SORGHUM PRODUCTION IN TANZANIA: NICHE MARKET OPPORTUNITIES FOR SMALLHOLDER FARMERS.

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Introduction

- Grain sorghum is a major crop in many parts of Africa and is noted for its versatility and diversity.
- It is mainly used for human consumption as malt, sorghum meal and sorghum rice. Malt is used for the manufacture of beer.
- Small-scale farmers in Tanzania produce sorghum on a subsistence basis with an average yield less than 1,000 tons/year, an amount considered too little to sustain an average farm family for 12 months.
- Sorghum is produced on 663,000 ha in the southern region, which represents 21% of the total cereal area in the country.
Problem statement and justification

- Sorghum is thinly traded due to low production volumes and poor marketing channels that discourage farmers from investing their income and energy in sorghum production.

- Farmers suffer from lack of a commercialized market and households consume more than 95% of the harvest. Margins between wholesale and retail prices are relatively high.

- This study, therefore, was designed to assess the underlying reasons why farmers hesitate to market their sorghum and/or its products in community settings, especially when an enabling policy environment, credit and infrastructure exist.
Objectives

General objective

- To assess the underlying reasons that hinder farmers from marketing their sorghum or its products in community settings.

Specific objectives

- To identify sorghum constraints and opportunities for value addition or diversification of sorghum products.
- To determine a resource optimization model for profitable sorghum production under smallholder farming using mathematical modeling.
Methodology

- A mathematical optimization farm model specifically a disaggregated static farm model, was used for this study.

- This kind of linear programming model is designed to determine the values for the decision variables that result in a maximum profit as defined by the objective function.

- The objective function was set to maximize profit given the expected operations and their variable costs. The model was setup and solved using Microsoft Excel™ and Frontline Systems ASPE.

- A total of 210 respondents (sorghum growers, village extension officers and wholesale buyers from nearby markets) were interviewed from three regions: Kilimanjaro, Singida and Dodoma.
Data collection and analysis

- Semi-structured questionnaires were administered to randomly selected respondents.
- Data entry and preliminary analysis were done using Microsoft Excel™.
- The study used descriptive statistics, including means, frequencies, minimum, maximum and standard deviations, in order to show the distribution of household characteristics and market constraint variables.
- Field data were also used to identify resources used by given farmers in setting constraints to solve for an optimal solution in Microsoft Excel solver.
Findings

Market constraints faced by sorghum growers at all three sites
Findings cont..

Sorghum current market performance

- Summing data across all three sites, 85% of all 210 participants reported that they find the sorghum market to be very difficult and characterized by very low prices.

- The low market prices have contributed to the demoralization of farmers and the decrease in sorghum production at all three study sites.

- Given the difficulties faced by farmers in marketing their sorghum harvests, it is logical to assume that most will decide to shift their production focus to other crops, especially sunflowers, so as to be able to make a profit and improve their living standards.
Findings cont..

Value addition and market opportunities

- No sorghum value added products are being produced.

- There is little knowledge about how to add value to produce and above all there are no processors in any of the six villages visited.

- Respondents claim to sell their sorghum without either processing or adding of any value.

- None of the respondents participate in any community market activities for sorghum, including market niches, which were not identified in any of the villages participating in the study.
Findings cont..

A Mathematical Optimization Model

The maximization equation: \[ \text{Max } Z = 16mm + 40msf + 35ms - 9plh - 40pla - 37.5plt - 30pm - 33.6psf - 27.6ps - 60wm - 40wsf - 40ws - 30hm - 36hsf - 30hs - 5hl \]

Table 1: Expected labor requirements and their costs per acre

<table>
<thead>
<tr>
<th>Activity</th>
<th>Labor/hr.</th>
<th>Variable cost ($)</th>
<th>Fixed costs ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>plh-plow hoe</td>
<td>0.6</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>pla-plow animal</td>
<td>2</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>plt-plow tractor</td>
<td>1.5</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>pm-planting maize</td>
<td>1.2</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>psf-planting sunflower</td>
<td>1.2</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>ps-planting sorghum</td>
<td>1.2</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>wm-weeding maize</td>
<td>2</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>wsf-weeding sunflower</td>
<td>2</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>ws-weeding sorghum</td>
<td>2</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>hl-hired labor</td>
<td>1</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>hm-harvesting maize</td>
<td>2</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>hsf-harvesting sunflower</td>
<td>2</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>hs-harvesting sorghum</td>
<td>2</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>
Findings cont..

The figures used in this model are average costs to produce sorghum, maize and sunflower in all three regions.

- The optimum solution (from excel solver) shows that a farmer’s maximum profit will be at $3,340.

- To get this profit a farmer is required to use animal labor for farming activities and also plant only sunflower on all 10 acres of land.

- It also shows that it will be better if a farmer does not weed sunflowers, as the cost is higher than its contribution to profit.
Conclusions

- Sorghum markets continue to deteriorate instead of improving and farmers have now shifted their focus from growing sorghum to other crops, particularly sunflower and maize.

- Niche market opportunities for sorghum were not observed as there is no value addition activity for sorghum and farmers do not engage themselves in community market activities.

- Optimization model data indicate that farmers will profit more from growing sunflowers and animals for cultivation purposes. Most farmers reported using hand hoes. However, in Moshi DC, most used tractors. This suggests that production costs will ultimately exceed profits.
Recommendations

- There is need to sensitize farmers on effective utilization of resources available to them based on pre-calculated maximum profits that can be earned by investing on certain crops rather than just producing traditionally.

- More training on the importance of sorghum production together with product value addition given the rapid changes in climatic condition and the need to eat healthier gluten free and low sugar foods.

- There is a need to assess existing national agricultural policies and priorities.
Thank you.