Theme:

“Repositioning African Agriculture by Enhancing Productivity, Market Access, Policy Dialogue and Adapting to Climate Change”
Participatory Evaluation of Pulse Crop Suitability to Mountain and Oasis Zones of Northern Kenya

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Abstract

The biophysical and climatic characteristics of the arable pockets of northern Kenya are different from other arable parts of the country. The mountain and oasis areas of northern Kenya, where crop farming is practiced are characterized by heterogeneity. The suitable pulse crops for these zones are not well understood, which has led to promotion of pulse varieties which are not suitable in mountain and oasis areas of northern Kenya. This study evaluated pulse varieties in these regions. Beans, cowpeas and green grams were tried in mountains, foot slopes and lowlands areas of northern Kenya. The focuses of the study were the crop yields, communities’ preference and gross margins. For yield comparison experimentation, a randomized complete block design was done and data analyzed using analysis of variance (ANOVA). To gauge community preference, pair-wise ranking was used. Gross margins were determined from total inputs and outputs. Results showed that all pulses performed best in irrigated lowland and mountains, with no significant difference between lowlands and mountains. Foot slopes performed poorest across pulses. Beans were highest yielding while green grams were lowest yielding across sites. Cowpeas and green grains were affected severely by sucking pest mainly aphids especially in foot slopes and irrigated lowlands. Across the sites, beans were most popular mostly due to their better marketability, locally and outside. Green grams had the highest gross margins despite having the lowest yield. It is concluded that in areas of lowlands and mountains, all the three pulses are viable crops and should be pursued. Bean pulse is
recommended for food security and green grams are recommended for commercialization across the sites.

Key words: Pulses, Mountain and Oases, Northern Kenya

Introduction
The farming communities in northern Kenya have grown different varieties of pulses for decades. The pulse varieties grown in these regions are beans, cowpeas and green grams. The pulses are grown in mountains and oasis areas of northern Kenya (Fig. 1). In mountains and foot slopes areas, they are grown under rain-fed systems, while in oasis (lowlands) areas they are both irrigated and rain fed (Muya et al, 2010). A characterization exercise done between 2007 and 2008 by KARI Marsabit showed that northern Kenya’s mountain and oasis had unique characteristics that were not found in the areas where the crop varieties grown had originated. Northern Kenya’s arable pockets were found to have 3 distinct zones including the highlands (Mountains), foot slopes and riverines (lowlands) as shown in table 1 (Muya et al, 2010). However, the extension agents in the zones encourage blanket growing of the pulses, assuming the areas are homogenous, with limited knowledge on biophysical and socio-economic heterogeneity. The study sought to identify the appropriate pulse variety for the 3 distinct arable zones of northern Kenya, the community preference for the pulses and the gross margins. The main objective of the study was to identify suitable varieties of pulses for mountains, foot slopes and oasis areas of northern Kenya.
Materials and Methods
The study was conducted in 3 sites representing the different zones. Songa represented the mountains, Gororukesa represented the foot-slopes and Kinna represented the irrigated riverines (Lowlands). The study was done during the rainy seasons of 2009/2010.
Table 1: Characteristics of different arable zones of Northern Kenya

<table>
<thead>
<tr>
<th>Zones</th>
<th>Characteristics</th>
<th>AEZ</th>
<th>Soils and water</th>
<th>Physiography</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highlands (Mountains)</td>
<td>Rainfall: 500-800 mm per annum,</td>
<td>Semi-humid to</td>
<td>Acid, pulverized soils, High quality</td>
<td>Altitude 1,500-2,000 m above sea level (a.s.l), Slopes 8-30%</td>
</tr>
<tr>
<td></td>
<td>Evaporation: 1600-1800 mm per annum,</td>
<td>semi-arid</td>
<td>spring water</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Temperature: 17 -23 o C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foot slopes</td>
<td>Rainfall: 400-750 mm per annum,</td>
<td>Semi-arid</td>
<td>Compact soils with strong surface</td>
<td>Altitude 1,000-1,500 m a.s.l, Slopes of 5-20%,</td>
</tr>
<tr>
<td></td>
<td>Evaporation: 1800-2300mm per annum,</td>
<td></td>
<td>crusting and sealing. Bore hole water</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Temperature: 27-29 o C</td>
<td></td>
<td>– good quality</td>
<td></td>
</tr>
<tr>
<td>Riverine (Oasis)</td>
<td>Rainfall: 300-400 mm per annum,</td>
<td>Arid</td>
<td>Saline sodic soils High quality river</td>
<td>Below 1000 m a.s.l Slope: flat to very gently</td>
</tr>
<tr>
<td></td>
<td>Evaporation: 1800-2500 mm per annum</td>
<td></td>
<td>and spring water but low quality</td>
<td>sloping</td>
</tr>
<tr>
<td></td>
<td>Temperature: 27-38 o C</td>
<td></td>
<td>borehole</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Muya et al (2009)*
The pulses tested were beans, cowpeas and green grams (Table 2).

Table 2: Different variety of pulses tested

<table>
<thead>
<tr>
<th>Crop category</th>
<th>Crop</th>
<th>Varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulses</td>
<td>Beans</td>
<td>Bean 1, Bean 9</td>
</tr>
<tr>
<td></td>
<td>Cowpeas</td>
<td>M66, KVU 27-1, KVU-419, K80</td>
</tr>
<tr>
<td></td>
<td>Green grams</td>
<td>N26</td>
</tr>
</tbody>
</table>

The research interest involved the yield of the pulses tested, the community’s preference and the gross margins of the different pulses.

To gauge the performance of the different pulses in terms of grain yield a randomized complete block design was used where each pulse variety was replicated 3 times in each of the trial farms. In each site 5 farmers tried the crops. Each plot was 12 meters by 6 meters and data was collected for the whole plot. Yield data was collected by a team of technical officers at the end of each season.

To determine the community preferences of the different varieties, the trial farmers and their neighbours were brought together in meetings where they listed the criteria they felt were most important when selecting a variety. Using pair wise ranking they determined the most important criteria and based on this criteria pair wise ranking was used to rank the pulse crops (Mugenda and Mugenda, 2003).

Gross margins were established using a socio-economic survey where all the trial farmers from each of the sites were interviewed to establish the quantity of inputs they used in the production process and the marketability of their varieties (Firth, 2009). Information on the outputs was obtained from the experimental data. Non-trial farmers were also interviewed on the inputs they used on their pulses and output determined from their own harvest and local market price. This was to compare the gross margin of experimental plot and the farmers own land.

Results and Discussion

Grain yield across sites

The three pulse crops tested performed best in irrigated lowland and Mountains. There was no significant difference in yield between lowlands (Oasis) and mountains \((P=0.0001)\). However, all the tried pulses had poor yield in the foot slopes zone. This is attributed to soil disturbance mainly...
through erosion and lack of water conservation structures resulting to high evaporation and subsequently water deficit. Poor soil conditions in the foot slopes areas of northern Kenya have been reported by Muya, et al., 2011. Beans were highest yielding while green grams were lowest yielding across the sites. Similar results on beans have been reported in Kenya (Pilbeam et al., 1994; Okoko et al., 2005). Cowpeas and green grains were affected severely by sucking pest mainly aphids especially in foot slopes and irrigated lowlands. This impacted negatively on the size of the yield of cowpeas and green grams (Fig.2).

![Fig. 2: Yield of different pulses in different sites](image1)

**Community ranking**
The community ranking determined from the weighted score depended on yield, drought tolerance, pest tolerance and the marketability. This is summed up as a popularity score (Fig.3). The study showed that beans were the most popular pulse across the three sites. Additionally, bean pulse is most popular in foot slopes and mountains than in irrigated lowland zones. The high popularity of bean pulse is attributed to its better marketability both locally and at international geographical levels. Additionally, the communities leaving in these zones are commonly eating Githeri, which is mixture of beans and maize. This makes beans a
component of staple food in the study areas. Opole et al., 2003, also found the importance and popularity of bean crop in western Kenya.

**Fig. 3: Weighted score of the pulses in the 3 arable zone types.**

**Gross margins (Grain only)**
The green grams had the highest gross margin despite having the lowest yield (Fig. 4). The highest economic returns on the green grams are manifested both in local farmer practice and optimal management methods. It was also noted that there is potential to increase the economic returns of the green grams in the zones. This can be achieved with appropriate agronomic practices. Similar result has been reported in the arid and semi-arid northern Kenya (Ngutu et al., 2011).

**Fig. 4: Gross margins of the pulses**
AFMA Conference

Conclusions and Recommendations
The pulses (Beans, Cowpeas, Green grams) performed well in lowlands and mountains but poorly in foot slopes. Beans were the most preferred and the common pulse crop variety. Green grams had the highest gross margin. It is recommended that Green grams should be pursued for the purpose of commercialization while beans and cowpeas for food security in mountains and lowlands areas of northern Kenya.
References


