

Ecosystem service delivery within a strip tillage system

Effect of tillage and fertiliser regime on provisioning service delivery

Iain Dummett
PhD Student
Cranfield University
i.p.dummett@cranfield.ac.uk

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

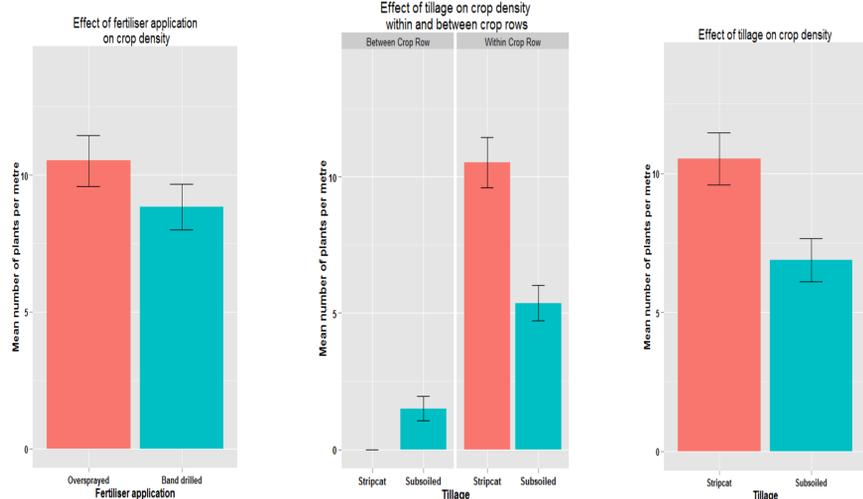


Stripcat plot, oversprayed with fertiliser
3/3/15



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

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