Water use Efficiency and Yield of Potato in Potato–legume Based Intercropping Systems in a Semi–humid Region, Kenya

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WATER USE EFFICIENCY AND YIELD OF POTATO IN POTATO-LEGUME BASED INTERCROPPING SYSTEMS IN A SEMI-HUMID REGION, KENYA

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Introduction

- Potato is an important food security crop in Kenya mainly cultivated under unpredictable rain fed conditions.

- Given that the crop is very sensitive to drought conditions various methods have been proposed to enhance water use efficiency. They included: increased fertilization, plastic film and mulching.

- Advantages and disadvantages.

- Can cover crops be used instead?

- Aim: Identify a potato-legume intercropping system that is efficient in water utilization and still upholding optimum potato yield.
Materials and Methods

- The experiment was laid in RCBD with 4 replicates at UoN for 4 seasons from short rains of 2014 to the long rains in 2016.

- The treatments were: Sole Potato and Potato intercropped with either lablab (*Dolichos lablab*), garden pea (*Pisum sativum*) or climbing bean (*Phaseolus vulgaris*).

- Plots measured 4 x 6 m and data collection done from the central 2 by 3m quadrants.

- SMC and cover were determined fortnightly using HSM 50 soil moisture meter and sighting frame, respectively.

- \[ ET (m^3) = P + I \pm \Delta S \ RO - DD. \quad \text{WUE (kg/ha/m}^3) = Y / (ET \times 10) \]

- Data Analysed using R Software, version 3.2.3 and means separated using Tukey’s post hoc test.
Among the potato legume plots, *D. Lablab* had the highest ground cover.
Results

Weather conditions

[Graph showing rainfall, ET, Tmax, and Tmin for different months and years.]

- 2014 Short Rains
- 2015 Long Rains
- 2015 Short Rains
- 2016 Long Rains
Results

Projection of the cropping systems and seasons on PCA1/2
Ground cover

Crop Cover (%)

Days after planting

Short Rains 2014
Long Rains 2015
Short Rains 2015
Long Rains 2016

Sole potato
Potato & Lablab
Potato & G.Peas
Potato & Bean

Days after planting
<table>
<thead>
<tr>
<th>Treatment</th>
<th>Fresh tuber yield (t ha(^{-1}))</th>
<th>Dry matter tuber yield (t ha(^{-1}))</th>
<th>Total DMY (t ha(^{-1}))</th>
<th>Evapotranspiration (mm)</th>
<th>Water use efficiency (kg ha(^{-1}) m(^{3}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potato</td>
<td>36.8 c</td>
<td>6.5 c</td>
<td>8.7 a</td>
<td>575 a</td>
<td>1.6 a</td>
</tr>
<tr>
<td>Potato + Dolichos</td>
<td>34.5 c</td>
<td>6.2 c</td>
<td>17.9 d</td>
<td>626 b</td>
<td>3.0 d</td>
</tr>
<tr>
<td>Potato + G. pea</td>
<td>24.6 a</td>
<td>4.4 a</td>
<td>13.5 b</td>
<td>618 b</td>
<td>2.3 c</td>
</tr>
<tr>
<td>Potato + Bean</td>
<td>30.5 b</td>
<td>5.4 b</td>
<td>16.0 c</td>
<td>622 b</td>
<td>2.7 b</td>
</tr>
</tbody>
</table>
Relationship Between Variables...

Y = -0.003x + 3.90
\( R^2 = 0.30^{***} \)

DMY = 0.01x + 6.45
\( R^2 = 0.25^{***} \)
The study demonstrates the practicality of intercropping potatoes with legume cover crops.

*Dolichos lablab* was the best in cover development and soil moisture conservation, competing less with potato for water enhancing water WUE and potato productivity.

Further study on spatial and temporal arrangements of the components crops. Upscaling is also recommended.
Acknowledgements
THANK YOU