Materials and Methods

Introduction

Soil Erosion (SE) Facts and Consequences
- 30 t ha\(^{-1}\) of soil is lost every year worldwide through erosion [1].
- 65% of SSA soils are eroded, leading to 40% yields decrease, equivalent to a loss of US$86bn/year [2]
- 60% of erosion is induced by human activities [3]
- Expected increase of soil erosion: 17% due to cropping [3]

Modelling Tillage Impact on Soil Erosion
- SE is often determined by fields measurements which is time consuming and expensive.
- Modelling SE in approach that is much more time and cost-effective is needed.
- Modelling of tillage effects on SE has mainly been restricted to mulching.
- Yet, other tillage practices such as ridge and furrow, tied ridging, etc. on erosion is scant.

Objectives of the study

1. Quantify soil erosion from three tillage systems:
   - Flat tillage (FT)
   - Ridge and Furrow tillage (RF)
   - Tied-Ridge tillage (TR)
2. Predict soil erosion from the 3 tillage systems using the:
   - Revised Universal Soil Loss Equation (RUSLE)
   - Griffith University Erosion Simulation Template (GUEST)

Materials and Methods

Soil Erosion Experiments:
- Conducted using lysimeters with maize as test crop (Fig.1)
- Data collected over two growing seasons (Major & Minor)
- Runoff and drainage water collected (Fig.2)
- Soil loss and sediments collected (Fig.2)

Results

Results from Experiments
- Rainfall: Major season (482 mm) was double of minor season (292 mm)
- Runoff/rainfall ratio for tillage practices was: RF > FT > TR
- TR reduced soil erosion up to 43%

Conclusion

- Soil erosion varied with rainfall and tillage practices
- Tied-ridge (TR) tillage significantly reduced soil erosion
- RUSLE and GUEST models adequately predicted erosion under the various tillage systems.

References

Table 1. Observed and Predicted (RUSLE and GUEST) soil erosion

<table>
<thead>
<tr>
<th>Tillage systems</th>
<th>Observed means</th>
<th>Predicted RUSLE</th>
<th>Predicted GUEST</th>
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<tbody>
<tr>
<td></td>
<td>(ton ha(^{-1}))</td>
<td>(ton ha(^{-1})) MAE</td>
<td>(ton ha(^{-1})) MAE</td>
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<tr>
<td><strong>Major Growing Season</strong></td>
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<tr>
<td>Flat Tillage</td>
<td>26.6±0.12</td>
<td>21.5±0.08</td>
<td>0.18</td>
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<tr>
<td>Ridge and Furrow</td>
<td>72.3±0.28</td>
<td>71.9±0.26</td>
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<tr>
<td>Tied-Ridge</td>
<td>30.9±0.15</td>
<td>26.1±0.12</td>
<td>0.23</td>
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<tr>
<td><strong>Minor Growing Season</strong></td>
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</tr>
<tr>
<td>Flat Tillage</td>
<td>06.3±0.03</td>
<td>09.8±0.04</td>
<td>0.18</td>
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<tr>
<td>Ridge and Furrow</td>
<td>22.4±0.15</td>
<td>37.4±0.13</td>
<td>0.30</td>
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<tr>
<td>Tied-Ridge</td>
<td>00.0±0.00</td>
<td>00.0±0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Fig. 3. Soil erosion during major (A) and minor (B) seasons

Fig.1. a: Flat tillage (FT); b: Ridge and Furrow (RF) and c: Tied-ridge (TR).

Fig.2. Soil erosion collector