Evaluation of Effect of Ridging on the Rainwater Use Efficiency of Soybean Production in Northern Ghana

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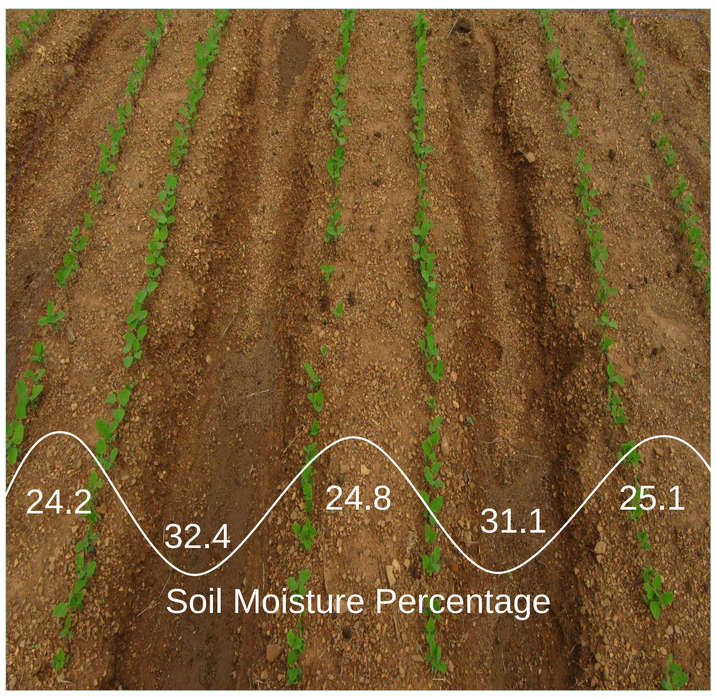
Introduction

As rainfall patterns become increasingly sporadic, it is imperative to create a system of maximum rainwater usage to assure an efficient cropping system. This is especially true in low-input farming systems, such as those found in Northern Ghana, that are already suffering from low crop yields.

Recently, soybean production is catching on in popularity in Northern Ghana as it is able to improve soil fertility. However, to reap the full benefits of the soybeans' leguminous properties, soil moisture must be stabilised. Soil ridging promotes the soils' ability to allow water to infiltrate, have improved permeability and water holding capacity - both necessary capabilities a soil must have in order to maintain consistent, proper moisture content.



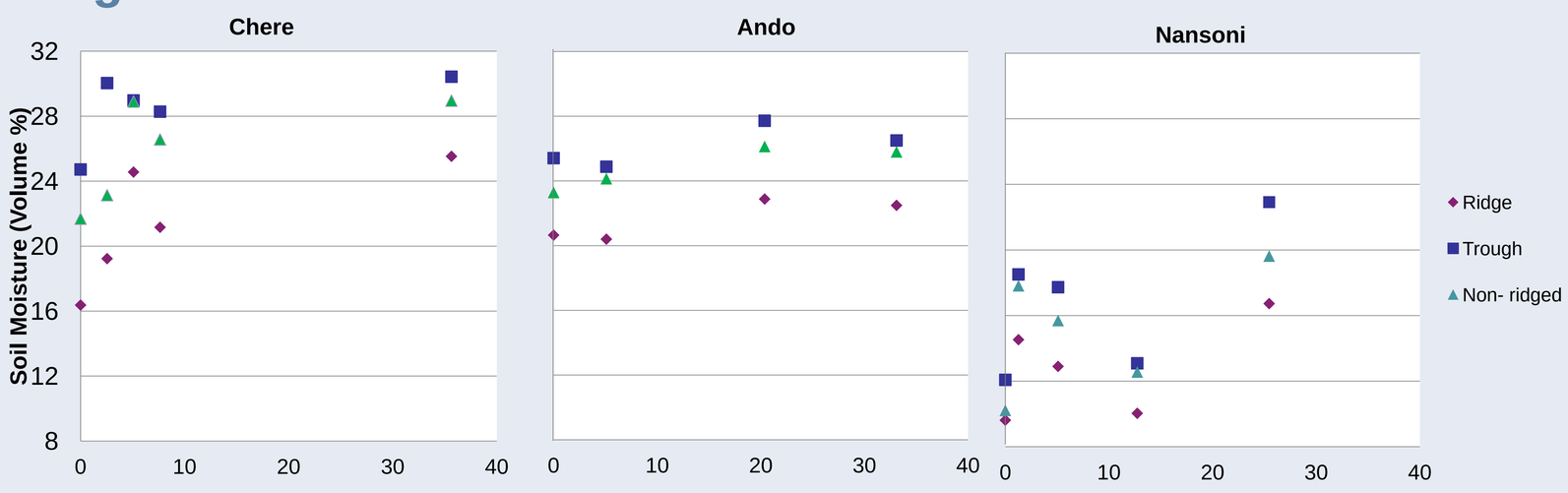
Objective

- To determine if soil moisture content can be stabilised by soil ridging methods in the Chereponi District in Northern Ghana.
- To determine if stabilisation of soil moisture content can cause a significant difference in yield.

Conclusion

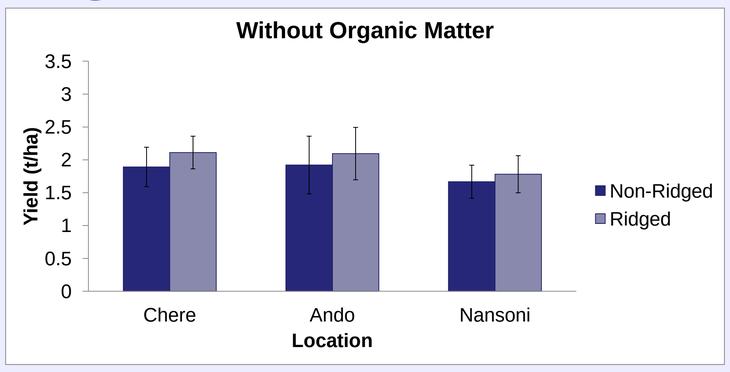
- Evidence found in this trial suggests that soil ridging was able to stabilise soil moisture content, as moisture percentages fluctuated less in the trough portion than than non-ridged plots in reaction to rainfall events.
- Ridging provides little to no yield advantages in optimal conditions, but can provide benefits within sub-optimal soil conditions.

Ridge Effect on Soil Moisture

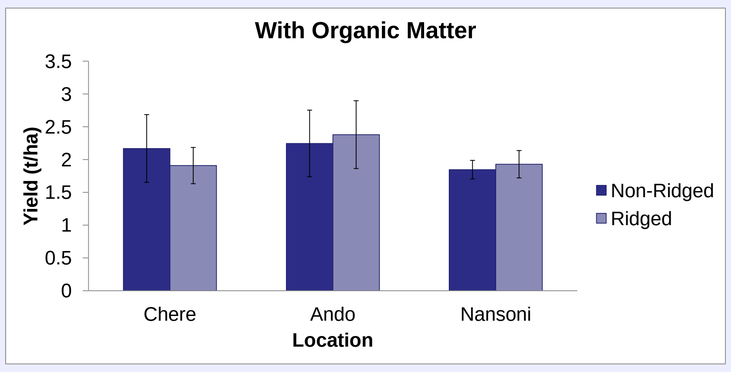


- Ridges were able to evacuate water during times of heavy rainfall.
- Troughs were able to maintain soil moisture content during times of drought.
- Troughs varied less than the ridged and non-ridged areas between times of drought and heavy rainfall.

Ridge Effect on Yield

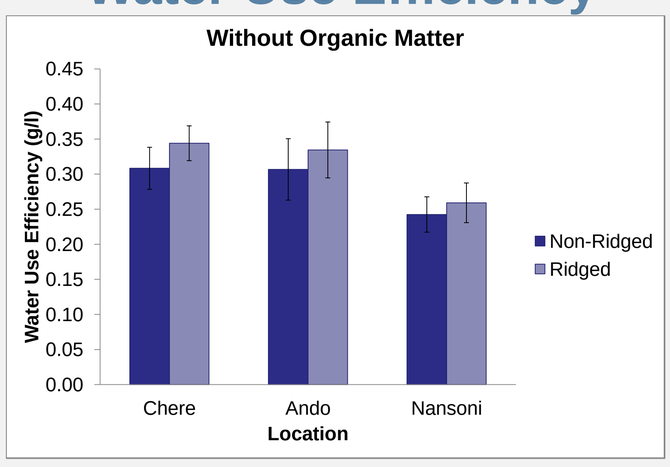


- Within control plots, ridged plots outperformed non-ridged plots in almost every replicate.
- The average ridged plot produced 1.98 t/ha and the average non-ridged plot produced 1.82 t/ha.

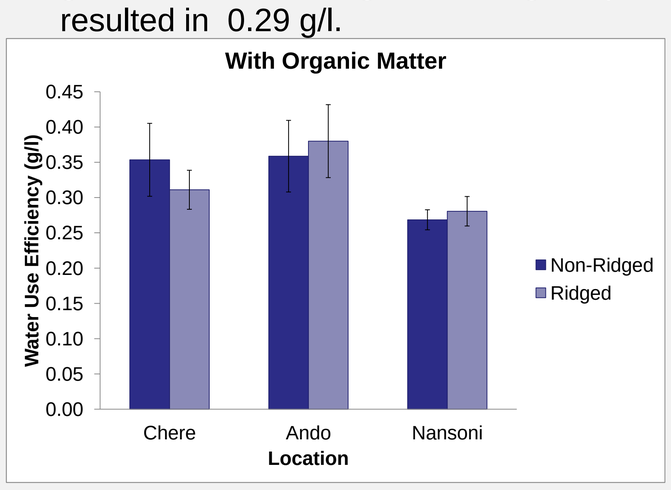


- While more ridged plots outperformed non-ridged plots, the non-ridged plots produced much more yield when they were superior.
- The ridged plots produced an average 2.058 t/ha and the non-ridged plots produced an average 2.063 t/ha.

Water Use Efficiency



- Ridged plots consistently outperformed non-ridged plots regarding water use efficiency.
- The average ridged plot resulted in 0.31 g/l and the average non-ridged plot resulted in 0.29 g/l.



- Plots treated with organic matter had a higher water use efficiency than plots without organic matter.
- Non-ridged plots had a slightly higher water use efficiency and on average resulted in 0.33 g/l compared to ridged plots which were average 0.32 g/l.

Methodology

Ridge Formation

- Ridges were 60 cm wide.
- Two rows of soy were planted per ridge.
- Troughs were 40 cm wide.
- Ridges were raised approximately 10 cm above the soil's natural level, with troughs dug 10 cm below to create a 20 cm ridge – trough height difference.
- Each subplot consisted of 3 ridges.

Organic Matter

- Two types of organic matter applied at two different rates.
- Manure – 2.5t/ha and 5 t/ha.
- Crop residue – 2.5 t/ha and 5 t/ha.

Acknowledgements

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