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RESPONSE OF HAUSA POTATO (*Solesnostemon rotundifolius* Poir) TO DIFFERENT NPK 15:15:15 FERTILIZER RATES IN NRCRI, UMUDIKE,ABIA STATE, NIGERIA

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ABSTRACT
The study examined the response of Hausa potato (Solesnostemon rotundifolius Poir) to different rates of NPK 15:15:15 fertilizer. The work was carried out during 2005 and 2006 cropping seasons. The experiment was laid out in split-plot design with three replications. Plant spacing of 100cm x 50cm was used. Four different rates (0,200,400 and 600 kgha^{-1}) of NPK 15:15:15 fertilizer were used in the study. Total harvest was calculated from each unit plot and converted to per hectare yield. The highest average yield (3.81t/ha) was obtained at 200kgha^{-1} fertilizer rate. This was followed by 0kgha^{-1} (3.54t/ha).Average yield (3.23t/ha) was recorded at 400kgha^{-1}fertilizer rate. The lowest average yield (2.56t/ha) was recorded at 600kgha^{-1}fertilizer rate. Gross return (₦230,100.00/ha) benefit cost ratio (1.40) implies that it is profitable to cultivate Hausa potato in Umudike with the application of NPK 15:15:15 fertilizer at the rate of 200kgha^{-1}.

Key words: Hausa potato, NPK fertilizer, Gross return, Benefit cost ratio

INTRODUCTION
Agriculture produces the necessary food for the world's populations under both rainfed and irrigated conditions (Appelgren and Klohn, 2001). Agriculture is the activity most essential for human survival. It feeds people, produces basic commodities for society and provides gainful employment for the majority (Ojemade, 2007). Nigeria, like any other typical African country, is an agrarian economy in which agriculture and agro-allied enterprises are the most popular income-generating activities providing employment for up to 90% of the rural dwellers (World Bank, 1993).

Despite the dominance of the petroleum sector, agriculture remains the mainstay of Nigeria's economy. Majority of Nigerians rely on agriculture for their livelihood. It is increasingly evident that improved agricultural development and growth can offer a pathway from poverty, but evidence-based policies and strategies are needed (Fan *et al.*, 2008). Nigerian agriculture is dominated by the small scale farmers who produce the bulk of food requirements in the country. Despite their unique and pivotal position, the small holder farmers belong to the poorest segment of the population and therefore, cannot invest much on their farms (Asogwa *et al.*, 2006).

The important benefits of the agricultural sector to Nigerian's economy include: provision of food, contribution to the Gross Domestic Product (GDP), provision of employment, provision of raw materials for agro-allied industries and generation of foreign exchange. Agricultural exports were the main source of foreign exchange earnings until the early 1970s (Oni *et al.*, 2009). According to WCED (1987), the problem of degradation and low resource productivity in many developing countries are closely interrelated. The long time needed for regenerating natural resources once degraded and persistent economic hardship in many African countries because of increased population pressure has made natural resource degradation a common phenomenon among small holder farmers as they try

to escape from the scourge of poverty. 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).

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 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 155kgN, 12.2kgP, 176kgCa and 10.7kgMg 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 fallowing (Agboola and Unamma, 1994).Fallow periods are now very short and most often non in existence especially in the southern part of Nigeria where population density is high (Ano and Orkwor, 2006). Ano (1990) reported that 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 should not be under estimated. Hausa potato (S*olesnostemon rotundifolius* Poir) is a small herbaceous annual crop with prostrate or ascending succulent stem and branches. The crop is popular in the middle belt region of Nigeria especially in Kaduna, Adamawa, Plateau, Nassarawa and Taraba States where it is known as *beku, tumuku, hyare, nvu, gamin, ngo and fugi* (Olojede *et al,*2005) 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 Hausa potato can be increased by adopting improved production technologies. It has the potential of contributing to food security and diversification of the local food base.

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 broad objective of this study was to ascertain the economics of Hausa potato (S*olesnostemon rotundifolius* Poir) production under different rates of NPK 15:15:15 fertilizer in Umudike.

METHODOLOGY

The study was conducted in at the research farm of National Root Crops Research Institute, Umudike, Nigeria (05^{o} 29'N, 07^{o} 33'E). The soil was an Ultisol and had a pH in water of 5.2,1.47 per cent organic matter, 0.10 per cent total nitrogen, 4.5Mgkg^{-1} Bray IP and effective cation exchange capacity (CEC) of 4.5cmolkg^{-1} (Ano, 2006). The experiment was laid out in split-plot design with three replications. The unit plot size was 6m x 3m. Plant spacing of 100cmx 50cm was used. The experiment was distributed in split plot with three dispersed replications.

The seed tuber of Hausa potato (6-10g) was planted between 11 – 15 May 2005 and 2006 respectively. Fertilizer was applied 8 weeks after planting. Weeding was done twice. Monthly rainfall data collected from the meteorology unit of the Institute 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 (₦/t/ha), opportunity cost of cost items (%), depreciation of cost of capital items (₦). Total harvested 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 (₦206,297.95t/ha) was obtained where 600kgha^{-1} NPK 15:15:15 fertilizer rate was used. The lowest total cost (₦140,075.72t/ha) was obtained where NPK 15:15:15 fertilizer rate was not applied. The highest average yield (3.81t/ha) was obtained at 200kgha^{-1} fertilizer rate. The result obtained when 200kgha^{-1} fertilizer rate was used is in tandem with a similar work reported by Ano and Orkwor (2006); Dhliwayo (2004) and Islam *et al* (2002) which reported highest yield with the application of NPK 15:15:15 fertilizer. Average yield (3.23t/ha) was recorded at 400kgha^{-1}fertilizer rate. The lowest average yield (2.56t/ha) was recorded at 600kgha^{-1}fertilizer rate. Highest gross margin (₦ 73,024.32) and benefit cost ratio (1.40) respectively were recorded at 200kgha^{-1} NPK 15:15:15 fertilizer rate. Meanwhile, gross margin (₦72,774.28) and benefit cost ratio (1.52) respectively were recorded at 0kgha^{-1} NPK 15:15:15 fertilizer rate. This result was expected because costs of fertilizer requirements and application were not included in the total cost of production at this rate. This may perhaps be an incentive to farmers who cannot invest much on their farms (Asogwa *et al.,* 2006).

Table 1: Economic performance of Hausa potato production under different NPK 15:15:15 fertilizer rates in Umudike

Fertilizer rates (kgha^{-1})	Yield (t/ha)	Total cost (₦/ha)	Gross return (₦/ha)	Gross margin (₦/ha)	Benefit cost ratio (BCR)
0	3.54	140,075.72	212,850.00	72,774.28	1.52
200	3.81	157,075.68	230,100.00	73,024.32	1.40
400	3.23	188,297.90	209,950.00	21,652.10	1.12
600	2.56	206,297.95	166,400.00	-19,897.95	0.90

Source: Field Data 2005/2006

Gross return (₦230,100.00/ha) benefit cost ratio (1.40) implies that it is profitable to cultivate Hausa potato in Umudike with the application of NPK 15:15:15 fertilizer at the rate of 200kgha^{-1}. Furthermore, the result showed that Hausa potato could also be cultivated profitably when fertilizer is either scarce or highly priced in the study area.

CONCLUSION

This study was carried out to evaluate the response of Hausa Potato to different NPK 15:15:15 fertilizer rates with a view to know the economic implications. The yield for the two years were seen to be non significant as the fertilizer rates increased from 0kgha^{-1} to 200kgha^{-1}.However, there was a significant difference when the increase was between 200kgha^{-1} to 600kgha^{-1} with negative gross margin with the application of 600kgha^{-1}. It therefore showed that Hausa potato could be grown profitably in a place where fertilizer is either available or highly priced.

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