

Tillage and soil moisture effects on winter pasture production and stocker average daily gain

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Introduction:

Stocker cattle production on annual cool season winter pasture is an important livestock enterprise in the southern Great Plains. Winter pasture is established using no-till or tillage methods. In summer, winter pasture areas are usually fallowed chemically or with tillage depending upon establishment methods. Objectives of this study are to examine the effects of adding a summer cover crop into a winter pasture system.

Methods:

- Study area: Ardmore, OK.
- Generalized soil type: Silt loam
- Treatments – 20, 2.02 ha⁻¹ paddocks:
 - 5 – no-till wheat/summer fallow.
 - 5 – no-till wheat/cover crop.
 - 5 – tillage wheat/summer fallow.
 - 5 – tillage wheat/ cover crop.

- Summer cover crop mix:
 - Cowpeas – 6.7 kg ha⁻¹
 - Soybeans – 6.7 kg ha⁻¹
 - Grazing corn – 4.5 kg ha⁻¹
 - Buckwheat – 3.4 kg ha⁻¹
 - Millet – 7.8 kg ha⁻¹
 - Sunn hemp – 3.4 kg ha⁻¹

Year 1 results:

- Wheat winter pasture
 - Soil moisture (Fig. 1)
 - Soil temperature (Fig. 3)
 - Forage mass (Fig. 5)
 - Infiltration rate (Fig. 8a)
 - Stocker gain (Fig. 9a)
 - Stocking rate 1 hd/.405 ha⁻¹
 - Mean on weight 243 kg (12/16/16)
 - Mean off weight (05/09/16)
 - No-till – 459 kg
 - Tillage – 415 kg
- Cover crop
 - Soil moisture (Fig. 2)
 - Soil temperature (Fig. 4)
 - Forage mass (Fig. 6)
 - Species composition (Fig. 7)
 - Infiltration rate (Fig. 8b)
 - Stocker gain (Fig. 9b)
 - Stocking rate 1 hd/.405 ha⁻¹
 - Mean on weight 318 kg (08/03/16)
 - Mean off weight (08/28/16)
 - No-till – 355 kg
 - Tillage – 345 kg

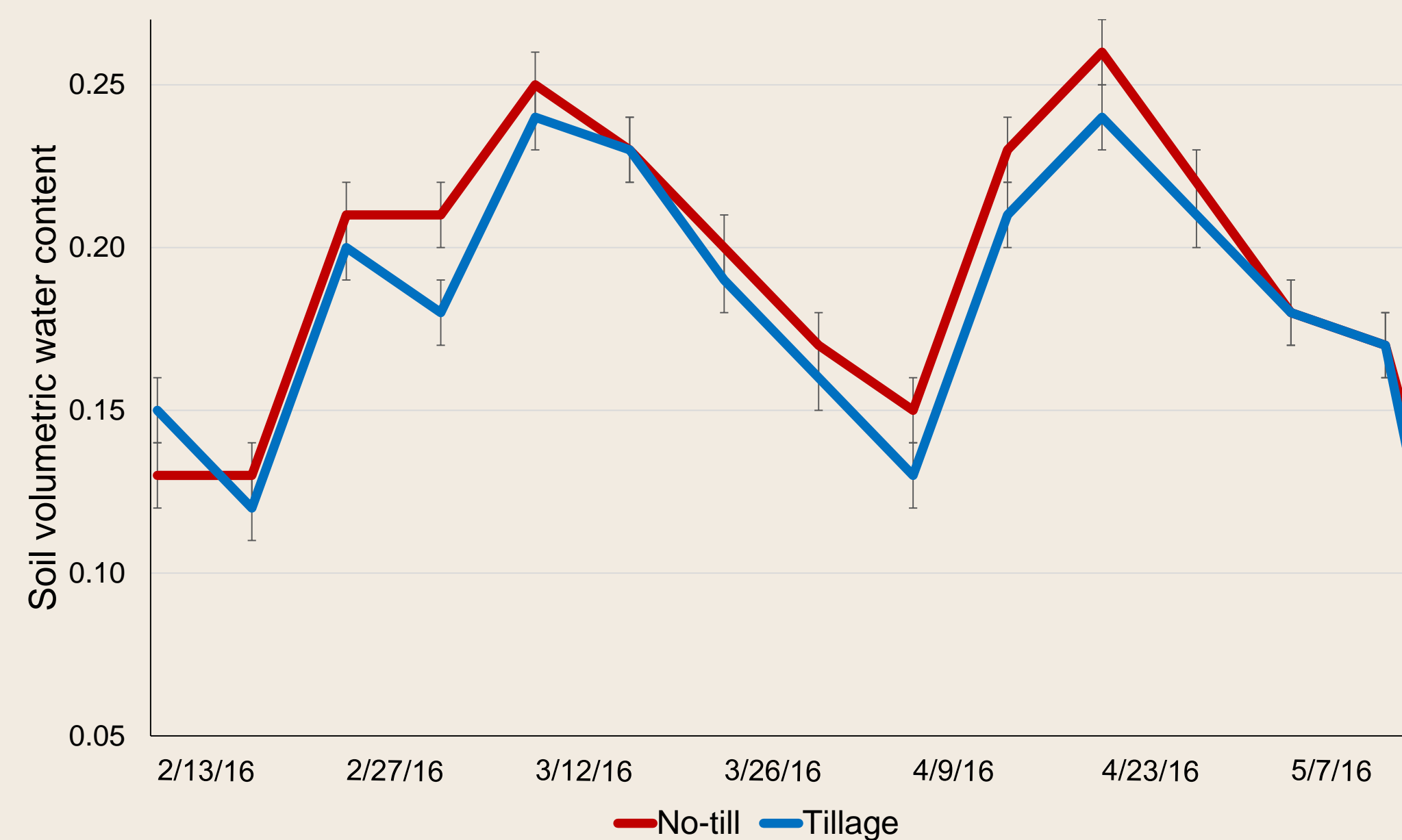


Figure 1. Weekly mean tillage and no-till winter pasture volumetric soil moisture at 8 cm depth (5m sensor Decagon Devices; Pullman, Wa).

- Total of 41.66 cm of precipitation.

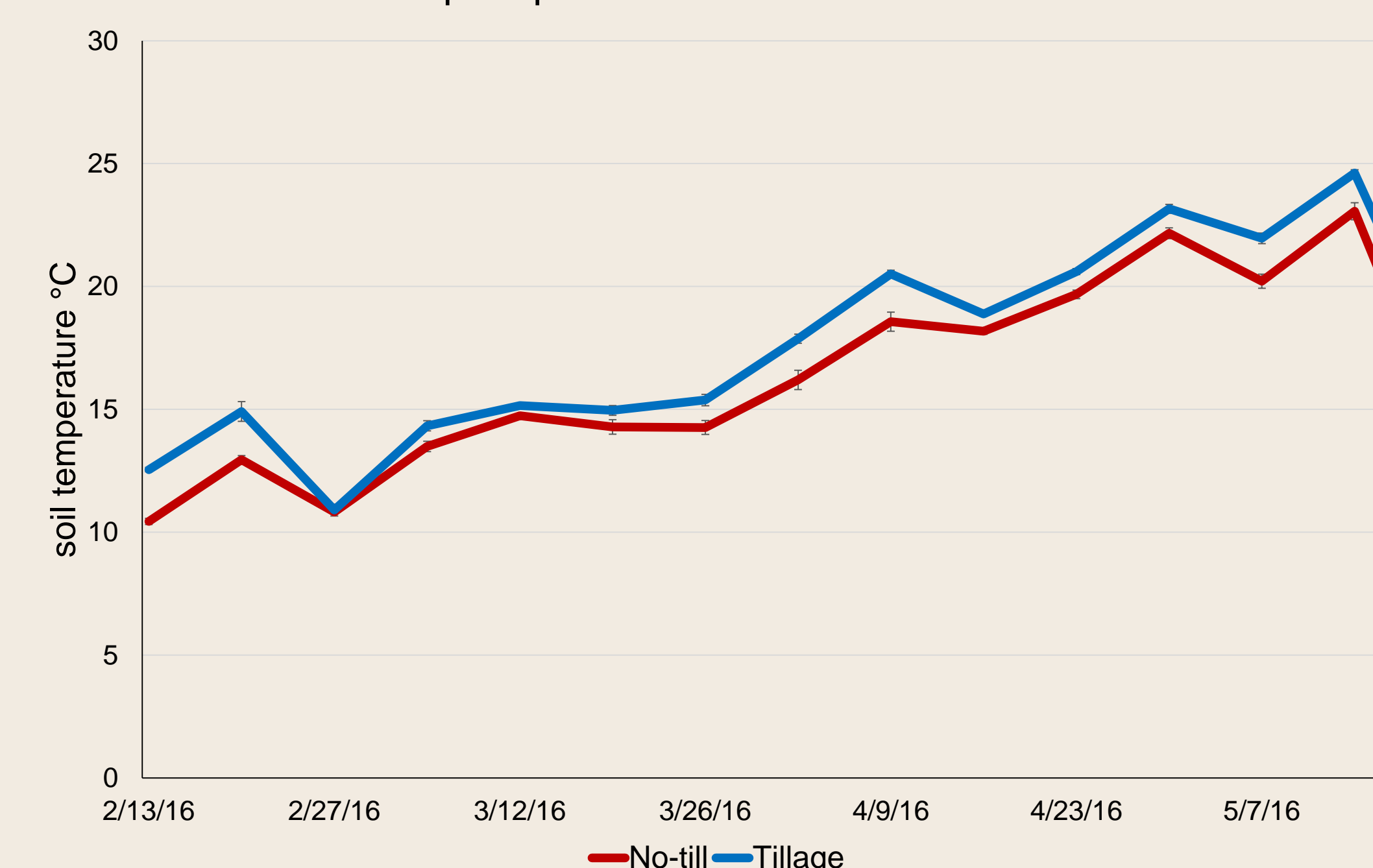


Figure 3. Weekly mean tillage and no-till winter pasture soil temperature at 8 cm depth (5m sensor Decagon Devices; Pullman, Wa).

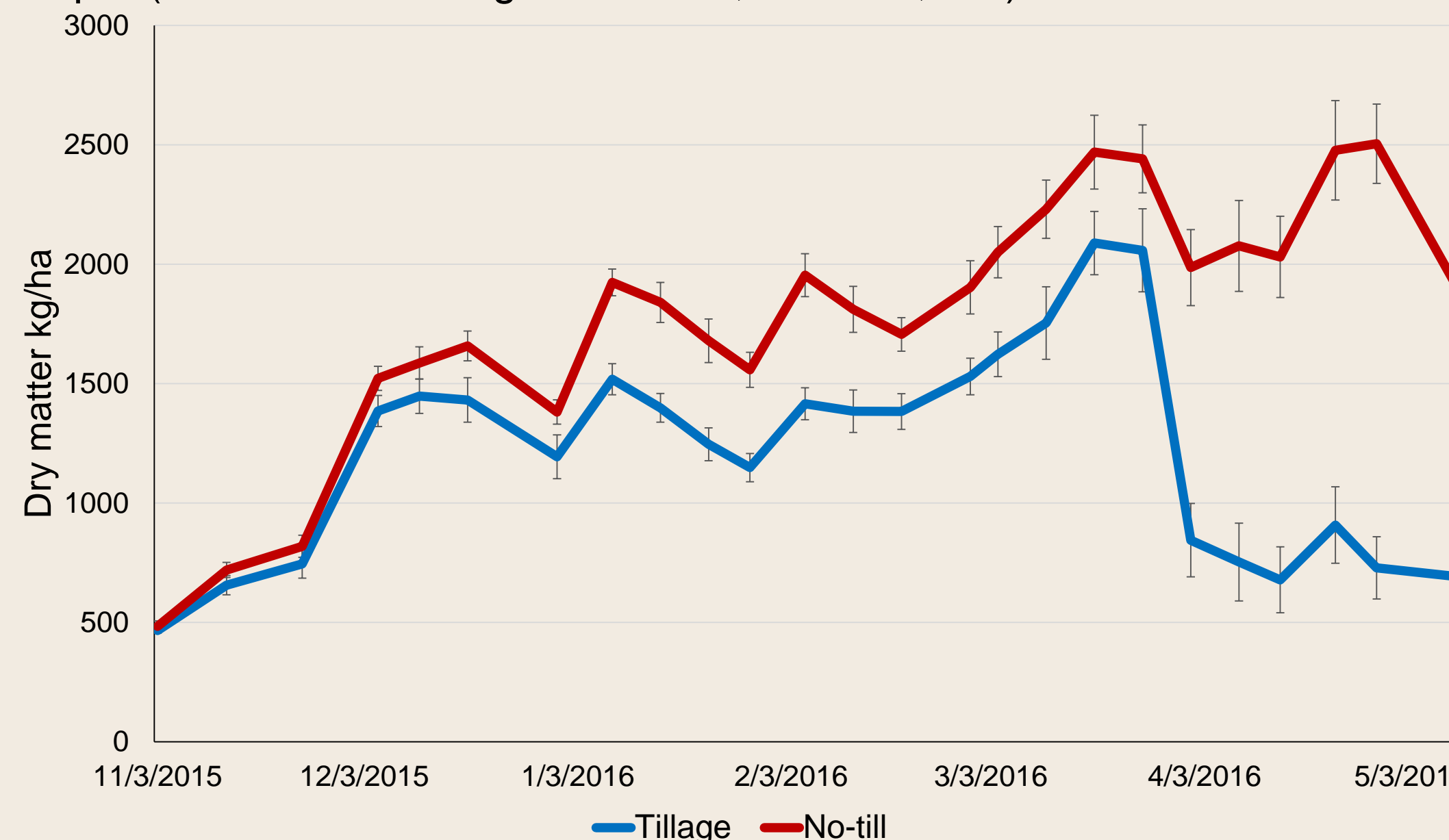


Figure 5. Mean tillage and no-till weekly winter pasture dry matter forage mass measured with a calibrated rising plate meter (Jenquip; Feilding, NZ).

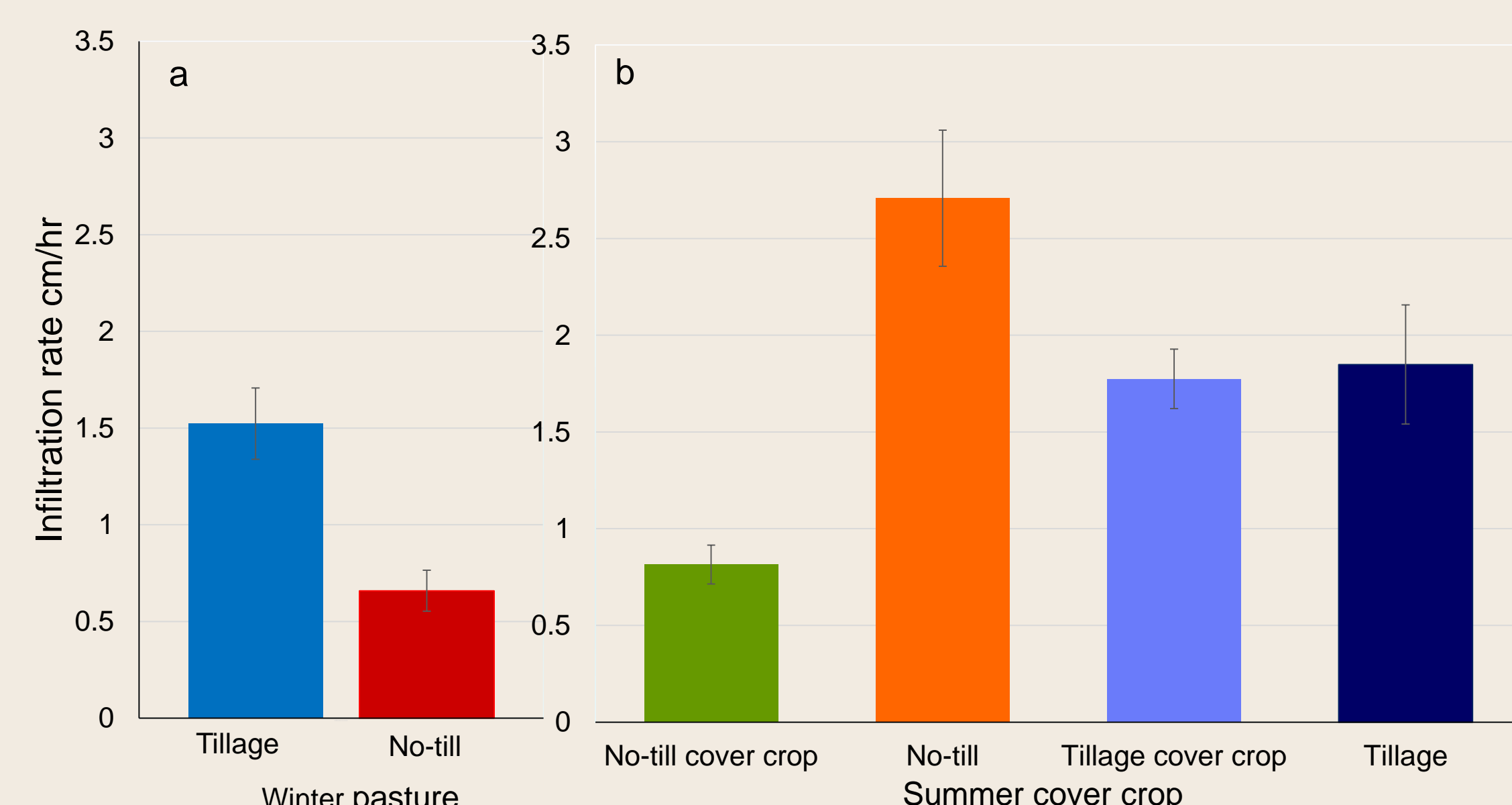


Figure 8. Mean tillage and no-till infiltration rates. Water infiltration rate was measured at the end of the grazing periods using a mini-disk infiltrometer (Decagon Devices; Pullman, WA). Rates were taken from each paddock and repeated four times within each paddock.

Summary of Year 1 Results

- No-till paddocks had higher winter pasture forage mass and greater animal gain than tillage paddocks.
- Soil moisture and temperature were similar between tillage and no-till paddocks during the winter pasture season.
- Water infiltration rates of tillage paddocks were higher than no-till paddocks following winter pasture.

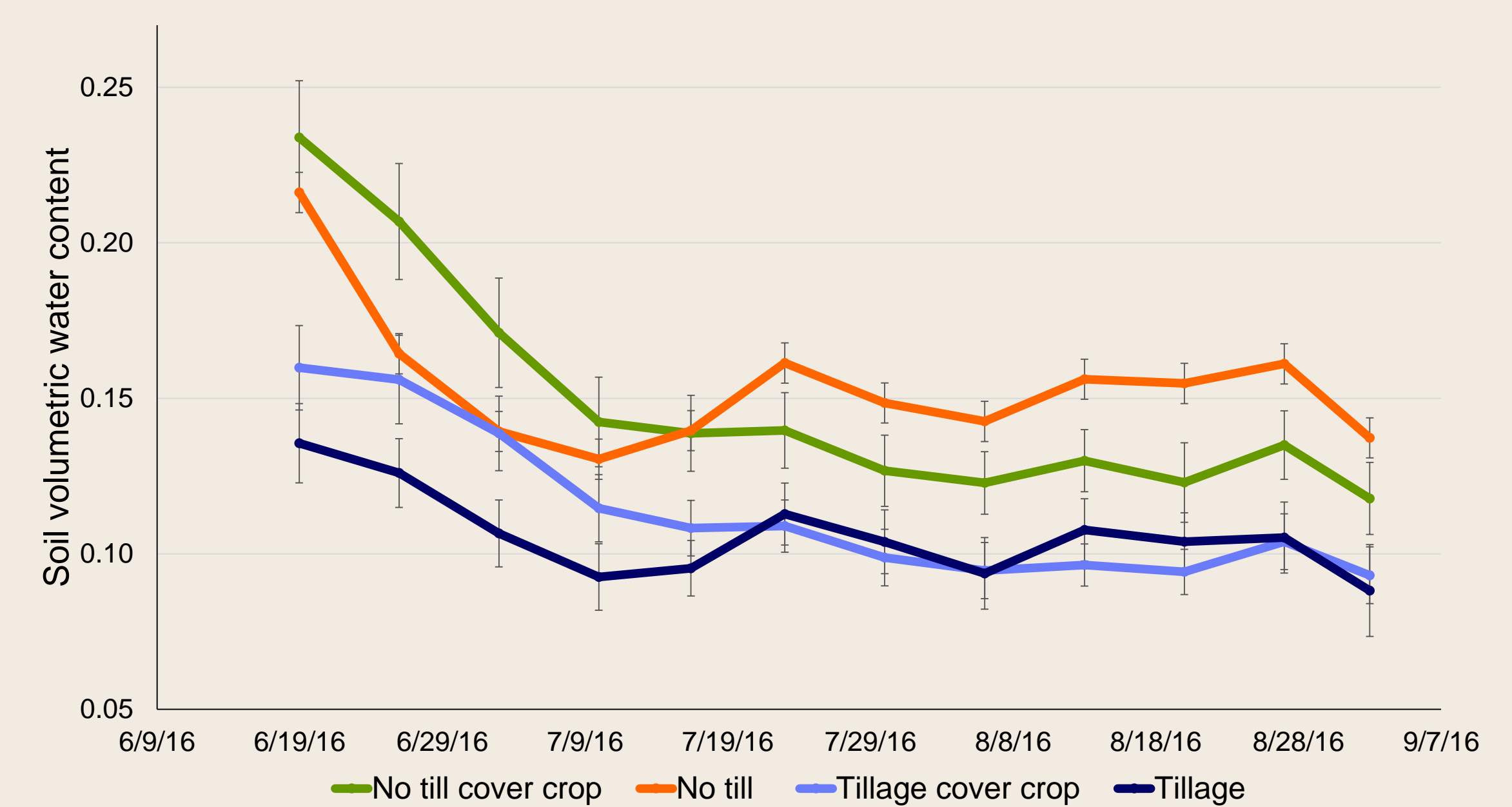


Figure 2. Weekly mean tillage (± cover crop) and no-till (± cover crop) summer volumetric soil moisture 8 cm depth.

- Total of 7.26 cm of precipitation.

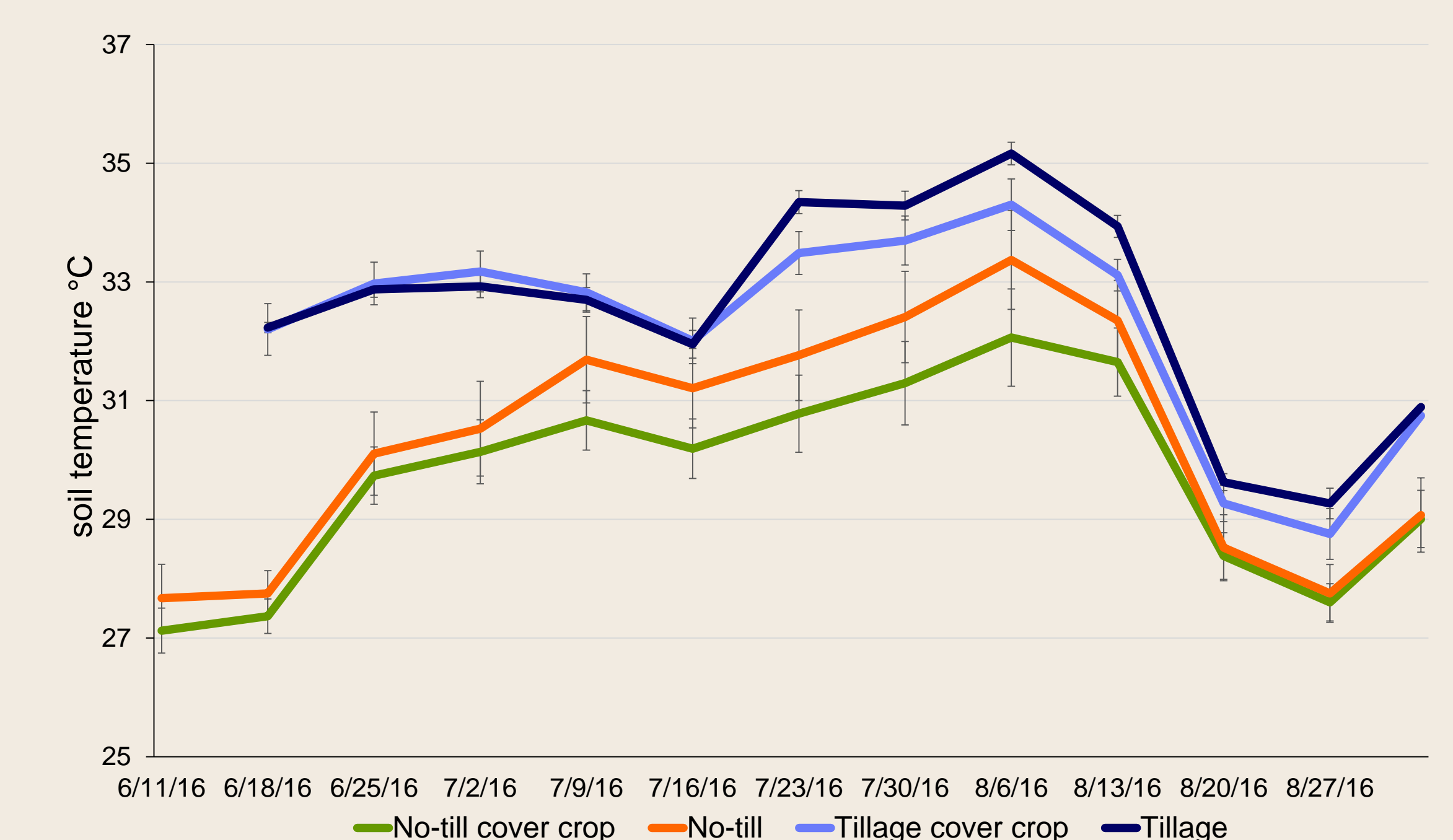


Figure 4. Weekly mean tillage (± cover crop) and no-till (± cover crop) summer soil temperatures 8 cm depth.

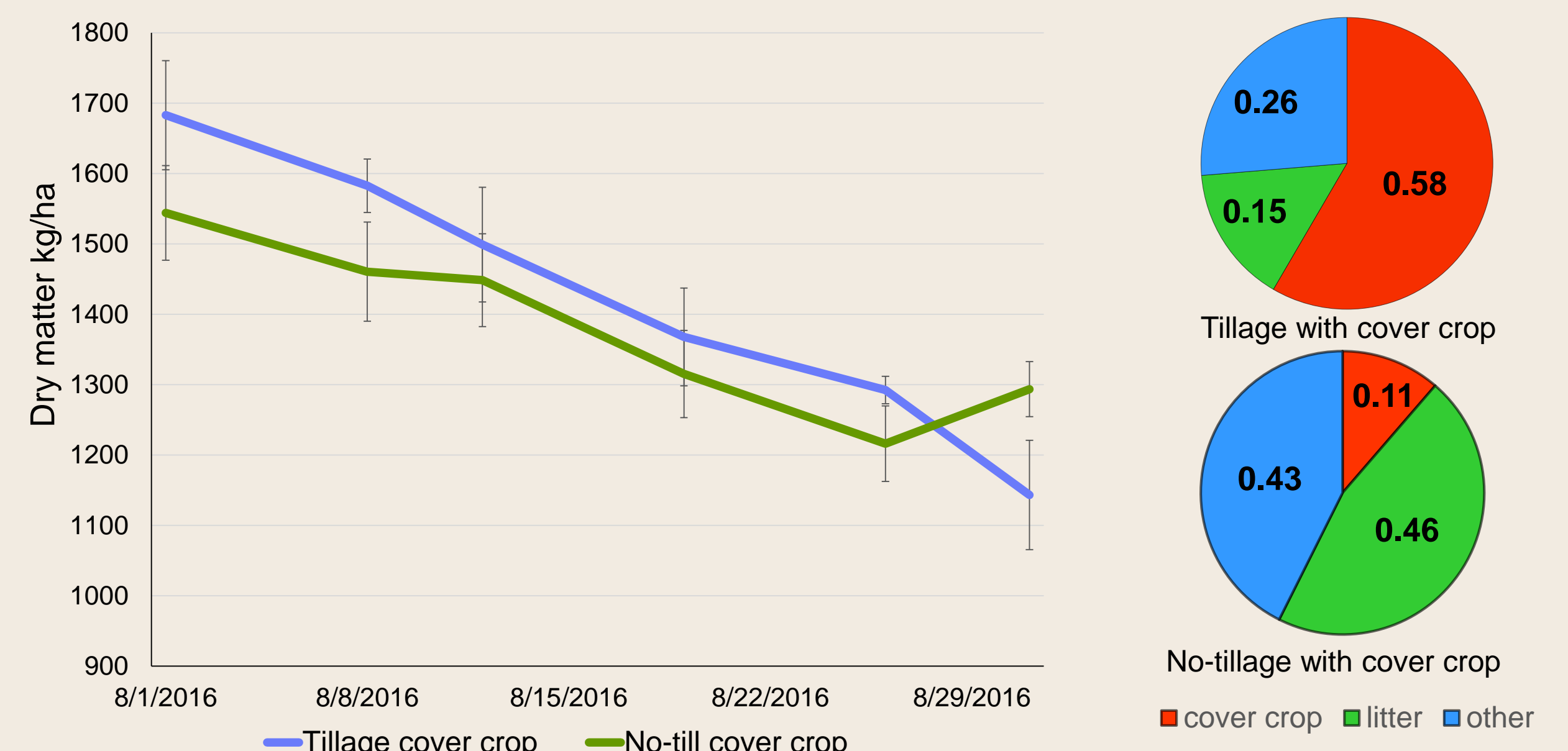


Figure 6. Mean tillage and no-till weekly cover crop paddock dry matter forage mass.

Figure 7. Composition of tillage and no-tillage cover crop paddocks. Composition was determined by clipping and sorting 5 quadrates per paddock. Dry weights were taken after separation.

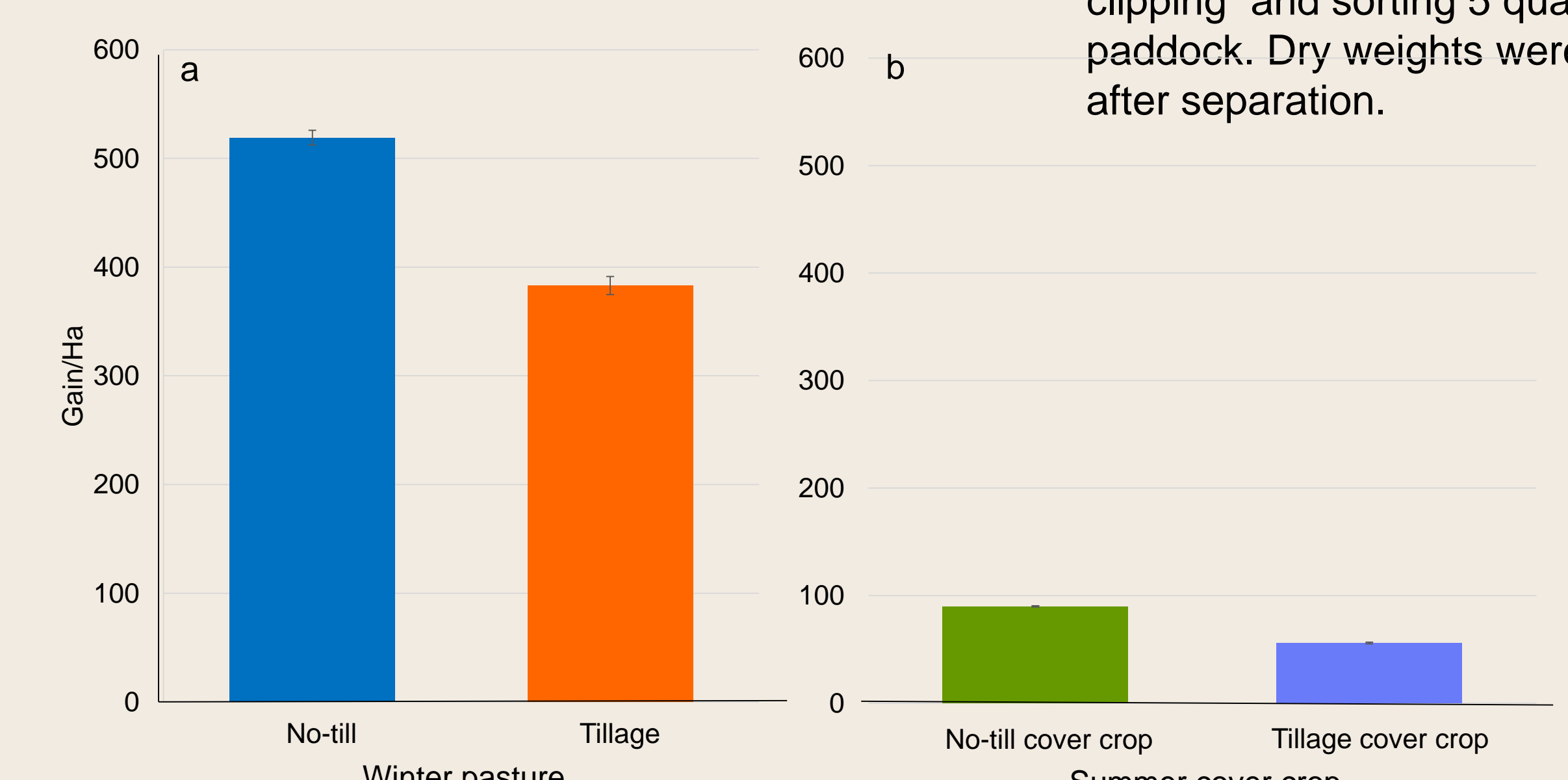


Figure 9. Mean animal gain per hectare for tillage (± cover crop) and no-till (± cover crop).

*Grazing days for winter pasture: no-till 145, tillage 137; summer cover crop: no-till 28, tillage 22.4.

- Persistence of a multi-species cover crop varied between no-till and tillage paddocks.
- Soil moisture and temperature during the summer varied between no-till and tillage paddocks.
- Cover crops had little effect on tillage water infiltration rates.
- No-till water infiltration improved without a cover crop.