

# Ecosystem service delivery within a strip tillage system

## Effect of tillage and fertiliser regime on provisioning service delivery

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### Introduction

- Oilseed rape production is threatened by the loss of agrochemicals
  - Metaldehyde, the active ingredient in many slug pellets
  - Metazachlor, an important herbicide
- A tillage method which reduces agrochemical leachate without damaging crop yield is required
- Strip tillage is a form of 'conservation tillage' in which tillage is used to produce crop rows, between which soil is undisturbed and crop residue is retained, and offers a potential solution
- A range of strip tillage implements and accompanying fertiliser regimes need to be evaluated for their effect on the delivery of the following ecosystem services
  - provisioning (yield),**
  - regulating (runoff and leachate volume and composition)
  - and supporting (nutrient cycling and soil structure)
- Delivery of supporting, regulating and provisioning ecosystem services within and between crop rows will be investigated

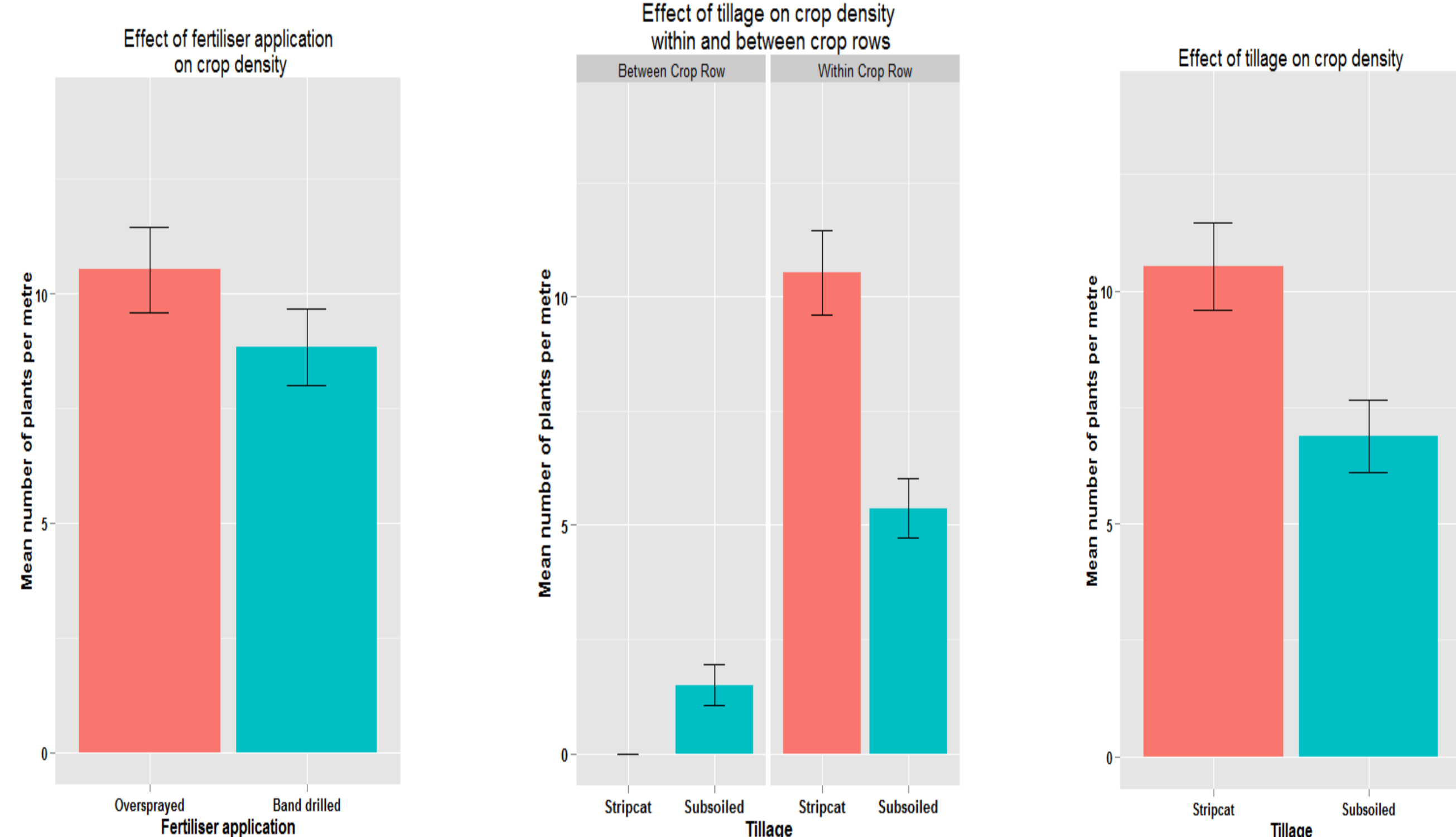


Stripcat plot, oversprayed with fertiliser  
3/3/15



Stripcat plot, fertiliser band drilled  
3/3/15

### Results



- Fertiliser regime had no effect on the density of crop plants (figure 1,  $t = 1.348$ ,  $df = 28.399$ ,  $p\text{-value} = 0.1883$ )
- Data from different fertiliser treatments was therefore pooled for rest of analysis
- Number of crop plants in crop rows was significantly higher in Stripcat plots (Figure 2,  $t = 4.5213$ ,  $df = 33.784$ ,  $p\text{-value} < 0.01$ )
- Number of crop plants between crop rows was significantly higher in Subsoiled plots (Figure 2,  $t = -3.3602$ ,  $df = 23$ ,  $p\text{-value} < 0.01$ )
- Total number of crop plants was higher significantly higher in Stripcat than Subsoiled plots ( $t = 2.916$ ,  $df = 46.38$ ,  $p\text{-value} < 0.01$ )

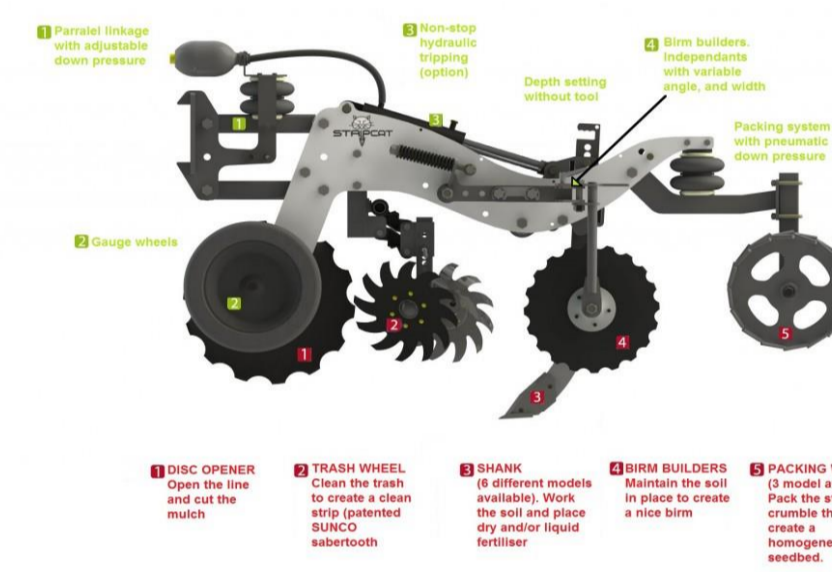
### Field site and methods

- Field plots of size 45 x 120m and 90 x 120m in Lincolnshire on a heavy clay loam soil.
- Two tillage treatments are being investigated
  - A TWB 'flatlift' subsoiler with a precision broadcast seeder (at working depth of ~30cm)
  - A Purpose built Stripcat implement, with the capability of applying fertiliser at depth within crop row (at working depth of ~15cm)
  - Both are one pass systems
- Two fertiliser treatments, applied at cultivation, are being investigated. See table 1 for details

Table 1

Tillage	Seed application	Fertiliser application method	N per hectare (kg)	P per Hectare (kg)
TWB Subsoiler	Precision broadcast	Oversprayed	31.5	0
Stripcat	Drilled	Oversprayed	31.5	0
Stripcat	Drilled	Band drilled	11.9	11.9

- Crop plant counts carried out 3 months after cultivation
  - At 6 random locations within each plot, the number of crop plants was recorded for a one metre transect within the crop row and a one metre transect between crop rows



Stripcat implement and crop establishment



Subsoiler implement and crop establishment

### Discussion

- The significantly larger number of crop plants in the Stripcat plots could be due to
  - The Stripcat producing a superior seedbed than the Subsoiler
  - Seed placement being superior in Stripcat than subsoiler plots
  - Both of the above
- Quantifying any effect of fertiliser regime on crop plant size will be valuable
- It is worth noting that where fertiliser was band drilled, the total quantity of nitrogen applied was less than a half of that where fertiliser was sprayed

### Further study

- Supporting services
  - Physical, biological and chemical soil quality indicators
- Provisioning services
  - Crop development and yield
- Regulating services
  - Infiltration and agrochemical leachate
- Will all be measured over three years



Insufficient regulating service delivery

### Acknowledgements

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