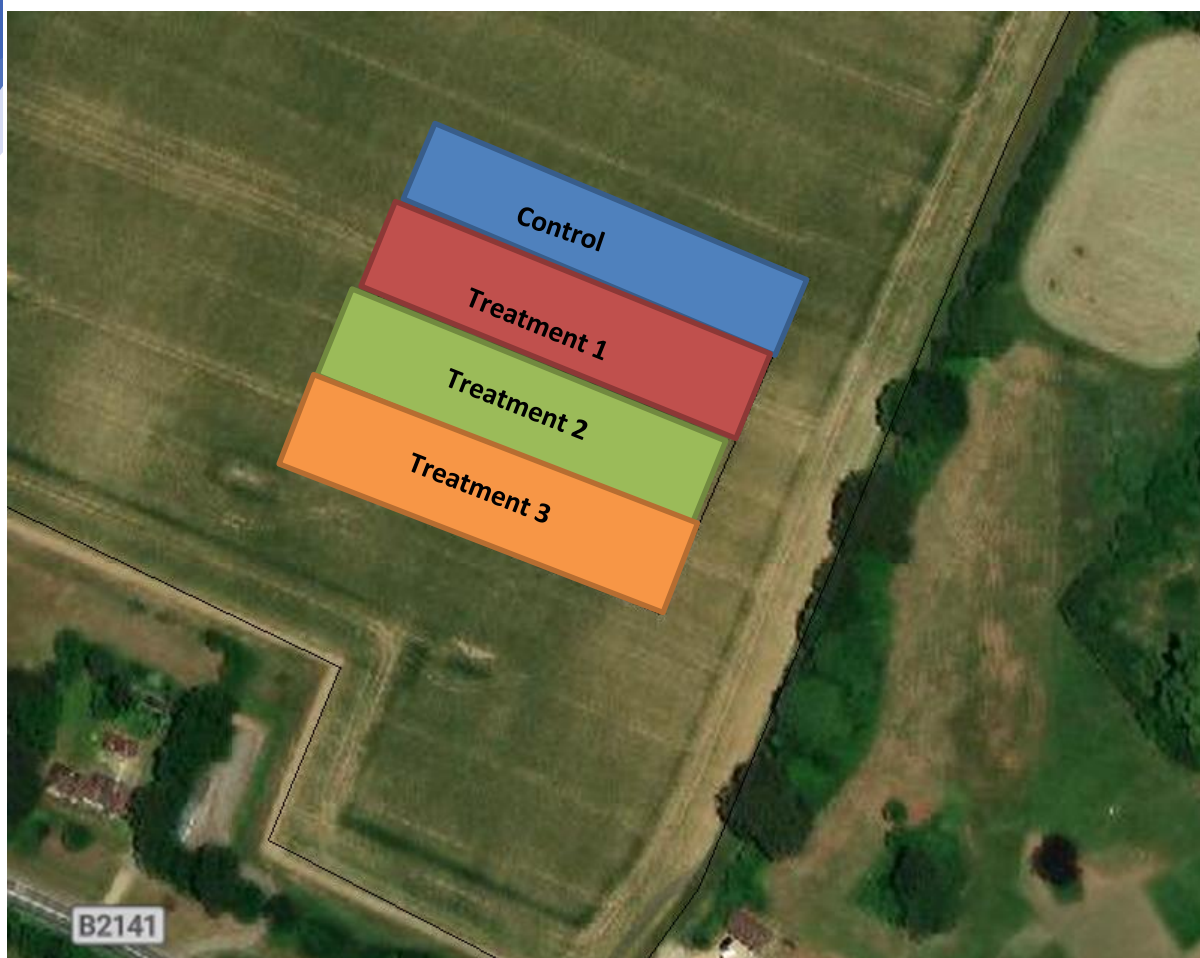


Table 1: Cover Crop Treatments

<p>Plot 1: Control Over wintered stubble</p>	<p>Treatment 1: Nitrogen Removal Cover Crop broadcast straight after harvest. Broadcast at 25 kg/ha</p>	<p>Treatment 2: Host farms choice of cover crop seed attempted broadcast after harvest. Later re-drilled. Rate 15kg/ha</p>	<p>Treatment 3: Nitrogen Removal Cover Crop Drilled into stubble at 25kg/ha</p>
---	---	--	---

<p>Nitrogen Removal Mix:</p>	<p>Farmers Seed Mix:</p>
<p>Black Oats 50% Forage Rye 30% Berseem Clover 20% Phacelia 10%</p>	<p>Phacelia 50% Vetch 50%</p>

Soil Results:

	<p>Index</p>		
--	---------------------	--	--

Plot	P	K	Mg	pH	Og
Control	3	3	2	7.3	4.8
Treatment 1	2	2+	2	7.6	4.6
Treatment 2	2	2-	2	7.7	4.6
Treatment 3	3	2+	2	7.7	4.7

Autumn SMN Results:

Available N kgN/ha 0-60cm			
Control	Treatment 1	Treatment 2	Treatment 3
43	24.2	17.7	18.1

Plot Assessments:

Prior to cover crop establishment, each plot was soil sampled for the standard P, K, Mg & pH with the addition of organic matter and a measure of soil textural classification. Soil indices came out relatively even and will not impact on the potential success of the cover crop and future spring barley.

SMN (Soil Mineral Nitrogen) levels (0-60cm) have come out very low in the autumn of 2019. The previous crop of winter wheat gave an outstanding performance and climatic the climatic conditions of summer 2019 ensured the crop utilised all applied nitrogen. This low level will likely lead to reduced growing potential of the cover crop canopy.

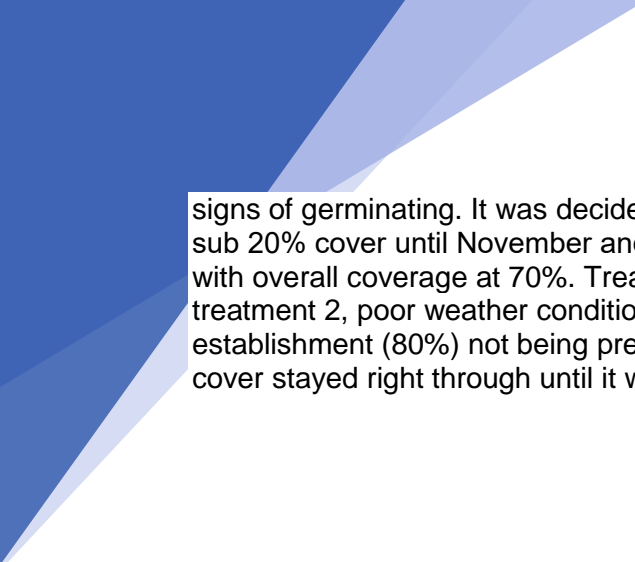
Cover Crop Assessments:

Four plots were identified, marked and drilled with cover crops (Table 1) in early August 2019 along 100m long single tramline (24m) widths. The soil type is a relatively shallow silty clay loam over chalk. The trial was designed to compare two different establishment methods, broadcasting into a standing crop and direct drilling the seed after harvest, against two different seed type mixes nitrogen removal mix (expensive) & the farmer's choice (low cost). These plots were compared against a bare over wintered stubble (control).

The cover crop seed was broadcast into the standing crop using a spinning disc fertiliser spreader while the drilled pots were planted using a tined cultivator and air seeder.

Winter 2019-20 results:

Treatment 1 (broadcast after harvest) grew well, quickly providing 50% ground cover by the middle of October and progressing on to have 90% ground cover by January 2020 (see picture below). Treatment 2 was originally broadcast into the stubble the same day as treatment 1. Unfortunately, it wasn't possible to get the plot rolled and the seed showed no



signs of germinating. It was decided to re-drill this plot at the same time as plot 3. There was sub 20% cover until November and good establishment levels didn't happen until January with overall coverage at 70%. Treatment 3 was always going to be drilled, but just like treatment 2, poor weather conditions hindered the cover crops growth with good establishment (80%) not being present until January 2020. The lack of frosts ensured the cover stayed right through until it was sprayed off and worked down in late February 2020.

October 2019:



Control (Weedy Stubble)



Treatment 1 (Nitrogen Mix broadcast)



Treatment 2 (Farmers choice broadcast & re - drilled)



Treatment 3 (Nitrogen Mix drilled)

January 2020:



Control (Weedy Stubble)



Treatment 1 (Nitrogen Mix broadcast)

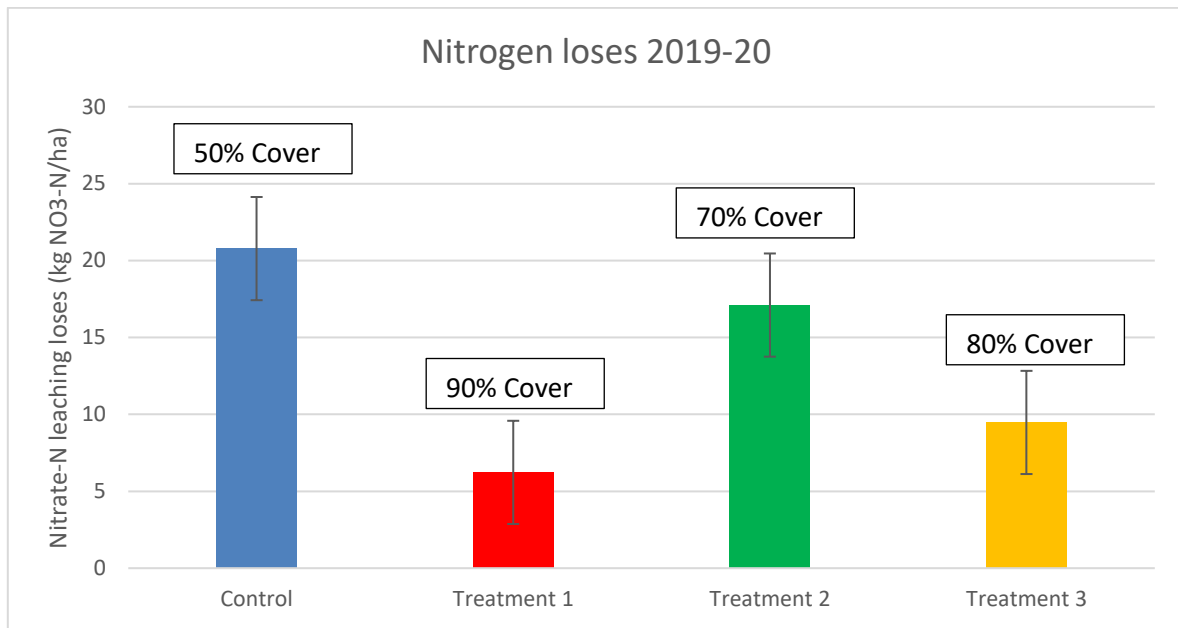


Treatment 2 (Farmers choice broadcast & re - drilled)

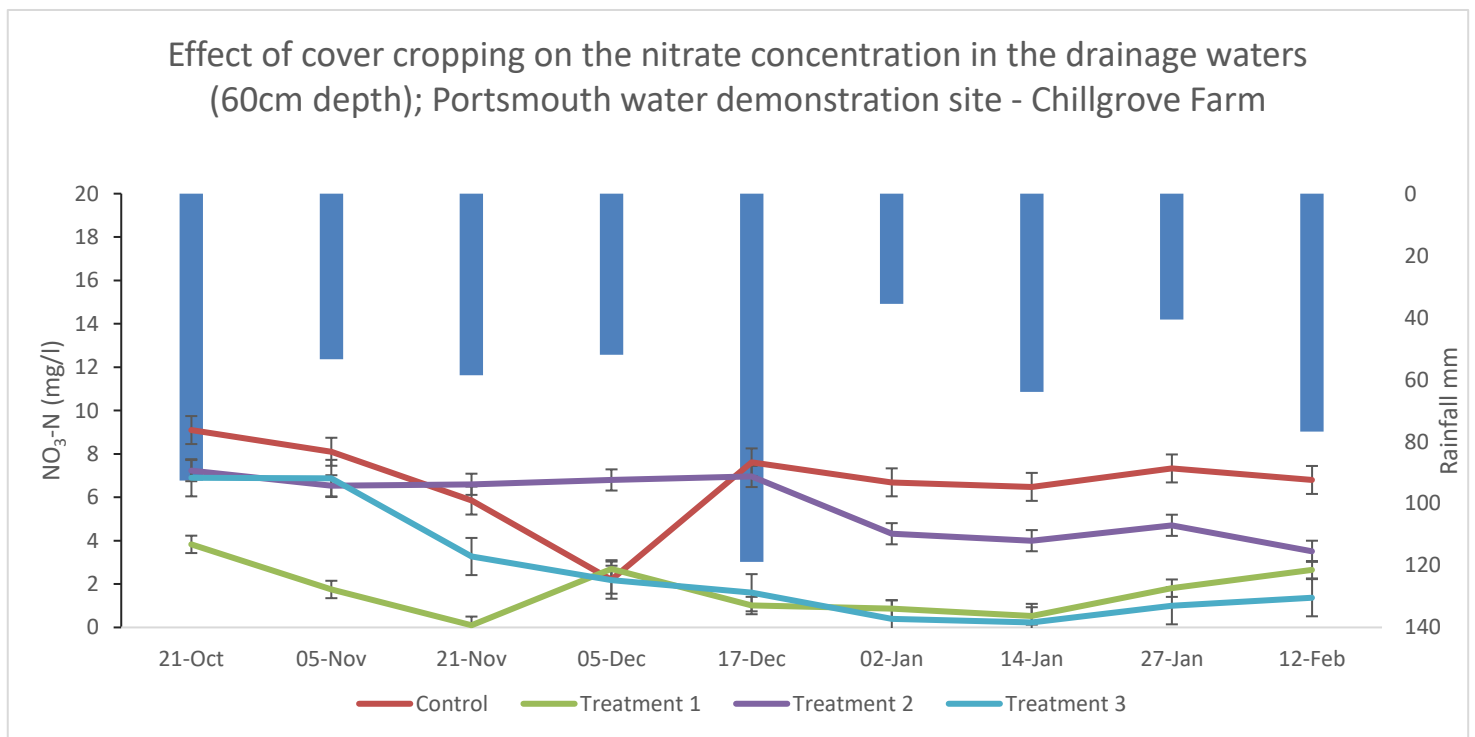


Treatment 3 (Nitrogen Mix drilled)

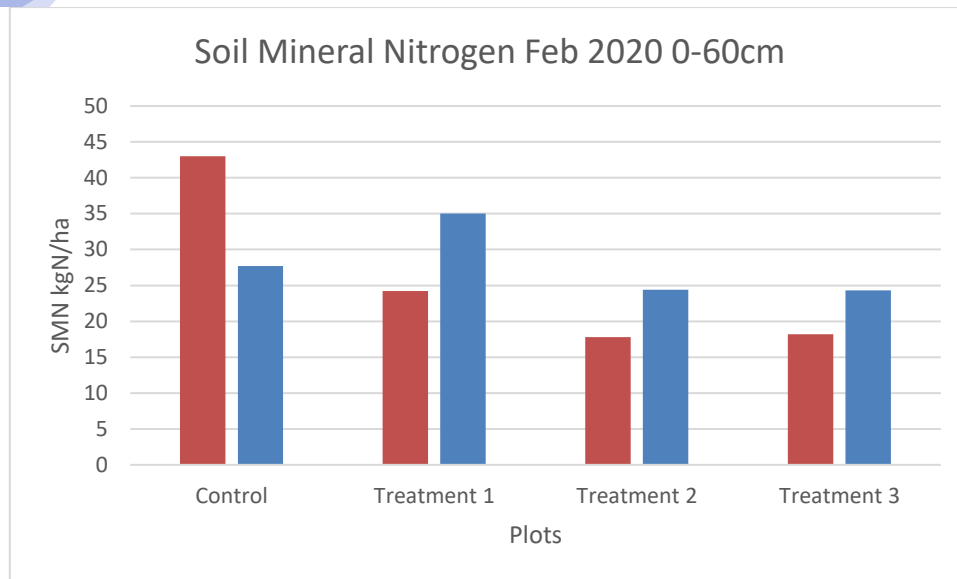
Nitrate Leaching Loses 2019-20



Graph 1. Nitrate leaching loses October 2019 – February 2020



Graph 2 Nitrate concentration in drainage water (porous pots)



Graph 3. Soil Mineral Nitrogen present in the soil; autumn 2019 and spring 2020. Note the extremely low levels present after harvest in August 2019. Levels in three of the plots have actually increased due to the soil microbial activity and cover crops reducing the levels of leaching within the soil.

Autumn 2019:

Field	SMN (kg/ha)	SNS Index
Control	43	0
Treatment 1	24.2	0
Treatment 2	17.8	0
Treatment 3	18.2	0

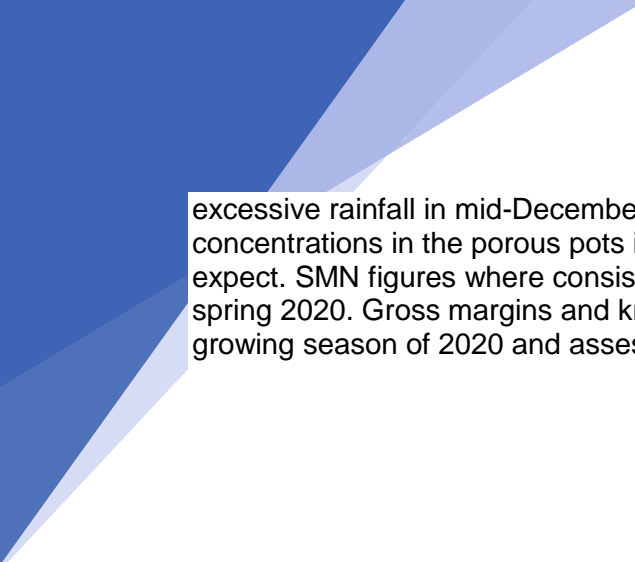
Spring 2020:

Field	SMN (kg/ha)	SNS Index
Control	27.7	0
Treatment 1	35	0
Treatment 2	24.4	0
Treatmentt 3	24.3	0

SNS = Soil Nitrogen Supply Index

Conclusions:

The nitrogen removal mix was very effective at reducing the levels of nitrate washing through the soil profile while retaining the nitrogen for the future spring barley crop. On average it was twice as effective as the simpler phacelia / vetch mix chosen by the host farm. The



excessive rainfall in mid-December was reflected in the sudden jump in nitrate concentrations in the porous pots in the control plot. This correlation is what you would expect. SMN figures were consistently low across all 4 trial plots in the autumn of 2019 and spring 2020. Gross margins and knock on yield effects will be monitored throughout the growing season of 2020 and assessed in October.