FIELD STUDY TO ASSESS THE INFLUENCE OF TIED RIDGING TECHNOLOGY USED IN POTATO CULTIVATION ON THE RATE OF SURFACE RUNOFF OF A HERBICIDE

Bashir Surfraz #, Liam Suttey, Gemma Woodward, Nathan Brettell, Lindsay Fogg and Tim Pepper

Cambridge Environmental Assessments, Gleadthorpe, UK; #Corresponding author: bashir.surfraz@cea-res.co.uk

Introduction

In potato fields, water and sediment transportation as run off and erosion can be problematic as potatoes can be vulnerable to soil erosion, particularly just after planting. On sloping sites water run off along with soil particles can lead to enhanced loss of nutrients and plant protection products to adjacent surface water bodies. The recent use of tied ridges (micro-dams), established in the ridge bottom/furrow of potato beds, is one of several ways in which growers can help significantly reduce surface runoff while increasing time for infiltration to occur.

A field study, in compliance with Good Laboratory Practice (GLP) standards, was set up to assess the influence of tied ridging on the rate of surface run-off (water and soil loss) of a test item, applied to bare soil, and monitored under realistic worst case conditions representative of the proposed use.

Methods

Test site design

- The field site consisted of seven plots, three had tied ridges (green), three did not (brown) and one plot as untreated control (yellow).
- The test item (single application, bottom left) and an inert tracer were applied to Plots 1-6 (Fig. 1).
- Subplots A were used to measure runoff on a flow proportional basis and Subplots B to take soil samples to asses soil moisture status (Fig. 1).
- Test item was applied before site equipment was installed (Fig. 1).

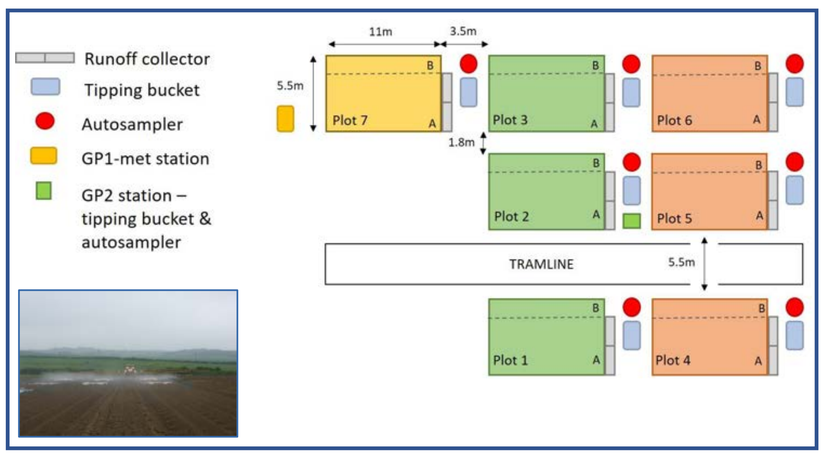

Figure 1

Site installation

- A weather station was installed to record climate data such as rainfall, wind speed and wind direction, prior, during and after the study (Fig. 2).
- Tipping bucket was used to quantify runoff (Fig. 3).
- Automatic water sampler was used to collect samples (Fig. 4 & 7) and coupled with a logger to capture data.

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

Runoff

- Irrigation used to mitigate dry weather conditions and simulate storm events (Fig. 5).
- Water pooling and runoff from both the normal ridged (left) and tied ridge plots (right, Fig. 6).
- Runoff collected using the automatic water sampler, processed samples for analytical testing (Fig. 7).

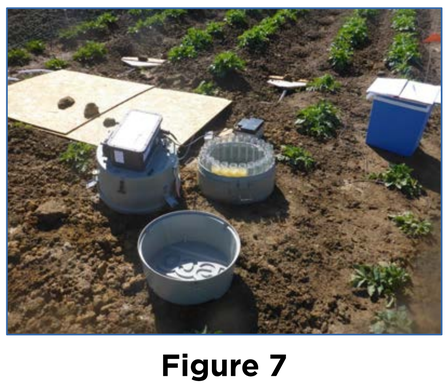

Figure 7

Figure 8

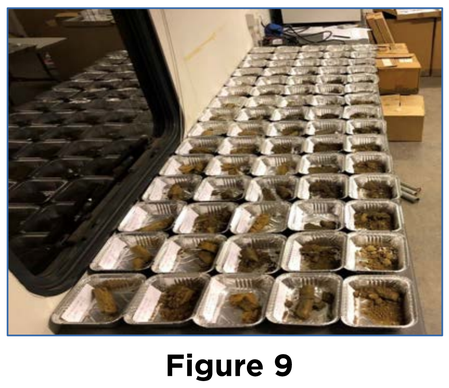

Figure 9

Soil sampling and processing

- Soil samples of incremental depths taken within the top 20cm soil (Fig. 8)
- Soil moisture evaluated by drying samples and calculating the percentage water loss from the weight differences from before and after drying (Fig. 9)

Preliminary Results and Discussion

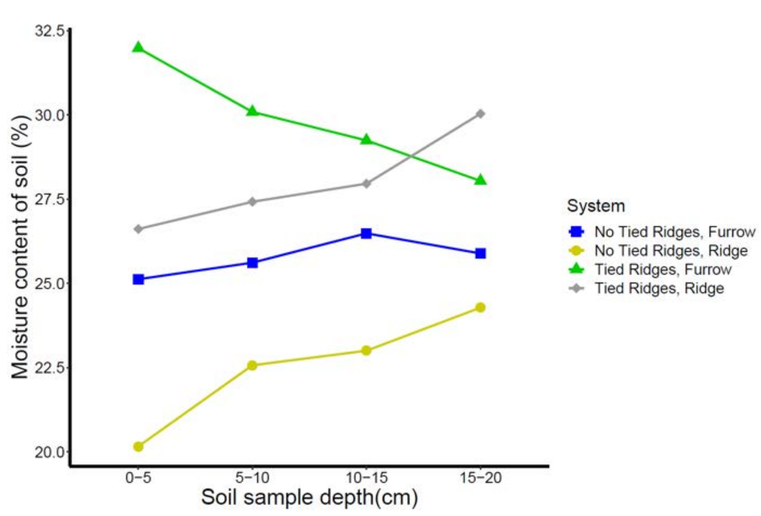

Figure 10. Soil moisture content of samples depending on depth (cm) for each ridge system used

- Higher soil moisture content recorded for tied ridges than non-tied ridge plots (Fig. 10).
- Soil moisture decreased with depth only in furrows of tied ridge plots (Fig. 10).
- Tied ridge plots captured more irrigation water than plots with no tied ridges, yet they produced less runoff (Fig. 11).
- Less runoff for tied ridge plots suggests higher retention of water and therefore more time for infiltration to occur. This explains the higher soil moisture contents recorded (Fig. 10 and Fig. 11).

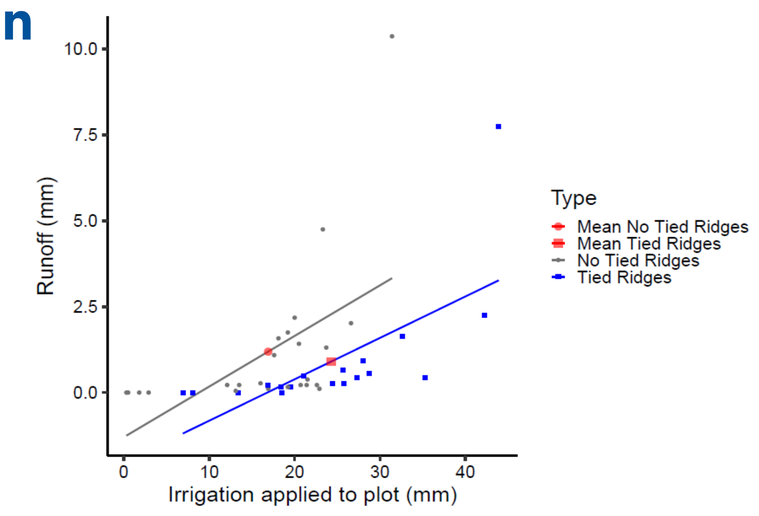

Figure 11. volume of irrigation applied, and runoff generated for plots with tied ridges and no tied ridges. Means for each type highlighted in red.

Conclusions

- An effective method and set-up that complies with GLP standards was implemented successfully.
- Preliminary results suggest that plots with tied ridges retain a higher soil moisture content and produced less runoff. These results are consistent with notions that tied ridges increase infiltration and reduce runoff.
- Such studies can be weather-dependent and in this case six irrigation events were needed to compensate for considerably dryer conditions that was experienced during the course of this study.