OPTIMISING SOIL EROSION CONTROL AND RUNOFF MANAGEMENT IN FORAGE MAIZE

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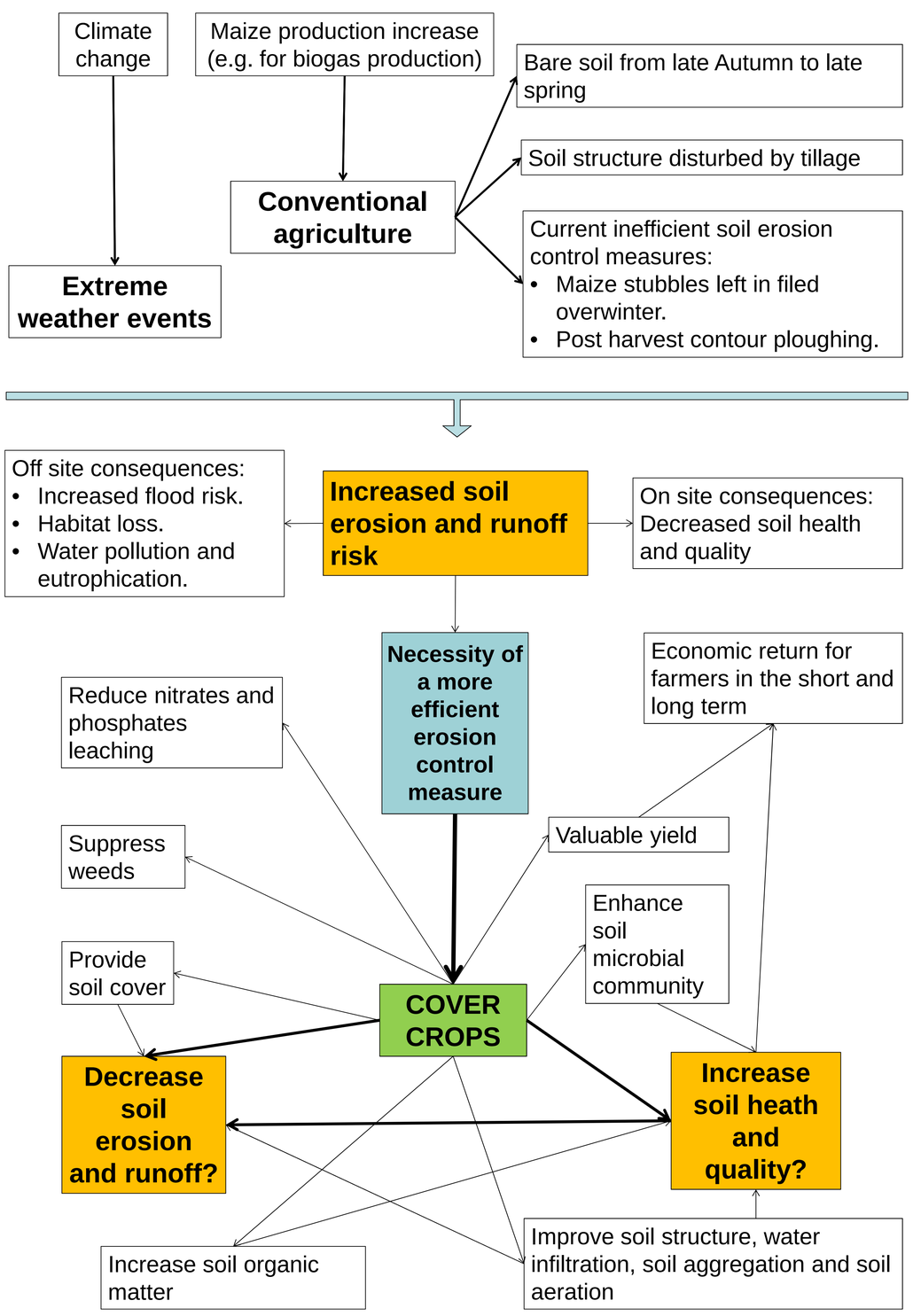
1. INTRODUCTION



2. OBJECTIVES

1. Critically evaluate and quantify the role of cover cropping towards reducing soil loss and runoff.
2. Critically evaluate and quantify the role of "soil heath" and "quality" (biological, chemical and physical indicators) towards controlling soil erosion.

3. METHODOLOGY

1. Collection of sediments and runoff from fully instrumented erosion plots.
2. Selection of heath and quality indicators.
3. Measurement of the indicators and comparison with soil loss and runoff results.
4. Selection of efficient indicators and formulation of a soil heath and quality index for erosion control.

- **Project area:** Field experiment is a forage maize cultivation at Wall End farm, Leominster, Herefordshire, located in the Wye catchment**.**
- **Experimental design:**

1. Italian ryegrass (*Lolium multiflorum*) undersown broadcast approx. 6-weeks after maize drilling (**IRB**).
2. Italian ryegrass undersown drilled approx. 6-weeks after maize drilling (**IRD**).
3. Forage rye (*Secale cereale*) drilled post-harvest (**RPH**).
4. Bare soil with strips tilled post-harvest across slope (ripvator cultivator) (**PHC**).
5. Bare soil tilled prior maize drilling (disc plough) (**CSD**).
6. Bare soil tilled prior maize drilling (mouldboard plough) (**CP**).

- Three erosion plots are located inside each treatment. The location of the plot was driven by the similarity of the slope and by the absence of evident soil compaction.


Forage Rye.


Italian Ryegrass.


Italian Ryegrass.

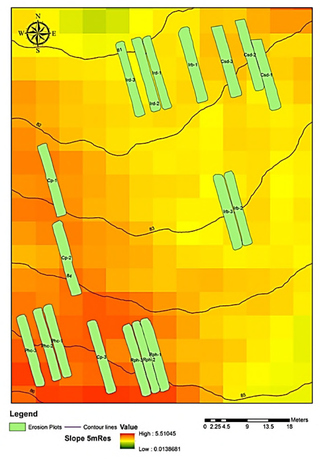

Forage Rye.

- Growth at low temperature
- Valuable yield
- Vigorous plants


Evidences of erosion in the field.


Tillage across slope.

Ripvator Cultivator.



Map of the field showing the differences in slope and the location of the different erosion plots

SOIL HEATH AND QUALITY INDICATORS

- **Physica**l: Soil compaction and strength, water infiltration, aggregate stability, soil wettability, soil cover.

It is hypothesised that cover crops will decrease soil compaction and increase soil strength, aggregate stability, water infiltration and soil cover.

- **Chemica**l: Total organic and inorganic carbon, total and available nitrogen, available phosphorous.

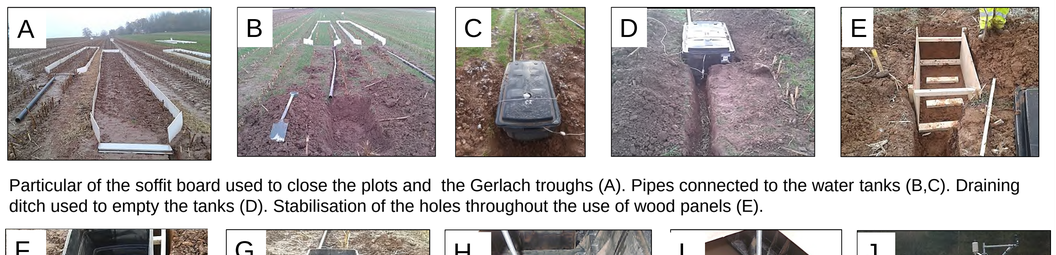
It is hypothesised that cover crops will increased soil carbon content and change the availability of nitrogen and phosphorous.

- **Biologica**l: Microbial biomass, community respiration, PLFA, microbial enzymes, fungal biomass.

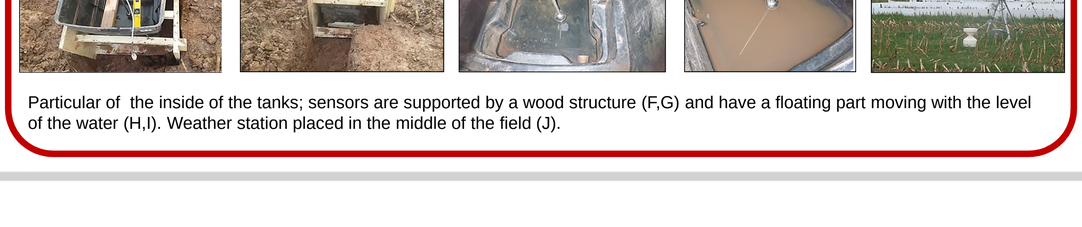
It is hypothesised that cover crops will enhance microbial community activity.

4. EROSION PLOTS

The erosion plots (12m x 1.5m) are hydrologically sealed at the soil surface. Runoff and sediments are collected via Gerlach trough placed at the bottom of the plot, which discharges to water tanks. Pre-calibrated linear level sensors monitor the level of water inside the tanks.

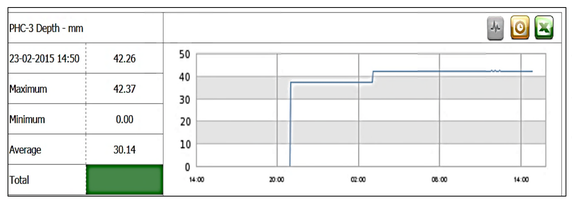


Particular of the soffit board used to close the plots and the Gerlach troughs (A). Pipes connected to the water tanks (B,C). Draining ditch used to empty the tanks (D). Stabilisation of the holes throughout the use of wood panels (E).

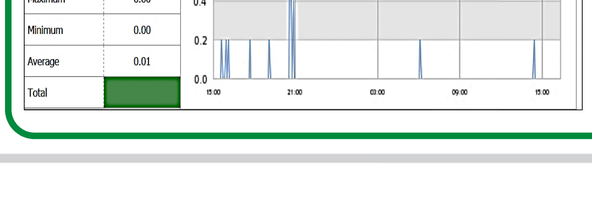


Particular of the inside of the tanks; sensors are supported by a wood structure (F,G) and have a floating part moving with the level of the water (H,I). Weather station placed in the middle of the field (J).

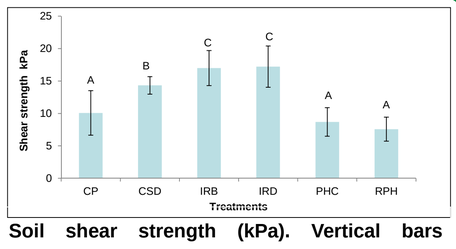
5. PRELIMIRARY RESULTS



Water accumulating in one of the tanks. The sensors monitor water level normally every 30 minutes.



Millimetres of rainfall over time collected by the tipping bucket rain gauge connected to the weather station.



Soil shear strength (kPa). Vertical bars indicate standard deviation, letter refers to homogeneous groups (p< 0.05).

According to this preliminary results Italian ryegrass seems to increase soil shear strength, while forage rye does not affect it .

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