# SHORT-TERM EFFECTS OF DEEP PLOUGHING ON SOIL C STOCKS FOLLOWING RENEWAL OF A DAIRY PASTURE IN NEW ZEALAND

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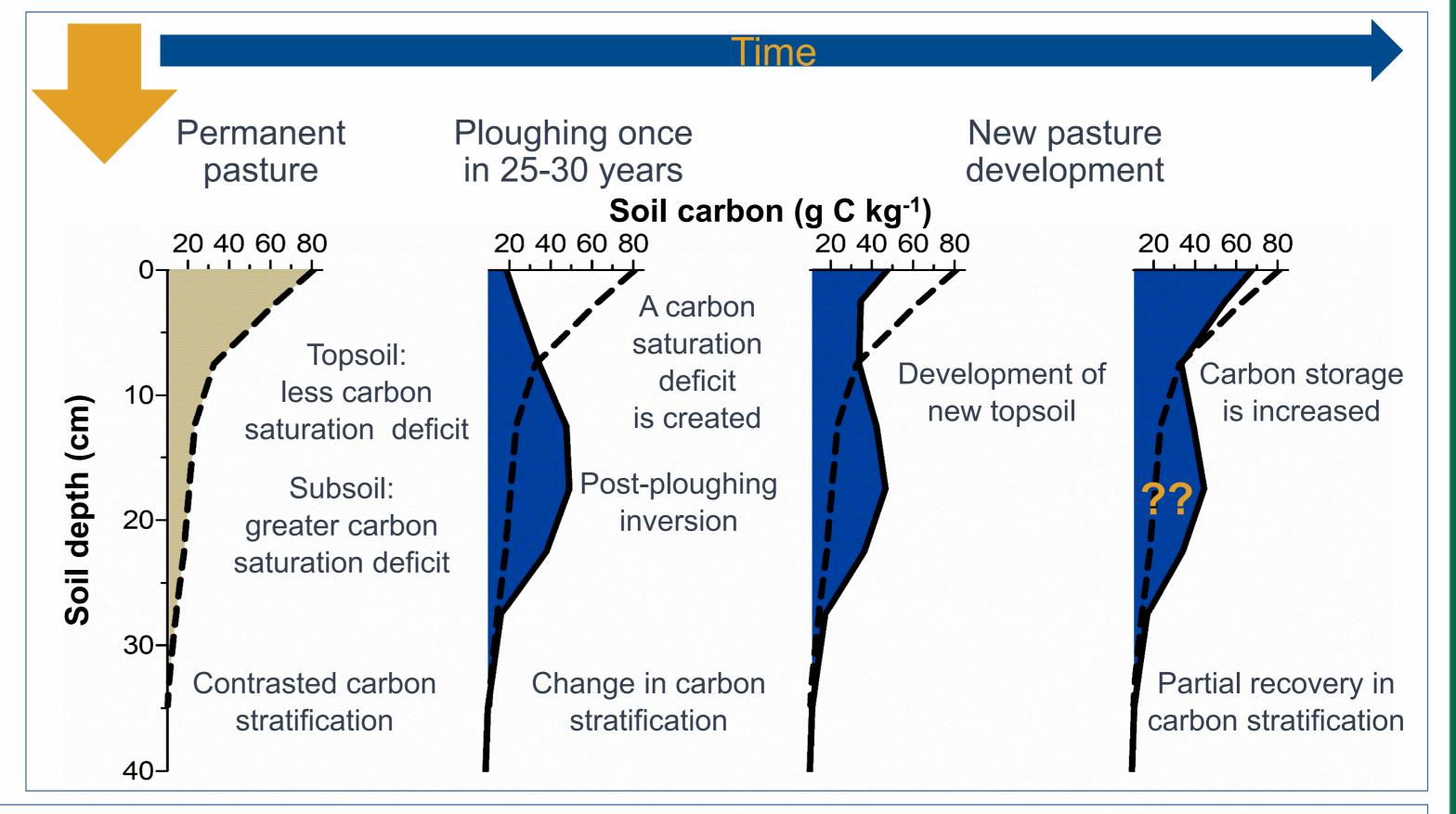
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Hypothesis

Infrequent inversion tillage of long-term pastoral-based soils may increase soil carbon storage.

### **Material and methods**

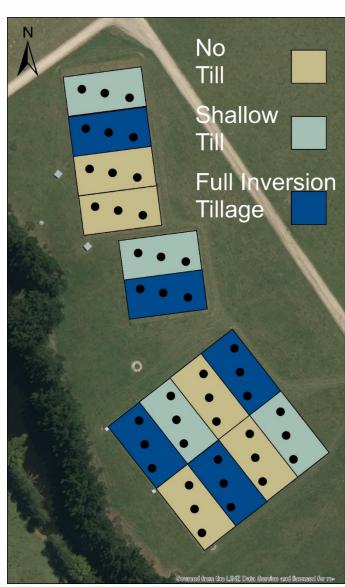
Renewal practices (no till, shallow till or full cultivation by deep –25 cm– ploughing) followed by summer forage cropping and autumn re-grassing (Fig. 1) were studied on an imperfectly drained Typic Fragiaqualf under dairy grazing. Site was core sampled (0-40 cm; Fig 1a, •) and monitored (plant growth, leaching) during 2016-2017 (Fig. 1; Fig. 2).



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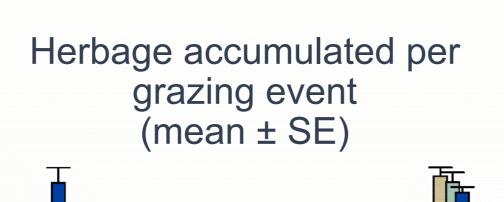
# **(a)**

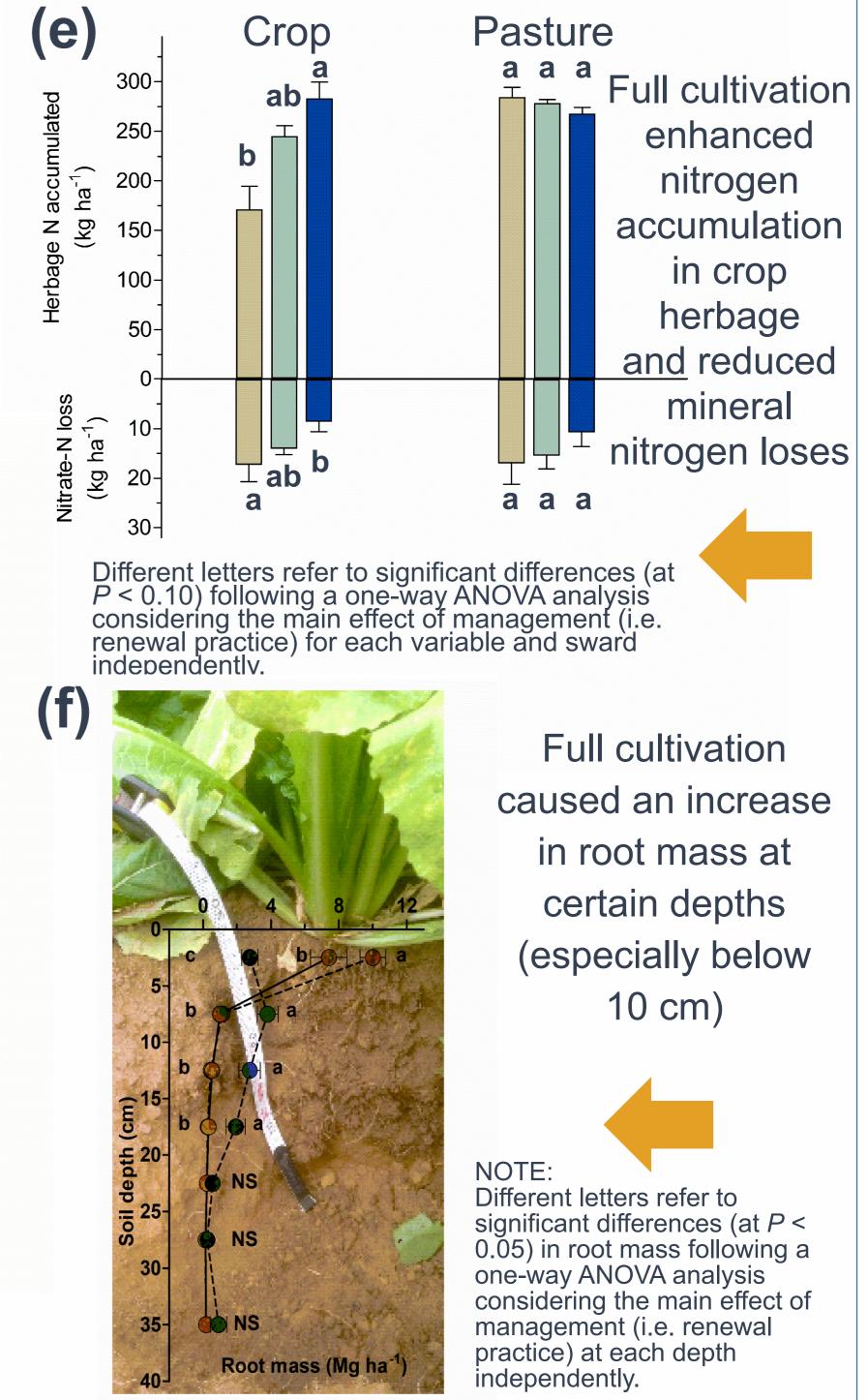


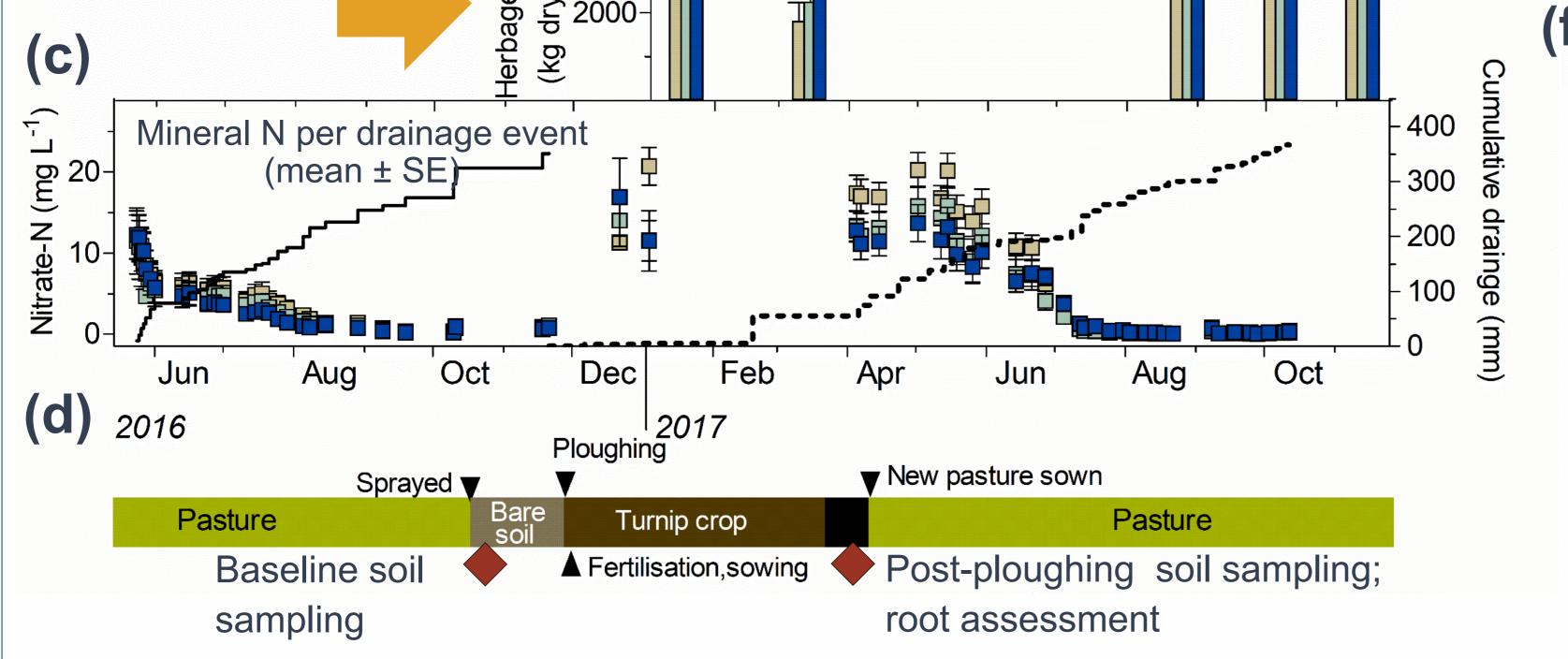
#### Experimental site:

Massey University, New Zealand North Island; replicated 20 x 40 m drainage plots; each plot with an isolated mole and pipe drain system on a Typic Fragiaqual f under longterm pasture (ryegrass/clover mixture; at least 10 years since previous grass renovation) grazed by cows.









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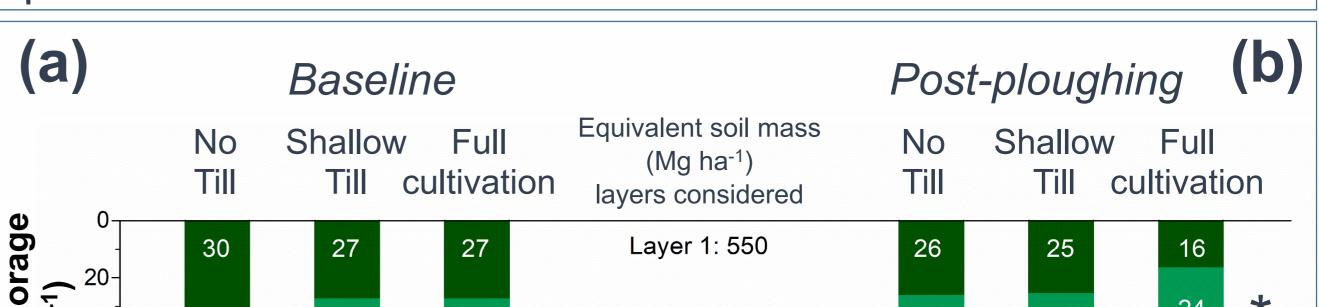
#### Figure 1

(a) Experimental site and experimental design; (b) herbage accumulation; (c) nitrogen (as nitrate-N) leaching and cumulative drainage; (d) crop and sampling calendar; (e) nitrogen (N) accumulation in herbage and N losses as nitrate; (f) changes in root mass assessed at the end of the crop phase.

## Results

Full cultivation:

favoured crop herbage production (Fig 1b); (1)enhanced crop herbage nitrogen (ii) accumulation and root development (Fig 1e,f); (iii) transferred soil carbon below 10 cm depth (Fig. 2; \*)



## **Final consideration**

The potential for infrequent inversion tillage increasing soil carbon sequestration as a greenhouse gas (GHG) mitigation tool is currently being tested at other sites in New Zealand.

**b** 40-\* ste 24 Layer 2: 641 19 19 20 20 22 carbon 22 C 15 \* 15 16 Layer 3: 661 16 60-60-W) 80-13 13 Layer 4: 677 \* 19 15 10 11 Layer 5: 710 9 16 12 Soil Layer 6: 750 100-10 Layer 7: 1540 120-121 119 107 110 107 104 Profile ab\* bc bc ac С a carbon storage

\* Different letters refer to significant differences (at *P* < 0.05) in profile C storage following a factorial ANOVA analysis considering the main effect of management (i.e. renewal practice) and time (sampling date), and the interaction between management and time.

#### Figure 2

Changes in soil carbon stocks: (a) baseline (pre-ploughing); (b) 5 months after ploughing and summer crop growth.

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