COMPARATIVE ASSESSMENT OF TECHNOLOGY GENERATING PRACTICE AMONG UNIVERSITIES AND RESEARCH INSTITUTES IN NORTH CENTRAL ZONE OF NIGERIA

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ABSTRACT

In order to examine the technology generating practice among universities and research institutes in north central zone of Nigeria, the study examined sources of funds for technology generating activities, compare agro-technology generating practices and identify constraining factor hindering technology generating practices. One hundred and fifty-two academic staff were randomly selected from universities and one hundred and thirty-six respondents were drawn from research institutes. Validated questionnaires with reliability coefficient of r=0.92 was used to elicit data. Data collected were analyses using descriptive statistics, Likert rating scale, T-test and Factor analysis. Majority 93.4% of universities respondents used their personal funds to generate new technology compare to their counterpart in research institutes. The most widely mechanism employed for generating agricultural technologies was joint radio programmes (mean= 3.38) while the least was biotechnology (mean=2.57). Major areas of difference were the physical distance between technology generation ($t=13.54;P<0.05$), Farmers participate in field research trial ($t=8.50;P<0.05$), Farmers co-finance adaptive research trial ($t=3.77;P<0.05$) and Adequate research facilities and incentives to workers ($t=2.05;P<0.05$). Factors constraining variable based on technology generation for universities respondents was Poor access to knowledge and information on new innovation r= 0.815 while for research institutes was Limited physical resources (ICT, Telephone) r= 0.801. It was recommended therefore that respondents should look in to option of writing different fund proposals and submitting to different funding bodies, Joint radio programme should be strengthen. Technological linkage advisory council should be formed and formalized.
Key words: Technology, Constraining Factor, Linkage practice, Linkage mechanism and innovative stride.

INTRODUCTION

Background of the Study

In the face of changing environmental and economic realities, technology generating system in Agriculture constitutes the cornerstone in effort to develop agricultural production and to improve the livelihood of farmers in Sub-Sahara African (Sanginga, Best, Chitske, Delve, Kaaria, Kirkby, 2004). Sound innovation policy is essential to ensure that necessary condition exist in linking of agencies/ subsystems to meet the family needs of rural populace.

Globally, universities are recognized as the centre of production of knowledge accumulation and knowledge transfer through research and scholarship. Universities all over the world are mandate to perform three functions, namely teaching, research and community service, with the overall aim to produce trained manpower for essential areas of social development (Okiki 2013). Nirman (2007), avers that the mission of higher education is to advance knowledge , create knowledge, disseminate knowledge through research and provide services to the rural farm families community. In Nigeria, the aim of establishing the research institutes and universities are imperative, but the issues of establishing a cordial relationship between institutional technology design among actor constitutes critical issues in technology generation in Nigeria Universities and Research Institutes more so, there are obvious challenges in instituting efficient collaboration and linkages among various agencies for greater innovative stride.

The findings will inform the policy makers the opportunity of designing and implementing holistic and regional approach and appropriate strategies for tackling the problems associated with technology generation to meet need of farm families in rural communities.

1.3 Objectives of the Study

The main objective of the study is to examine the linkage practices among research institutes and universities for agricultural innovation transfer sub-system in North Central Nigeria.

The Specific Objectives are to:

1. describe the socio-economic characteristics of the respondents in the study area.
2. examine sources of funds for technology generating activities.
4. compare agro-technology generating practices of ARI's and University.
5. identify constraining factors hindering technology generation.

Methodology

The study was conducted in North Central Agro-Ecological Zone of Nigeria. The region occupies a total land of 296,898km^2 representing about 32% of the land area of the country. It

is located between latitude 6^{O} 30^{1} N to 11^{O} 20^{1} N and Longitude 2^{O} 30^{1} E to 10^{O} 30^{1} E . The region has two main season; namely dry and wet season, with the wet season beginning toward the end of the March and ends at the October, While the average of 187 to 220 rainy days with average monthly temperature ranging from 21^{o} C to 37^{o} C. The vegetation of the zone consists of the forest Savanna Mosaic, Southern Guinea Savanna and the Northern Guinea Savanna. Geographically, the zone is characterized by varying landforms such as extensive and swampy features which are common in the lowland areas which occurs in the areas along the valleys of Niger and Benue rivers, alongside deep valleys, large hills, mountains and plateaus,. The vegetation, soil and weather pattern are favourable for production of wide spectrum of agricultural food, industrial and cash crop of various types

The study was conducted in North Central agro-ecological Zone of Nigeria. Niger and Kwara was purposively selected for the study. Their selection was based on the existence of University with agro transfer outreach programme and functional research institutes. A total of 288 respondents were sample from estatablished sampling frame of 353 using Yamane's fomula. A validated questionnaire which was subjected to Cronbach's Alpha reliability test (r= 0.92) was used for data collection. Data were collected on the respondent's socio-economic characteristics, sources of fund for technology generating practice and mechanism employed for generating agricultural technologies as well as on constraining factor hindering technology generating practices. Age, research experience were measured in years; while house hold size was measured in number. Sources of fund for technology generation were measured by asking the respondents to indicate their sources of research funding. Technology generating practice were measured by asking the respondents to rate nine possible technology generating practice on four-point Likert scale of non-existed (4) weak (3) somewhat strong (2) quite strong (1). Constraining factor to technology generating practice were measures by identifying Twenty-eight possible constraining variables on four possible factors. Factor one

(1) was political and/or policy related constraints which includes pressure from policy and its effect on value, reward and sanctions; factor two (2) was organizational/ institutional constraints; factor three (3) attitude related factors and factor four (4) was poor motivational factors. Data collected were analyses using descriptive statistics, likert-scale, T-test and Factor analysis. Field survey for data collection was conducted between January and

March, 2012. Data were analyzed using descriptive statistics (frequency, Percentage and mean), T-test and factor analysis.

RESULTS AND DISCUSSION

SOCIO ECONOMIC DISTRIBUTION OF THE RESPONDENTS

Table 1 reveals that majority of university staff about 43.4% were between 41 and 50 years old while majority of research institute respondents about 55.3% were between 31 and 40 years old. This means that universities had relatively older staff than research institute. Generally there were no significant difference between the respondents' mean age. The implication of this is that large proportion of respondents were young and in active age to face challenges associated with the research activities. The table shows that, in the university system only 14.7% of the respondents had research experience of less than five years while 43.4% of the research institutes fell in the same categories. This corroborate with findings of Ogungbaigbe (2004) who reported that a relatively inexperienced institution is one with researchers having less than five years of work experience. A possible explanation to the variation is that while Madukwe *et al*. (2000) conducted their research in older universities all over the country, this study drew its respondents mainly from younger universities. Also the brain drain and the retirement from service scourge in the past decade must have left behind in the systems, staff with relatively few years of research experience. The data in Table 1 shows that about 20.4% of research institutes staff held HND certificates, while none of the university staff was in this category. The table further shows that, about 66.2 % of the

university respondents obtained Ph.D qualification, while only 5.9% of the research institutes staff had same qualification. This agreed with the findings of Oyedokun (2000) who reported that universities in Nigeria have higher number of qualified researchers than the agricultural research institutes. More so, the more the difference in qualification of staff of the both system, the less the level of linkage between them. Obibuaku (1983) argued that the staff of both systems should be sufficiently literate and educationally well qualified to undertake agricultural extension and research services. More so the table revealed that, majority (51.5%) of university respondents had house hold size ranging from 6-10. while 64.5% of research Institutes staff had house hold size from 1-5. Universities respondents had more children than their counterpart in research institutes. This may probably be as results of number of dependents and/or probably number of respondents who are Muslim that practice polygamy. Majority (99%) of universities respondents were membership of professional bodies while only 1% percent of them were non-member. While for research institutes 61% were Member of professional while 39.5% were non-member. This means that majority of respondents from both system were membership of professional bodies. The higher percentage of membership for both systems is because belonging to membership of professional bodies of your discipline is compulsory and needed for assessment in promoting academic staff.

Age (years)	**Universities n=136**	**Research Institutes n=152**
21-30	18 (13.2)	18 (11.8)
31-40	45 (33.1)	84 (55.3)
41-50	59 (43.4)	40 (26.3)
>50	14 (10.3)	10 (6.6)
Mean	***41***	***39***
Research Experience (years)		
1-5	20 (14.7)	66 (43.4)
6-10	74 (54.4)	52 (34.2)
11-15	21 (15.4)	8 (5.3)
>15	21 (15.4)	26 (17.1)
Mean	***11***	***9***
Educational Qualification		
HND	-	31 (20.4)

BSc/ Btech	7 (5.1)	53 (34.9)
MSc/M.Tech	39 (28.7)	59 (38.8)
PhD	90 (66.2)	9 (5.9)
Marital Status		
Single	7 (5.1)	28 (18.4)
Married	129 (94.9)	124 (81.6)
House Hold Size		
1-5	64 (47.1)	98 (64.5)
6-10	70 (51.5)	54 (35.5)
11-15	2 (1.5)	-
Mean	***5***	***5***
Membership of Association		
Member	134 (98.5)	92 (60.5)
Non-Member	2 (1.5)	60 (39.5)
Gender		
Male	117 (86.0)	124 (81.6)
Female	19 (14.0)	28 (18.4)

Sources of Funds for Technology generation: The data in Table 4.9 shows that about 60% of respondents from research institutes received direct government financial support for research, while only about 12% of the university respondents received from the same source. However, both the university respondents 75% and research institutes 73.7% indicated that their highest source of fund came from their establishments. This conform with Adams (2006) who reported that government is the sole provider of the funds for Nigeria universities accounting for 94%. It however, contradicts the opinion of Obayan (2006) that the practice in some part of the world is basically the responsibility of all stake holders to contributes substantially to funding university education. Private sector sponsorship for research was quite high for research institutes 44.7% compare to their counterpart in the universities 8.1%. The table also shows that about 93.4% of the university staff used personal funds for their research and 10.3% of them used loans. This is in line with findings of Musa (1988) who reported that the bulk of university research are driven by demand for publication towards career advancement. In the research institutes only 40.8% of staff used personal funds and 3.3% used loans for research. It can be inferred that the high percentage of university

respondents who utilized their personal funds for research were working for their personal academic and intellectual advancement as their promotion were usually based on published research findings.

Table 3 Distribution of Respondents by Source of Fund for Technology Generation

Sources of research funding	**Universities n=136**	**Research Institutes n=152**
Direct government funding	*16 (11.8)	*90 (59.2)
From Universities/research institutes	102 (75.0)	112 (73.7)
Private sector sponsorship	11(8.1)	68 (44.7)
Personal fund	127 (93.4)	62 (40.8)
Loans	14 (10.3)	5 (3.3)
Support from farmers	2 (1.5)	35 (23.0)

Values in the parentheses are the percentages
***Multiple responses**
Field Survey, 2014

Comparison of agricultural technology generating practice of Universities and Research Institutes.

The results revealed that a significant difference ($t=8.50; P<0.05$) in the level of farmers participation in field research trial by the universities and research institutes in generating agricultural innovations. Farmers' participation in field research trials contributes largely to orienting innovation towards sustaining farmers' interest. The results further revealed that universities and research institutes differed in terms of adequate research facilities and incentives to workers ($t=2.05; P<0.05$); Also, research institutes differed with the universities in the physical distance between technology generation ($t=13.54; P<0.05$). The close physical distance between the innovation generation and transfer sub-system could explain why in the research institutes system the innovation generated were within farmers co-finance adaptive

research trials. Distance between innovation generation and transfer sub-system had been identifies as a major factor influencing the quality and time of providing innovation to participating farmers (Blum,1991;Madukwe, 1996) The table revealed that universities and research institutes differed on practices in farmers co-finance adaptive research trial (t=3.77;P<0,05).

Table 4: T-test results showing differences in Agricultural Innovation Generating Practice Between University and Research Institution.

Innovation generating practices	**Universities (max.=4)**	**Research Institutes (max.=4)**	**t-cal**
Autonomy in technology generation	3.11 (.857)+	3.18 (.958)	1.07
Technology generation base on field problem	3.38 (.731)	3.48 (.825)	1.10
Farmers participate in field research trial	3.17 (.985)	2.13 (.951)	8.50*
Technology generating activities keep pace with current field practices	3.50 (.779)	3.53 (.719)	0.38
Adaptive research trials are located in farmers field	2.10 (.871)	1.97(.973)	1.23
Extension agents participate in field research trial	3.28 (1.05)	3.34 (.929)	0.84
Adequate research facilities and incentives to workers	1.98 (.843)	1.73 (.942)	2.05*
Distance between technology generation and technology transfer	1.97 (.910)	3.49 (.807)	13.54*
Farmers co-finance adaptive research trial.	2.31 (.963)	2.76 (1.110	3.77*

+ Data in parenthesis are standard deviation
***P<0.05**
Field Survey, 2014

Factors constraining the linkage activities of the respondents

Table 5. Showed factor matrix on linkage constraining factors base on variable loading were used; four factors were identified and named. Factor one (1) were political and/or policy related constraints which includes pressure from policy and its effect on value, reward and sanctions; factor two (2) were organizational/ institutional constraints; factor three (3) attitude related factors and factor four (4) were poor motivational factors. Items that loaded high in factor 1, (political/ or policy related constraints), included Poor government commitment to extension (.754), Unclear delineation of function (.702) and multiplicity of with varying ideologies (.756). Items that loaded high in factor 2, (organizational/institutional constraints),

included limited qualified human resources in the agencies for linkage leadership (.636), poor access to knowledge and information on new innovation (.815) and low mobility of expert/ professionals (.804). Items that loaded high in factor 3, (attitude related factors), included long administrative procedure/administrative bottleneck associated with public agencies (.765), poor macro system linkages (.675) and excessive organization fragmentation (.793). Items that loaded high in factor 4, (poor motivational factors), includes poor training opportunity for professionals (.758). However, variables that were bolded in the table loaded high in more than one factor and were, as a result not considered in the process of extracted factors because they overlapped.

Table 4: Factors constraining the linkage activities of the respondents

Variables	Factor 1	Factor 2	Factor 3	Factor 4	Rank
Overlapping mandate/objectives	**.580**	.172	.232	**.327**	-
Limited qualified human resources in the agencies for linkage leadership	.241	.636*	.074	.254	9th
Lack of adequate sources of finance	**.567**	**.490**	.236	.095	-
Limited physical resources (ICT, Telephone)	**.410**	**.517**	**.331**	.251	-
Poor access to knowledge and information on new innovation	.158	.815*	.167	.239	1st
Low mobility of expert/professionals	.196	.804*	.049	.125	2nd
Poor logistics support and incentives for linkage	**.369**	**.655**	.200	.043	-
Organizational rigidities	**.466**	.292	**.455**	.156	-
Long administrative procedure/administrative bottleneck associated with public agencies	.214	.136	.765*	.041	4th
Weak legal frame work/lack of rule for interaction/linkage	**.308**	.002	**.770**	.248	-
Poor macro system linkages	.278	.274	.675*	.195	-
Excessive organizational fragmentation	.247	.125	.793*	.060	3rd
Inappropriate government policy on agriculture	**.597**	.041	**.309**	.199	-
Poor/differences in orientation of personnel of agencies	.164	**.312**	.261	**.553**	-
Influence of international/donor mandates	**.450**	-.177	-.119	**.375**	-
Lack of farmer's interest in extension	-.070	**.590**	.167	**.607**	-
In equality in qualification and salary scale of staff of the agencies	**.528**	.224	-.023	**.493**	-
General poor attitude and low morale of extension workers	.208	**.357**	-.017	**.703**	-
Poor training opportunities for professionals	.277	.054	.184	.758*	5th

Traditional public characteristics of most extension information.	.044	**.300**	.243	**.741**	-
Poor government commitment to extension	.754*	.032	.183	.115	7th
Wrong view of famers incapable of taking rational decision	.000	**.557**	.102	**.395**	-
Un equal status among agencies	**.520**	.109	**.346**	**.330**	-
Top down decision making procedure	**.678**	**.387**	.135	.024	-
Unclear delineation of Function	.702*	.282	.233	.074	8th
Multiplicity of organization with varying ideologies	.756*	.190	.277	.031	6th
Management policy	**.655**	.266	**.408**	.075	-
Bureaucratic bottleneck	**.659**	.286	**.399**	.182	-

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
***Sig**
Field Survey, 2014

CONCLUSION AND RECOMMENDATIONS

5.2 Conclusion

Based on the findings of the study, it can be concluded that:

The mean age of the respondents for in both systems were almost the same. The number of Ph.D holders in the universities is more than research institutes. Universities respondents utilized their personal funds for research than their counterpart in research institutes. Technology generating activities keep pace with current field practices was the major area where the universities and research institutes form greater linkages for innovation generating practice. Categorizing farmers according to needs was the major areas where the universities and research institutes form greater linkages for innovation transfer practice**.** Research institutes differed with the universities in the physical distance between technology generation and technology transfer.Poor access to knowledge and information on new innovation rank first and as such was identified as major constraints by universities respondents while limited qualifies human resource in the agencies rank least. Limited physical resources (ICT,

Telephone) was identify as major constraints by research institutes respondents which was poor motivational factor while lack of adequate source of finance rank least which was policy related factors.

5.3 Recommendations

Base on the findings of the study the following recommendations are giving for improving the linkages between the actors involved for better innovations.

1.The number of Ph.D. holders in the universities is more than research institutes. It is therefore recommended that non-university-based scientists should be encourage for higher studies to acquire advanced knowledge.

2. Considering the personal fund expended for research by universities respondents. It is recommended that respondents should look in to option of writing different fund proposals and submitting to different funding source for sustaining the activities of linkages.

3. Considering research facilities and incentives to workers which are very limited because of current situation of linkage which revealed that, the linkage is informal and non-institutionalized which let it to budget challenges from the government. It is therefore recommended that linkage advisory council should be formed and formalized as in the case of Ethiopia, this may help in getting government fund.

4. Since poor access to knowledge and information on new innovation rank first in terms of constraints face by the universities respondents. It was recommended that every academic staff should have internet in their various offices and allowed to attend international conference from where they will interact and cross fertilize ideas.

5. Poor government commitment to extension, Unclear delineation of function, multiplicity of organisation with varying ideologies, lack of adequate sources of finance, top down decision making procedure, management policy and bureaucratic bottle neck were all identify as policy related factor. It is recommended that Sound innovation policy should be put in place to

ensure that necessary condition exist in linking the agencies. Governing rule and regulation of the linkage council should be revised and updated regularly adapting into the context it operates.

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