THE IMPACT OF ADOPTION OF ROOT AND TUBER EXPANSION PROGRAMME (RTEP) TECHNOLOGIES ON THE PRODUCTION AND INCOME CAPABILITIES OF FARMERS IN PLATEAU STATE

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Abstract
       The study was carried out in Plateau State in the year 2008-2010 to ascertain the impact of adoption of Root and Tuber Expansion Programme (RTEP) technologies on the production and income capabilities of farmers after the first phase of RTEP (2001 – 2004). The population of the study comprised all the 1020 registered RTEP farmers and the rest farmers not involved in RTEP. Proportional random sampling using 10% of participant farmers in each of the 5 Local Government Areas was used in selecting 102 Programme Participant Farmers (PPFs), while purposive sampling selection by chance of equal number of PPFs from each of the 5 local government areas was used in selecting 102 Non Programme Participant Farmers (NPPFs). Data collected by the use of structured questionnaire, were analyzed using descriptive statistics (mean, grand mean, standard deviation) and inferential statistics (t-test). The t-test analysis result revealed that there were differences between PPFs and NPPFs and even among PPFs in their production and income capabilities, it is recommended that RTEP should be enriched and designed to be attractive as to involve greater number of rural farmers so as to achieve greater influence on the production and income capabilities of the rural farmers in Plateau State.

Keywords: RTEP, income, production, impact

Introduction

In Nigeria increased food production for feeding the teaming population has increased support for studies on better methods of root and tuber production. Thus a larger volume of research has been carried out on root and tuber crops in research institutes especially the National Root Crop Research Institute (NRCRI) Umudike Umuahia, and International Institute of Tropical Agriculture (IITA) Ibadan and in the Universities. Based on the results of the various research in agriculture, programmes are formulated and carried out through extension services. These programmes are mainly called Agricultural Extension Programme.

Agricultural Extension Programme (AEP) has been variously defined by different authors but their ideas are still the same. Bradfield (1996) defined AEP as a written long range and annual working plan with specific objectives for agricultural development of an area by communities, assisted and guided by trained and experienced extension workers. Maunder (1992) saw AEP as a statement of objectives of an agricultural extension service based upon an analysis of the existing situation and needs of the people in the areas involved. Boyles (1981) identities three types of extension programme, developmental, institutional and informational programmes. While Developmental Programmes helps in identifying the major problems of the clientele or the community, institutional programmes bring about growth and development of the individual and his basic activities Informational Programmes deals with dissemination of useful and practical information from relevant sources to the rural farmers.

Root and Tuber Expansion Programme (RTEP), one of the agricultural programmes was formulated by the Food and Agricultural Organisation Investment centre in 1995, negotiated by International Fund for Agricultural Development Executive Board in 1999. It was launched in December 2000 and declared loan effective on the 31st July 2001. The overall objective of RTEP like other Agricultural Programme is to achieve a sustainable increase in the production of root and tuber crops as well as their end products and thus enhance national food self-sufficiency and improve rural house hold food security and income. Specifically the objectives of RTEP was to enhance rural food security, income and livelihood through improved root and tuber production, processing and marketing in the operational areas.

Root and Tuber Expansion Programme took off in Plateau State in the year 2001 and the activities include multiplication and distribution of improved root and tuber planting materials and adding value to root and tuber crops by processing, marketing and linking fabricators with processors. The impact of project or programme relates to changes in the production and actual living condition among projects beneficiaries following from and

attributable to the product. (UNO, 1984). Impact is a special form of evaluation that deals with the effect of intervention programmes output on the target beneficiaries. To measure the impact of the project on the target beneficiaries the socio-economic conditions of the target beneficiaries before and after the intervention programme should be compared, this would help one to know the level of achievement of the programme. The impact of any agricultural programme is measured in terms of change in crop yield, food production, farm size, income and living condition of the target beneficiaries. Impact evaluation report of (Ugbomeh 1994, Aribisala (1983), Agwunobi 1993, Asiabaka 1991, Olayide and Ogunfiditimi1980, Ogumbameru 1986, Obiechina and Otti 1985, Mbawonku 1986, Brain 1980, Fadoyomi 1988, Heyer 1971, and Ajayi 1996) showed that there were increase in crop yield, food production, increased farm size, large number of enrolment, increased income and better living condition. It was also discovered that the programmes were faced with the following constraints: lack of adequate credit facilities, storage facilities, poor supply of farm input, land tenure problems, financial problems and complexity of the technologies involved. Umar and Tyen (1995), world Bank 1995 and Eboh 1995 advocated the following as being responsible for the success of the agricultural programme: active participation of the farmers involve in planning, formulation and implementation, autonomy in the management, simplicity of the technology, increased crop production and high returns, existence of substantial market , initial incentive for adoption and building around knowledge, skill, capability and techniques already in existence and not imported techniques.

Statement of Problem

Many Agricultural Programmes have been introduced and implemented all aimed at increasing the food security, self-sufficiency, increased income level and good level of living of the rural farmers. Some of these programmes are Agricultural Development Programme (ADP): National Accelerated Food Production (NAFPP), Operation Feed the Nation (OFN), Food Security, National Fadama Programme and Root and Tuber Expansion Programme. The impact of these programme on the beneficiaries are not fully accomplished. William (1998) observed that the only kind of evaluation peculiar to many publicly supported programmes is the progress report which can be published monthly, quarterly or annually based solely on the hunches of the reporting officer. This seems not enough to justify the impact of the programme on the Programme Participant and Non-programme Participant Farmers.

RTEP being one of the Agricultural Programmes, the study is aimed at finding the impact it has on the production (crop yield) and the income capability of the rural farmers in Plateau State.

Objectives of the Study
1. Determine the root and tuber crops production capabilities of PPFs and NPPFs in the study area.
2. Compare the incomes of PPFs and NPPFs in Plateau State before and after RTEP.

Research Questions
- Are there significant differences between Programme Participant Farmers (PPFs) and Non-Programme Participant Farmers (NPPFs) in their production capabilities (crop yields) of root and tuber crops in Plateau State?
- Is there significant difference between PPFs and NPPFs in their levels of income?

Research Hypotheses
1. There is no significant difference in the production capabilities of PPFs and NPPFs
2. There is no significant difference in the income level of PPFs and NPPFs.

Methodology
Plateau State is within the North Central States of Nigeria. It is located in the Guinea Savannah of Nigeria. It lies between longitude 7^0 3' and 80^0 37' East and between latitude 80^0 30' and 10^0 30' North with cultivable land mass of 35,000km sq. More than 80% of the population are farmers Plateau State has three agricultural zones namely Central, Northern and Southern. The Local

Government areas involved in the study include Mangu, Bokkos, Langtan, Shandam and Riyom. The adequate rainfall and average relative humidity make Plateau State very conducive for root and tuber crop cultivation and livestock production too.

Five out of the eleven RTEP participating Local Government Areas were purposively selected for the study. Population of the study was made up of 1020 registered farmers involved in the RTEP and the rest farmers not involved in RTEP. Proportional random sampling using 10% of participant farmers in each of the five LGAs was used in selecting 102 PPFs that formed the sample size of PPFs. Purposive sampling selection by chance of equal numbers of PPFs from each of the 5 LGAs was used in selecting 102 NPPFs that formed the sample size of NPPFs (see t

Table 1 Sample Size for the Study.

Agricultural Zone	LGA	Programme Participant Farmers (PPFS)		Non-Programme Participant Farmers (NPPFS)	Total
		Population (P)	Sample (S) 10%	Sample (S) 10%	
Central Zone	Mangu	200	20	20	40
	Bokkos	220	22	22	44
Southern Zone	Shendam	200	20	20	40
	Langtang	200	20	20	40
Northern Zone	Ryom	200	20	20	40
Total	5 LGAs	1020	102	102	204

Data collected with the use of structured validated questionnaire by the researcher with the help of ten trained enumerators were analyzed using descriptive statistics – (mean, grand mean) to determining the levels of adoption of RTEP technologies while t-test was used to determine the impact of RTEP technologies on the production and income capabilities of the rural farmers in Plateau State.

Measurement of Variables

Scholars have extensively expressed the difficulties involved in qualifying and measuring social variables. Where direct measurement is impossible reliance on indicators and proxies are considered satisfactory. (Hays, 1965). This situation becomes more compounded when data are to be obtained from illiterate population with no practice of record keeping.

With regards to production (crop yield) farmers give estimates that fall within certain rounded limit reflecting reasonable and accurately the true value of output (Lusy, 1982). Furthermore the use of farmers estimates as an indicators should not be overlooked, there is tendency for such estimate to be biased as to be valued, but there is some evidence from the Philippines and elsewhere that farmers estimates are sufficiently accurate for monitoring and evaluating purposes.

Ladele (1991) used measured, operationalised and standardized estimated variables from farmer's memory in his study and he came up with reasonable, acceptable and reliable result. Adopting the principles, all the social variables in this study were estimates that emanated from the rural farmer's memory especially as related to situations before and after RTEP. In this study, the variables were measured, standardised and operationalised as follows.

The crop yield of the 5 major crops was determined or measured by asking the farmers to give an estimated number of 50kg fertilizer bag of cassava, yam, 50kg fertilizer bag of cocoyam, 100kg jute bag of sweet potato and 50kg fertilizer bag of Irish potato from one kadada. The estimated value given was later converted to the number of bags/ha. This gave the estimated crop yield per hectarage of the farm land cropped. This

was later converted to kg/kadada using 50kg fertilizer bag as a crop yield index per hectare.

1 kadada = 0.04ha

The estimated income realized from the sales of the 5 major crops by the respondents was also assessed in Naira by using the income group modified from work of Ajayi 1996. The estimated income groups and their corresponding weighted values were.

N	Period value
< 25,000	1
25,000 – 64,999	2
65,000 – 149,999	3
150,000 and above	4

Each was asked to indicate the estimated annual income group to which he belonged.

1. the total adoption scores per each of the innovations was computed adoption score = $(x_1 + x_2 + x_3 + x_4 + \text{------} x_{13})$
2. The mean adoption scores (x) of each innovation was computed by dividing the total adoption scores by the number of innovations involved. t – was calculated by using the following formula.

$$t = \frac{m_1 - m_2}{\frac{\sqrt{(sd_1)^2}}{n_1} + \frac{\sqrt{(sd_2)^2}}{n_2}}$$

Where t = t – ratio

m_1 = mean of PPFs

m_2 = mean of NPPFs

sd_1 =   mean deviation of PPFs

sd_2 =   mean deviation of NPPFs

n_1 = Number of PPFs

n_2 = Number of NPPFs

Result and discussion

Among the 5 major RTEP crops, PPFs had high yield in cassava (53kg/ha), yam (33kg/ha) and Irish Potato (32kg/ha) and low yield in cocoyam (24kg/ha) before RTEP, while NPPFs, had high yield in cassava (58kg/ha) yam (30kg/ha) and low in cocoyam (17kg/ha). But after RTEP, PPFs had higher yields in Irish Potato (78kg/ha), cassava (74kg/ha) and sweet potato (50kg/ha), and lower yield in cocoyam (38kg/ha). NPPFs had higher yield in cassava (69kg/ha), Irish potato (40kg/ha), and sweet potato (30kg/ha), and with lower yield in cocoyam (19kg/ha) (Table II).

Furthermore PPFs had significant higher crop yield than NPPFs after RTEP in the 5 major RTEP crops especially in Irish potato (78 kg/ha). After RTEP there was higher crop yield among the PPFs than before showing the impact of RTEP on the PPFs. This agrees with (U.N.O. Task Force, 1984) that the impact of any programme on the target beneficiaries relates to changes in crop yield and living condition of the beneficiaries flowing from and attributed to the programme.

Table II Production Capabilities of PPFs & NPPFs Before and After RTEP in terms of Crop yield

Variable	PPFs (n=102)				NPPFs(n=102)			
	No.	%	Before Kg/ha	After Kg/ha	No	%	Before Kg/ha	After Kg/ha
Yam	79	77.5	33	46	80	78.4	30	27
Cassava	81	79.4	53	74	82	80.4	58	69
Cocoyam	89	87.3	24	38	85	83.3	17	19
Sweet potato	60	58.8	28	50	40	38.2	26	30
Irish potato	35	34.3	32	78	31	30.4	26	40
Average crop yield			34	57.2			31	37

Hypothesis

There is no significant difference in the Production Capabilities of PPFs and NPPFs.

Table III shows that PPFs had higher crop yield than NPPFs after RTEP. (t = 2.78 less than 0.05). Among the PPFs, there was higher crop yield after RTEP (t= 2.78 less than 0.05) as shown in Table IV. From the t-test analysis, the calculated value is more than the critical or table value, hence the hypothesis that states that there is no significant difference in the production capabilities (crop yield) of PPFs and NPPFs is rejected as the t calculated value is 4.42 while the t- critical is 2.78. Also among the PPFs, there was significant difference in their production capability (crop yield) as the t calculated value is 4.30 as against the t-critical of 2.78.

Table III: t-test analysis of PPFs and NPPFs in terms of crop yield.

Variable	Mean (Kg)	df	T stat	P (T < t) 2 tail	t crit 2 tail.
PPFs	2400				
NPPFs	560	4	4.42	0.01	2.78

Table IV: t-test analysis of PPFs before and After RTEP in terms of crop yield.

Variable	Mean (Kg)	df	t stat	P (T< t) 2 tail	t crit 2 tails.
Before	4560				
After	6950	4	4.30	0.01	2.78

Research Question

Is there significant difference between PPFs and NPPFs in their level of income.

The Income Levels of PPFS and NPPFS.

Income denotes the total revenue that accrues to an individual within a given period. The higher the income levels of the farmer, the higher the capacity for adoption (Ekong, 1988).The income levels of the two groups were examined before and after RTEP. The results in Table V indicates that the average income realized by the PPFs among the 5 major crops was higher in Irish potato (₦149,026) followed by Yam(₦78,557) and cassava(₦69,793) and lower in cocoyam (₦53,549) after RTEP while that of NPPFs was higher in Irish potato (₦85,000) followed by sweet potato (₦52,000), yam (₦62,280) and lower in cocoyam (₦45,250) after RTEP. This higher increase in income is attributable to the impact of RTEP.

Table V Income realized by PPFs & NPPFs Before and After RTEP.

Variable	PPFs (n=102)				NPPFs (n=102)			
	No.	%	Before ₦	After ₦	No	%	Before ₦	After ₦
Yam	79	77.5	54,349	78,557	80	78.4	50,240	62,280
Cassava	81	79.4	53,504	69,793	82	80.4	38,502	48,250
Cocoyam	89	87.3	48,713	53,549	85	83.3	40,750	45,250
Sweet potato	60	58.8	49,541	58,541	40	38.2	35,000	52,000
Irish potato	35	34.3	106,884	149,026	31	30.4	65,000	85,000

Hypothesis

There is no significant difference in the Income levels of PPFS and NPPFs. The two groups' incomes were examined before and after RTEP. (Table VI)

The t-test analysis shows that the PPFs had higher average income realized from the 5 major crops than the NPPFs (t – calculated value 3.58 is greater than t-critical 2.78). Hence the hypothesis that states that there is no significant difference in the income levels of PPFs and NPPFs was rejected.

Table VI   t-test analysis of income realized between PPFs and NPPFs.

Variable	Mean ₦	df	t stat	P (T < t) 2 tail	t crit 2 tail.
PPFs	19295				
NPPFs	12657.6	4	3.58	0.27	2.78

Table VII shows significant difference between before and after RTEP in the income level of PPFs. The income realized after RTEP by the PPFs was higher than the income realized before RTEP as the t-calculated value 3.67 is more than the t-critical 2.78. This higher level of income of PPFs after the programme could only be attributed to the impact of RTEP.

Table VII   t-test analysis of PPFs Before and After RTEP in terms of income realized.

Variable	Mean (₦)	df	t stat	P (T< t) 2 tail	t crit 2 tail.
Before	62598.2				
After	66181.6	4	3.67	0.22	2.78

Conclusion

There were significant impact of RTEP on the crop yield of the five major root and tuber crops among the PPFs. Crop yield were high in cassava, yam and Irish potato and low in cocoyam among the PPFs and NPPFs. However PPFs had significant higher crop yield than the NPPFs after RTEP intervention indicating the impact of RTEP on the PPFs. The level of income differed significantly between PPFs and NPPFs. The income realised was high in Irish potato, yam and cassava but low in cocoyam.

The production capabilities and income level of PPFs and NPPFs were significantly different at 5% level of probability attributed to the impact of RTEP. Therefore RTEP made a significant positive impact on the PPFs regarding production capabilities and income level.

Recommendation

Even though there are differences between PPFs and NPPFs in the production capabilities and income realised, the impact were not very adequate. RTEP should be designed and made attractive to meet the need of thousands of rural farmers in Plateau State for them to be able to benefit and have positive impact on their production and income realisation

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