Impact of National Root Crops Research Institute (NRCRI) on Yam Production in Umuahia Agricultural Zone, Abia State, Nigeria

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Abstract

The study assesses the impact of National Root Crop Research Institute (NRCRI) on yam production in Umuahia Agricultural Zone, Abia State, Nigeria. Specifically, it described socio-economic characteristics of yam farmers, identified yam production technologies (developed by NRCRI) disseminated to yam farmers by EAs, (by National Root Crop Research Institute), determined level of adoption of yam production technologies developed by NRCRI by yam farmers, identify constraints to use of National Root Crop Research Institute yam production technologies by yam farmers. Multi-stage random sampling technique was used to select 120 yam farmers from whom data were elicited using interview scheduled. Data were analyzed with descriptive statistics such as frequencies, means, tables, and percentages, adoption scale analysis, paired-t-test analysis. Result showed that mean age of the yam farmers was 50 years. Also, majority (86.7%) of the yam farmers were males. The mean household size was 6 persons. Result on regularity of extension contact showed (41.7%) of the yam farmers had no extension contact, 35.8% of them had less regular extension contacts, (80.8%) and (80.0%) of the respondents were using NRCRI UMUDr-17 (TDr 95/19177) and UMUDr-19 (TDr 89/02475) improved varieties respectively. Result on level of adoption of Yam production technologies developed by NRCRI showed that use of UMUDr-17 (TDr 95/19177) (3.18), Mini-sett technology of rapid multiplication of seed yams (3.07), use of TDr 89/02565 (3.05), use of UMUDr-19 (TDr 89/02475) (3.03) and recommended land preparation and cultural practices in yam cassava based intercrop (3.01) all had mean score values that are greater than the Likert critical score of (3.0). Three foremost problems constraining adoption of NRCRI yam production technologies in the area as reported by the yam farmers are inadequate information on NRCRI yam production technologies (85.0%), low access to credit (75.8%) and lack of fund to invest on NRCRI yam technologies (81.7%). The study recommended awareness creation in the use of the various NRCRI yam production technologies by extension agencies as a necessary step to achieve increased cultivation and production of yam. Consequently, the study recommends vigorous sensitization of farmers on the benefits of adoption of NRCRI yam production technologies.

Keywords: National Root Crop Research Institute, Impact, Yam Production, Nigeria.

Introduction

National Root Crop Research Institute (NRCRI) was established with the mandate to research into genetic improvement of root and tuber crops including yam and problems encountered in root and tuber crop production. Due to the constraints in yam production, NRCRI developed technologies used in yam production. NRCRI objectives are to develop new varieties of yam, with desired agronomic and quality traits and also to improve yam based cropping system. Important yam production technologies developed and transferred by NRCRI include: Mini-sett technology of rapid multiplication of seed yams which was developed by the National Root Crop Research Institute Umudike in collaboration with International Institute of Tropical Agriculture (IITA),
Ibadan for production of healthy seed yams and also to reduce inadequate supply and dearth of high quality and disease-free seed yams for yam production. There is also the introduction of vine cutting technology as a better means of production of seed yams [1].

The technology requires the use of synthesized auxins which makes adoption of the vine cutting technology by farmer in developing countries, such as Nigeria difficult [2]. The NRCRI has also introduced various high yielding, pest and disease resistant yam varieties such as: TDr89/02565, TDr89/02677, TDr89/02461, TDr89/02665, TDr89/01438, TDr89/01213, TDr89/01924, DrN 200/412, TDa 98/01166, TDa 98/01168, TDa 98/01176, TDr89/02660, TDr89/02602, TDr95/10158, TDr00/000104, UMUDr-17 (TDr 95 / 19177), UMUDr-19 (TDr 98/ 02475), UMUDr-6 (TDr 00 / 00364). Yams (Dioscorea species) are annual root tuber bearing plants with more than 600 species out of which six are socially and economically important in terms of food, cash and medicine [3].

Yam (Dioscorea spp) is one of the principal tuber crops produced in large quantities in Nigeria. The common yam species grown in Nigeria are white yam (Dioscorearotundata), water yam (Dioscoreaalata), yellow yam (Dioscoreacayanensis), three leaf yams (Dioscorea dumentorum) and aerial yam (Dioscoreabulbifera). The crop constitutes a major staple food for the Nigerian population contributing about 20.0% of the daily calorie intake of the people [4]. It is widely appreciated for its taste and cultural roles [5].The crop is grown throughout Africa with Nigeria producing over 65.0% of the total world production of yam [6-7-4]. In 2011, world production figure rose to 56 million tones with Nigeria producing about 37 million tones representing 67.0% of world production [8].

The Federal Ministry of Agriculture and Water Resources [9] reported that all the states in the Federation produce yam. However, the major yam producing areas in Nigeria include: South Eastern parts of the country (Abia, Anambra, Ebonyi, Enugu and Imo), the middle belt (Benue, Nasarawa, Kwara, Kogi and Niger) and South Western parts. According to Bababeye [10], yam contributes more than 200 dietary calories per capita daily for more than 150 million people in Nigeria while serving as an important source of income to the people. However, since yam remains a major staple food in Nigeria based on its cultural role [11], contributing immensely to rural and regional economies [12] and its significance among the food crops in Nigeria.

Materials and Methods

The study was carried out in Umuahia North Local Government Area (L.G.A) of Abia State. Umuahia North L.G.A is made up of two clans namely, Ibeke and Ohuhu consisting many communities. These communities are Isieke, Emede, Afaranta, Afaraukwu, Osah, Ndume, Amao for, Nkwoachara, Nkwoegwu, Umuhu and Isingwu. The farmers usually grow food crops such as yam, cocoyam, maize, vegetable, cassava, melon, pepper and cash crops, such as oil palm trees and cocoa are also available in the L.G.A. In the first stage 4 extension circles were selected at random.

In the second stage, 3 extension sub-circles were selected from each circle, making a total of 12 sub-circles. Finally, 10 yam farmers were randomly selected from each of the 12 sub-circles, giving a total of 120 yam farmers. Primary data were collected following a field survey using semi-structured questionnaire. Secondary information was collected from bulletins of the National Root Crops Research Institute.

Descriptive statistics such as means, percentage and frequency distribution, a seven point likert scoring, adoption scale analysis and paired t-test analysis were used for the analysis of the data. The level of adoption of NRCRI disseminated yam production technologies was determined using adoption score index. It was achieved with aid of a 7 point likert scale graded thus: unaware = 0, Aware = 1, interest = 2, evaluation= 3 trial = 4, accept = 5 and reject = 6. In accordance with Okoyeet al., [13] the mean adoption level was determined as follows:

$$X_s = \frac{\Sigma x}{n}$$

Mean score was computed by multiplying the frequency of each response pattern with its appropriate nominal value and dividing the
same with the number of respondents to the terms. This is summarized with the equation below.

$$X_2 = \sum fn/nr$$

Where;

- $X_2$ = Mean score
- $\Sigma$ = Summation
- $f$ = Frequency
- $n$ = Likert nominal value
- $nr$ = number of respondents

$$X_2 = 0 + 1+2+3+4+5+6 = 21 = \frac{3.0}{7} = 0.7$$

**Decision Rule**

Less than 1.0 = Unaware stage of the technology

1.0 – 1.49 = Awareness stage of the technology

1.5 – 1.99 = Interest stage of the technology

2.0 – 2.49 = Evaluation stage of the technology

2.50 – 2.99 = Trial stage of the technology

3.0 And above = Adopting of the technology

The paired treatment test was used to determine effect of adoption of NRCRI yam Production, technologies on yam production. This is stated implicitly following Emerole, Et al [14].

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

$$n_1 + n_2 - 2 \text{ degree of freedom}$$

Where;

- $t$ = Student “t” statistic

$\overline{X}_1$ = Sample mean of farm size, yam output, fertilizer use levels and household monthly expenditure of yam farmers adopters of NRCRI yam production technologies.

$\overline{X}_2$ = Sample mean of farm size, yam output, fertilizer use levels and household monthly expenditure of yam farmers non-adopters of NRCRI yam production technologies.

$S_1^2$ = Sample variance of farm size, yam output, fertilizer use levels and household monthly expenditure of yam farmers adopters of NRCRI yam production technologies.

$S_2^2$ = Sample variance of farm size, yam output, fertilizer use levels and household monthly expenditure of yam farmers non-adopters of NRCRI yam production technologies.

**Results and Discussion**

The Result of Socio Economic Characteristics of the Respondents

Result showed that mean age of the yam farmers was 50 years. This corroborates the findings of that got mean age of 52 years and 53 years among yam farmers in Delta and Kogi States respectively.

This finding indicates low involvement of youths in yam production and agrees with Osondu and Ibezim [15] Okoronkwo et al, [16] and Dankyang [17] assertion that most youths in Nigeria have left agriculture in favour of employment in non-agricultural sector. Majority (86.7%) of the yam farmers were males. About 13% of the yam farmers in the study area were females. This shows the overwhelming dominance of yam production in the study area by males. Nlerum [18] Orewa and Izekor [4] and Zaknayiba and Tanko [19] noted that yam production in many parts of Nigeria was dominated by males. This could be attributed to the energy demanding activities involved in yam production which require men who are naturally endowed with abundant strength necessary for such jobs [20].

The mean household size was 6 persons. This result indicates that many of the yam farmers had moderate household sizes. This is good because household members help in works in the farm enterprise, and thus reduce cost of hired labour [21].

This finding closely supports Oluwatusin [22] that reported a mean household size of 7 persons per household for yam farmers in Osun State. Furthermore, the mean years of experience in yam production was 16 years. This indicates that the respondents are well versed in the enterprise and are likely to adopt new technology if opportunity comes.
High experience in yam production enterprise would enhance the respondents’ ability for efficient management practices that will ensure increased productivity, all things being equal. According to Olomola [23] farmer’s years of experience impacted positively on their productivity and efficiency due to prudent allocation of resources overtime arising from acquired practical knowledge through trial and error over time.

However, experience can sometimes become a limiting factor to production improvement as farmers become set in their ways and could refuse to change and take advantage of new ideas on production [24]. 88.3% of the respondents had formal education. According to Nwaru [21] education and training are of utmost importance in any attempt to enhance farmers’ capabilities to understand and accept technological innovations in economic activities that lead to increased and sustainable agricultural production. 60.8% of yam producers and processors did not have access to credit, while 39.2% of them had access to credit. This means that the level of the respondent’s access to credit was low. The low access to credit among the respondents is a disadvantage in increasing scale of production/processing, which leads to low capital formation. According to Ijere [25] credit is a catalyst that activates other factors of production and makes under-used capacities functional for increased production.

### Table 1: Distribution of the yam farmers according to regularity of extension Contact

<table>
<thead>
<tr>
<th>Extension contact</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No extension contact</td>
<td>50</td>
<td>41.7</td>
</tr>
<tr>
<td>Less regular extension contact</td>
<td>43</td>
<td>35.8</td>
</tr>
<tr>
<td>Regular extension contact</td>
<td>16</td>
<td>13.3</td>
</tr>
<tr>
<td>Very regular extension contact</td>
<td>11</td>
<td>9.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>120</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Source: Field Survey, 2016

Table 2. Showed that 41.7% of the yam farmers had no extension contact, 35.8% of them had less regular extension contacts, 13.3% of the yam farmers had regular extension visits and 9.2% of them had very regular contact with extension agents. The more the regularity of extension contacts between farmers and extension agents the more the farmers’ awareness of recommended practices. Frequent extension contact is likely to minimize doubts among farmers.

### Table 2: Distribution of respondents according to NRCRI yam production technologies extended to them

<table>
<thead>
<tr>
<th>Technology items</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved yam varieties</td>
<td>89</td>
<td>74.2</td>
</tr>
<tr>
<td>UMUDr-17 (TDr 95/19177)</td>
<td>97</td>
<td>80.8</td>
</tr>
<tr>
<td>UMUDr-19 (TDr 89/02475)</td>
<td>96</td>
<td>80.0</td>
</tr>
<tr>
<td>TDr 89/02565</td>
<td>81</td>
<td>67.5</td>
</tr>
<tr>
<td>TDr 89/02677</td>
<td>85</td>
<td>70.8</td>
</tr>
<tr>
<td>Mini-sett technology of rapid multiplication of seed yams</td>
<td>75</td>
<td>62.5</td>
</tr>
<tr>
<td>Vine cutting technology</td>
<td>18</td>
<td>15.0</td>
</tr>
<tr>
<td>Improved soil management technique (minimum tillage) for erosion control</td>
<td>37</td>
<td>30.8</td>
</tr>
<tr>
<td>Improved yam staking methods</td>
<td>21</td>
<td>17.5</td>
</tr>
<tr>
<td>Pest and disease control/prevention measure</td>
<td>58</td>
<td>48.3</td>
</tr>
<tr>
<td>Recommended fertilizer type and dosage</td>
<td>72</td>
<td>60.0</td>
</tr>
<tr>
<td>Recommended fertilizer application method</td>
<td>61</td>
<td>50.8</td>
</tr>
<tr>
<td>Recommended land preparation and cultural practices in yam cassava based intercrop</td>
<td>78</td>
<td>65.0</td>
</tr>
</tbody>
</table>

*Multiple responses recorded

Source: Field survey, 2016

Table 3 shows that 80.8% and 80.0% of the respondents were using NRCRI UMUDr-17 (TDr 95/19177) and UMUDr-19 (TDr 89/02475) improved varieties respectively. While, 70.8% and 67.5% of them were using NRCRI TDr 89/02677 and TDr 89/02565 improved varieties respectively. Also, 62.5% of the respondents were using the mini-sett technology of rapid multiplication of seed yams developed by NRCRI. Other disseminated NRCRI yam production technologies were recommended land preparation and cultural practices in yam cassava based intercrop (65.0%), recommended fertilizer type and dosage (60.0%), recommended method of yam fertilizer application (50.8%). Use of improved farming production technologies
and crop varieties has been shown to impact positively on farmers' welfare [26].

Table 3: Distribution of yam farmers according to level of adoption of yam production technologies developed by nrcri

<table>
<thead>
<tr>
<th>Improved Technologies</th>
<th>Unaware (0)</th>
<th>Aware (1)</th>
<th>Interest (2)</th>
<th>Evaluation (3)</th>
<th>Trial (4)</th>
<th>Accept (5)</th>
<th>Reject (6)</th>
<th>Total</th>
<th>MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>UMUDr-17 (TDr 95/19177)</td>
<td>10 (0)</td>
<td>11 (11)</td>
<td>23 (46)</td>
<td>17 (51)</td>
<td>25 (100)</td>
<td>31 (155)</td>
<td>3 (18)</td>
<td>381</td>
<td>3.18</td>
</tr>
<tr>
<td>UMUDr-17 (TDr 95/19177)</td>
<td>14 (0)</td>
<td>10 (10)</td>
<td>20 (40)</td>
<td>25 (75)</td>
<td>27 (108)</td>
<td>23 (115)</td>
<td>1 (6)</td>
<td>354</td>
<td>2.95</td>
</tr>
<tr>
<td>UMUDr-19 (TDr 89/02475)</td>
<td>11 (0)</td>
<td>13 (13)</td>
<td>19 (38)</td>
<td>18 (54)</td>
<td>25 (100)</td>
<td>28 (140)</td>
<td>3 (18)</td>
<td>363</td>
<td>3.03</td>
</tr>
<tr>
<td>TDr 89/02565</td>
<td>13 (0)</td>
<td>9 (9)</td>
<td>18 (36)</td>
<td>27 (54)</td>
<td>26 (104)</td>
<td>26 (130)</td>
<td>1 (6)</td>
<td>366</td>
<td>3.05</td>
</tr>
<tr>
<td>TDr 89/02677</td>
<td>16 (0)</td>
<td>22 (22)</td>
<td>12 (24)</td>
<td>28 (56)</td>
<td>23 (120)</td>
<td>19 (95)</td>
<td>0 (0)</td>
<td>317</td>
<td>2.64</td>
</tr>
<tr>
<td>Improved yam varieties</td>
<td>11 (0)</td>
<td>10 (10)</td>
<td>20 (40)</td>
<td>19 (57)</td>
<td>30 (120)</td>
<td>28 (140)</td>
<td>2 (12)</td>
<td>379</td>
<td>3.16</td>
</tr>
<tr>
<td>Improved soil management technique (minimum tillage) for erosion control</td>
<td>21 (1)</td>
<td>18 (18)</td>
<td>14 (28)</td>
<td>22 (44)</td>
<td>26 (104)</td>
<td>18 (90)</td>
<td>1 (6)</td>
<td>312</td>
<td>2.60</td>
</tr>
<tr>
<td>Improved yam stacking methods</td>
<td>28 (0)</td>
<td>30 (30)</td>
<td>23 (46)</td>
<td>17 (51)</td>
<td>10 (40)</td>
<td>12 (60)</td>
<td>0 (0)</td>
<td>227</td>
<td>1.89</td>
</tr>
<tr>
<td>Pest and disease control measure</td>
<td>15 (0)</td>
<td>15 (15)</td>
<td>17 (34)</td>
<td>17 (34)</td>
<td>21 (42)</td>
<td>17 (34)</td>
<td>1 (6)</td>
<td>345</td>
<td>2.88</td>
</tr>
<tr>
<td>Recommended fertilizer application method</td>
<td>12 (0)</td>
<td>13 (13)</td>
<td>18 (34)</td>
<td>22 (44)</td>
<td>24 (48)</td>
<td>29 (58)</td>
<td>2 (12)</td>
<td>368</td>
<td>3.07</td>
</tr>
<tr>
<td>Recommended fertilizer type and dosage</td>
<td>20 (0)</td>
<td>29 (29)</td>
<td>17 (34)</td>
<td>16 (32)</td>
<td>20 (40)</td>
<td>18 (40)</td>
<td>0 (0)</td>
<td>281</td>
<td>2.34</td>
</tr>
<tr>
<td>Recommended land preparation and cultural practices in yam cassava based intercrop</td>
<td>9 (0)</td>
<td>18 (18)</td>
<td>21 (42)</td>
<td>19 (57)</td>
<td>24 (96)</td>
<td>26 (130)</td>
<td>3 (18)</td>
<td>361</td>
<td>3.01</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2016

Decision Rule 3.0 and above = Adoption stage
1.5-1.99 = Interest stage
1.0 – 1.49 = Awareness stage
2.50 – 2.99 = Trial stage
2.0 – 2.49 = Evaluation stage

Figures in parentheses are Likert scores.

Table 4: Distribution of the yam farmers according to constraints to NRCRI yam technologies adoption

<table>
<thead>
<tr>
<th>Problems</th>
<th>* Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low access to credit</td>
<td>91</td>
<td>75.8</td>
</tr>
<tr>
<td>Inadequate information on NRCRI yam production technologies</td>
<td>102</td>
<td>85.0</td>
</tr>
<tr>
<td>Inadequate extension service</td>
<td>75</td>
<td>60.8</td>
</tr>
<tr>
<td>Low follow up from extension agents</td>
<td>71</td>
<td>59.2</td>
</tr>
<tr>
<td>Lack of fund to invest on NRCRI yam technologies</td>
<td>98</td>
<td>81.7</td>
</tr>
<tr>
<td>Limited land</td>
<td>51</td>
<td>42.5</td>
</tr>
<tr>
<td>High cost of inputs</td>
<td>71</td>
<td>59.2</td>
</tr>
<tr>
<td>Poor producer price</td>
<td>65</td>
<td>54.2</td>
</tr>
</tbody>
</table>

* Multiple responses recorded
Source: Field Survey, 2016

Table 5. Shows the distribution of the yam farmers according to constraints to adoption of NRCRI yam production technologies. Three foremost problems constraining adoption of NRCRI yam production technologies in the area as reported by the yam farmers are inadequate information on NRCRI yam production technologies (85.0%), low access to credit (75.8%) and lack of fund to invest on NRCRI yam technologies (81.7%). The decline in the Nigerian economy, particularly in the area of agricultural productivity, has often been blamed on lack of credit facilities, which prevented many farmers from adopting improved technologies [27].

Conclusion and Recommendations
The major conclusion derived were: (1) Farm size, credit access, educational level, extension contact, membership to farmers’ association, and age were significant factors
that influenced adoption of NRCRI yam production technologies in the study area. (2) Farming experience, education level, fertilizer quantity, NRCRI varieties, farm size, credit access, extension contact and membership to farmers association were significant factors that influenced yam production in the study area. The following recommendations were proffered: Awareness creation in the use of the various NRCRI yam production technologies by extension agencies is a necessary step to achieve increased cultivation and production of yam. Consequently, the study recommends vigorous sensitization of farmers on the benefits of adoption of NRCRI yam production technologies. Also there is need for Policies targeted on improved extension service delivery system and credit access to yam farmers by the federal and state governments to enable the farmers acquire practical knowledge of research innovations and foster their capacity to adopt such innovations.

References


