RESPONSE OF LIVINGSTONE POTATO (PLECTRANTHUS ESCULENTUS) TO DIFFERENT NPK 15:15:15 FERTILIZER RATES

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ABSTRACT

This study examined the response of Livingstone Potato (Plectranthus esculentus) to different rates of NPK 15:15:15 Fertilizer. The work was done during 2005 and 2006 cropping seasons. The experiment was laid out in split-plot design with three replications. Plant spacing of 100 cm x 50 cm was used. Four different NPK 15:15:15 fertilizer rates were used in the study at 0, 200, 400, 600 kg/ha respectively. Total harvest was calculated from each unit plot and converted to per hectare yield. The highest average yield (6.41 t/ha) was obtained from 200 kg/ha which was closely followed by 0 kg/ha (6.06 t/ha). Average yield (5.88 t/ha) was recorded from 400 kg/ha fertilizer rate. The lowest average yield (5.46 t/ha) was recorded from 600 kg/ha fertilizer rate. It is therefore suggested that NPK 15:15:15 fertilizer application rate at 200 kg/ha is economically suitable for Livingstone Potato production in Umudike.

Key words: Livingstone Potato, Soil fertility, Economic performance

INTRODUCTION

All activities of crop improvement and productivity are geared towards improving economic and financial analyses. Economic analysis refers to benefit derivable from a project by the whole nation while, financial analysis refers to benefit derivable to an investor or group of investors. Agricultural production economics involves analysis of production relationships and principles of rational decisions in order to optimize the use of farm resources on individual farms and to rationalize the use of inputs from the nation’s point of view (Subba Reddy et al, 2004). Despite the dominance of the petroleum sector, agriculture remains the mainstay of Nigeria’s economy. Agriculture is the largest non oil export earner and the largest employer of labour accounting for 88 per cent of the non oil foreign earnings and 70 per cent of the active labour force of the population (FGN 2001).

The future of agricultural production in the southern part of Nigeria depends on the development of systems that would stabilize short fallows and thus improve soil productivity. Such a system could be achieved through the application of fertilizer. The addition of nutrient input from inorganic fertilizer should however be based on the result of scientific investigations since indiscriminate fertilizer use would cause nutrient imbalance in the soil (Ano and Orkwor, 2006).

Obigbesan and Agboola (1978) reported that an average of 155 kg N, 12.2 kg P, 176 kg K, 3.9 kg Ca and 10.7 kg Mg per hectare are lost from the soil when a tuber crop such as yam (Dioscorea spp) was harvested and taken out of the farm. In the time past the lost nutrients are replenished through long falling (Agboola and Unamma, 1994). Fallow periods are now very short and most often non-existent especially in the southern part of Nigeria where population density is high (Ano and Orkwor, 2006). Ano (1990), reported that the soil of the experimental site is strongly weathered and of low nutrient status.

The significance of major root and tuber crops such as cassava, sweetpotato, potato, yam and cocoyam in the diet of people of sub-Saharan Africa can not be overemphasized. However, the
contribution of other minor root and tuber crops such as Livingstone Potato (Plectranthus esculentus), turmeric (Curcuma longa Linn), and Hausa potato (Solenostemon rotundifolius Poir) should not be underestimated. These are three of the minor root and tuber crops currently receiving research attention in National Root Crops Research Institute, Umudike, Abia State.

Livingstone Potato (Plectranthus esculentus) is a dicotyledonous perennial shrub belonging to the family Labiatae (Purseglove, 1968). The shrub grows to approximately 0.6 m to about 2 m in height (Schippers, 2000; Tredgold, 1986). It is propagated vegetatively using tubers. The tuber pieces are principally obtained from previous harvest and through farmer-to-farmer exchange. Planting of seed tubers takes place as early as April at the onset of the rainy season. Harvesting is done 6-7 months after planting. Livingstone Potato (Plectranthus esculentus) also known as Rizga, Nvat, Vu, Sima or Rungbabi is one of the edible indigenous tuber crops commonly grown in some states in the middle belt of Nigeria (Schippers, 2000; Olojede et al., 2005). It plays a significant role in the food systems of the people in this region. Livingstone Potato (Plectranthus esculentus) could become one of the important tuber crops of the people in this region if its production is expanded. The tuber is either eaten raw as snack after peeling and washing or boiled and eaten with rice, while the leaves are also consumed as vegetables (Demissie, 1997; Olojede et al., 2005).

Despite its acceptance, and nutritional value (Alleman, 1996), the crop has received little or no attention from researchers in Nigeria, and consequently its potential is being underexploited. Farmers growing this crop follow indigenous methods which resulted in relatively low yield. The reason behind such low yield is due to lack of high yielding variety and method of production practices adopted by local farmers. The yield of Livingstone Potato can be increased by adopting improved production technologies such as application of NPK 15:15:15 fertilizer at recommended rates. Although, it has the potential of contributing to food security and diversification of the local food base, its production technologies have not been standardized from scientific and economic points of view.

Therefore, research needs to bring improvement in production technologies as well as considering economic returns for a crop that provides income-generation opportunities for rural people of the middle belt of Nigeria, especially women who are actively involved in the cultivation and marketing of this crop (Olojede et al., 2005). The objective of this study was to ascertain the economics of Livingstone Potato production under different rates of NPK 15:15:15 fertilizer in Umudike.

METHODOLOGY

The study was conducted at research farm of National Root Crops Research Institute, Umudike, Nigeria (05o 29'N, 07o 33'E). The soil was an Ultisol and had a pH in water of 5.2, 1.47% organic matter, 0.10% total nitrogen, 4.5Mgkg⁻¹ Bray IP and effective cation exchange capacity (ECEC) of 4.5cmolkg⁻¹ (Ayo 2006). The experiment was laid out in split-plot design with three replications. Plant spacing of 100 cm x 50 cm was used. The experiment was distributed in split plot with three dispersed replications.

The unit plot size was 6 m x 3 m. Plant spacing was 100 cm x 50 cm. The seed tuber of Livingstone Potato (6-10g) was planted on 11-15 May 2005 and 2006 respectively. The variety planted was Loangat. Fertilizer was applied at 8 weeks after planting. Weeding was done twice. Monthly rainfall data for both years were 2081.8mm and 2038.2mm respectively. Data were collected on labour (man days), planting materials (₦ t/ha), yield (t/ha), fertilizer requirements (₦ kg/ha), total cost of production (₦ t/ha), opportunity cost of cost items (%), depreciation of cost of capital items (₦). Total harvest was
calculated from each unit plot and converted to per hectare yield. Data were analyzed using costs and returns analysis (Okezie and Amaefula, 2006) specified as:

\[ GM = GR - TC \]

Where, GM = gross margin, GR = gross return, TC = total cost

BCR = benefit cost ratio.

RESULTS AND DISCUSSION

The highest total cost (₦209, 408.76/ha) was obtained where 600 kg ha\(^{-1}\) NPK 15:15:15 fertilizer rate was used. The lowest total cost (₦138,965.40/ha) was recorded where NPK 15:15:15 fertilizer was not applied. The highest average yield (6.41 t/ha) was obtained at 200 kg ha\(^{-1}\) fertilizer rate which was closely followed by 0 kg ha\(^{-1}\) (6.06 t/ha) fertilizer rate. Average yield (5.88 t/ha) was recorded at 400 kg ha\(^{-1}\) fertilizer rate. The lowest average yield (5.46 t/ha) was recorded at 600 kg ha\(^{-1}\) fertilizer rate. The result obtained when 200 kg ha\(^{-1}\) was used is in consonance with a similar work reported by Ano and Orkwor (2006). The result also showed no significant difference between the yields obtained when NPK 15:15:15 fertilizer was applied at both 400 kg ha\(^{-1}\) and 600 kg ha\(^{-1}\) respectively. Highest gross margin (₦76,134.60) and benefit cost ratio (1.80) respectively were recorded at 0 kg ha\(^{-1}\) of NPK 15:15:15 fertilizer rate. This was probably because costs of fertilizer requirements (₦/kg/ha) and application (man day) were not added to the total cost of production at this rate. Gross return (₦224,350.00/ha), benefit cost ratio (1.60) and return per naira (61%) were recorded respectively. Return per Naira (61%) implies that the farmer could recover ₦0.61 for every ₦1.00 invested in the production of Livingstone Potato using this population density.

<table>
<thead>
<tr>
<th>Fertilizer Rates (kg ha(^{-1}))</th>
<th>Yield (t/ha)</th>
<th>Total cost (₦/ha)</th>
<th>Gross return (₦/ha)</th>
<th>Gross margin (₦/ha)</th>
<th>Return/Naira (%)</th>
<th>Benefit-cost ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>6.06</td>
<td>138,965.40</td>
<td>212,100.00</td>
<td>76,134.60</td>
<td>83</td>
<td>1.80</td>
</tr>
<tr>
<td>200</td>
<td>6.41</td>
<td>167,631.00</td>
<td>224,350.00</td>
<td>56,719.00</td>
<td>61</td>
<td>1.60</td>
</tr>
<tr>
<td>400</td>
<td>5.88</td>
<td>179,631.00</td>
<td>205,800.00</td>
<td>26,169.00</td>
<td>38</td>
<td>1.40</td>
</tr>
<tr>
<td>600</td>
<td>5.46</td>
<td>209,408.76</td>
<td>191,100.00</td>
<td>-18,308.76</td>
<td>9</td>
<td>1.10</td>
</tr>
</tbody>
</table>

*Note:*
Price of inputs:
Labour: ₦200.00/manday; NPK 15:15:15 fertilizer: ₦50.00/kg; Livingstone Potato (seed): ₦30.00/kg; Primextra ₦1,560.00/lt; Gramoxone ₦920.00/lt
Price of output: Livingstone Potato: ₦35.00/kg

CONCLUSION

This study was carried out with a view to know the economics of producing Livingstone Potato under different NPK 15:15:15 fertilizer rates. Though, yield results for both years were observed to be agronomically significant, it may be concluded that planting Livingstone Potato (Plectranthus esculentus) at NPK 15:15:15 fertilizer rate of 200 kg ha\(^{-1}\) in Umudike may be economically viable while application of NPK 15:15:15 fertilizer at both 400 kg ha\(^{-1}\) and 600 kg ha\(^{-1}\) may result into economic waste of scarce resources. Thus, application of NPK 15:15:15 fertilizer rate at 200 kg ha\(^{-1}\) to Livingstone Potato (Plectranthus esculentus) may allow farmers in the rural areas have profitable returns on investment in the cultivation of this under-exploited crop. This may perhaps have multiplier effects on the development of the rural areas.
REFERENCES


