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Research article

Developing capacity for biotechnology in the Nigerian National Agricultural Research System (NARS): a challenge for sustainable funding

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Abstract

Building strong capacity for agricultural biotechnology research requires a strong funding environment. The study examined the state of funding for agricultural biotechnology in the Nigerian National Agricultural Research System. A total of 148 Agricultural scientists'' were sampled from faculties of agriculture in conventional universities, universities of technology, universities of agriculture, and National Agricultural Research Institutes (NARI's) on the basis of their participation in agricultural biotechnology research. Data covering respondents' participation in agricultural biotechnology research, access to funding for biotechnology research, adequacy of funding and funding sources were collected using a structured questionnaire. Majority of the respondents (78.4%) indicated that they required more than five hundred thousand naira (₦500, 000.00) per annum to carry out their research activities, 97.2% considered funding inadequate while 87.8% considered funding inaccessible. Adequacy and accessibility of funding were significantly related to scientists'' participation in agricultural biotechnology research ($p < 0.05$).Funding for agricultural biotechnology research was found to be determined by availability of private sponsorship ($P < 0.05$) and institutional allocation ($P < 0.05$). The study concluded that efforts at ensuring sustained development in agricultural biotechnology research must facilitate scientists'' access to adequate funding.

Keywords: Biotechnology, funding, participation, adequacy, accessibility

1.1 Introduction

Research funding is an important predictor of the rate at which the agricultural sector would be expected to grow and brace up to spiraling challenges of poverty, unemployment, disease, insecurity and other characteristics of underdevelopment in sub-Saharan Africa. Recent feeling among development watchers is that there must be a swift departure from the non-renewable resources economics of underdeveloped countries to green agrarian economic models. It is also the general opinion that agricultural biotechnology research holds the key to such change. It is worrying however to note that advancement in agricultural biotechnology in sub-Sahara Africa is severely constrained by a lack of funds (Cohen et al., 2004). The situation is worsened by the fact that efforts are scattered over a wide range of products and Institutes without critical mass, and most often heavily dependent on donor funding.

Roseboom et al., (1994) in addition to other sources, identified funding for research in Nigeria for example, as coming from general government funds and income earned through sales of produce and services. On the average, sales (otherwise called internally generated revenue) account for about 8% of the funds available for research, especially in government Institutes. Another very important source of fund for research is donor support. In spite of all these sources of funding, it is a general consensus of scientists' that there is a paucity of funds for agricultural research. This condition is all the more serious in view of the fact that fluctuations in research funding reduce the effectiveness of research. The non-availability of funds in the right amounts and at the times they are most needed reduces the productivity of both research and researchers.

The underlying motive for private participation in research is for profit. Adeoti and Sinh, (2009) confirmed that the private sector has a greater incentive to conduct research whose returns are relatively quick and whose benefit can be captured privately. This, incidentally does not fit into the description of the workings of agricultural research funding which as described by Pray and Nasseem, (2003) is intended by government to improve the welfare of farmers and other citizens. Private firms invest in agricultural research and offer new technologies to famers with the aim of making money, in other words, research must promise to be profitable. An important disincentive for private participation in research funding is the fact that agricultural research is an expensive, time consuming and risky investment. It requires scientists', infrastructure, and other inputs and it takes time and patience to identify priority areas, to develop appropriate technology and to test and make sure it is effective, safe and marketable.

Funding is considered a critical factor in building a strong capacity in any research system to enable it cope with and accommodate accessions in the science and technology community where it operates. It must not only be available, but adequate, accessible and sustained. Since some effort has gone into determining the participation of scientists' in agricultural biotechnology (Alhasan 2001 and Adisa et al., 2011), it becomes pertinent to examine the state of funding for scientists' participating in the use of biotechnology. This, it is hope would predict the prospects and promises of the technology in delivering solutions to age long challenges faced by farmers. The aim of this study was to examine the state of funding for agricultural biotechnology research. It was guided by the following specific objectives:

i. To determine the funding needs of scientists' participating in agricultural biotechnology research
ii. To determine the adequacy of funds available to respondents for biotechnology research
iii. To find out the sources of funding available to the respondents

2.0 Materials and method

Two Federal universities, two state universities were randomly selected from a list of Federal and States universities respectively. In addition to these four, one university each was selected from the four universities of Technology, and three Federal universities of Agriculture in Nigeria, bringing the total of selected universities to six (6). Forty three scientists' (43) were purposively selected from the faculties of agriculture and veterinary medicine on the basis of their participation in agricultural biotechnology research. Nine research Institutes were purposively selected based on their mandates. A total of 105 scientists' were purposively selected from the research Institutes, based on their participation in agricultural biotechnology research. The total number of respondents from the selected universities and Research Institutes amounted to 148 scientists'.

The independent variable consisted of various items the measured adequacy of funding, accessibility and alternative funding sources. Scientist were asked to estimate annual budgetary requirement for the conduct of

agricultural research requiring biotechnology applications. Respondents were to estimate of how much of the annual monetary requirement they get, while adequacy was evaluated using very adequate (3); adequate (2); inadequate (1). The dependent variable is scientist's participation in agricultural biotechnology research. In this study it represents the use of agricultural biotechnology research laboratory/field applications, publication/documentation of biotechnology information, training/extension activities in the area of agricultural biotechnology and participation in agricultural biotechnology development activities. Respondents indicated the frequency of participation in these activities, i.e. Always=2. Sometimes=1, and never=0. An aggregate score of all the participation indices indicates level of participation, which was either high or low.

Data were subjected to descriptive and inferential analyses. Descriptive statistics included frequency counts and percentages while Spearman rho correlation was used to test the hypothesis.

3.0 Results and discussion

Table 1 shows that only 21.6% of scientists' estimated an annual budgetary requirement less than half a million naira (₦500, 000.00), for agricultural biotechnology research activities. Most scientists' considered the funding they get for agricultural biotechnology research as inadequate (97.2%). Only 1.4% considered funding as adequate as shown on table 2. This result is corroborated by results on table 3 showing that 81.0% get only 1-20 % of their budgeted amount with only 0.7% getting 81-100 %. Table 4 shows that eighty eight percent (87.8%) of scientists' indicated that funds for agricultural biotechnology research are not accessible. Only (10.8%) indicated that funds are accessible while 1.4% considered funds very accessible. Table 5 shows that 95.9% of the scientists' do not enjoy any sponsorships or grants for their research other than allocations within the institution. Only 4.0% indicated that they get sponsorship. Table 6 shows that adequacy and accessibility of funds for agricultural biotechnology research was significantly related to scientists' participation in agricultural biotechnology research ($p < 0.05$).

Results show that estimates indicated by scientists as their annual budgetary requirement for agricultural biotechnology research is generally high. Modern agricultural biotechnology research is generally an expensive and specialized technique requiring large budgetary allocations. Ozor, (2006) reported an estimate by the International Institute for Tropical Agriculture (IITA) and Technical Centre for Agricultural and Rural Corporation (CTA) suggesting that simple forms of modern agricultural biotechnology, emphasising techniques such as tissue culture to propagate disease free crops may cost not less than US$1M and take 3-6 years. Funds for agricultural biotechnology are usually available for scientists' in form of research grants either directly or through the institution. Majority of the respondents indicated that funds were inadequate. Beintema and Ayoola, (2004) described the financial contribution of government to agricultural research as unstable and declining, pointing out that over the last 3 decades total agricultural research and development spending exhibited a negative average growth of 2% per year. Pray and Naseem, (2003) confirm this slowing down of public investment in agricultural research observing that adequate spending holds a great promise for economic growth. Funds for agricultural biotechnology are either through annual budgetary allocations to the institute for research, internally generated revenue or grants (national or foreign). In order to increase the prospects of scientists' accessing funds for agricultural biotechnology research, Michelsen et al., (2003) suggested the development and maintenance of staff capacity for research, especially with respect to technical and process skills. Process skills such as project formulation, project-proposal presentation, scientific writing and presentation, may be important ways to improve the access of research staff to national and foreign funding. The recommendation of Michelsen et al., (2003) above will enhance the chances of scientists' getting sponsorships or grants for their research projects.

The significant relationship between adequacy and accessibility of funding and participation of scientists' corroborates the position of Adeoti and Sinh, (2009), which insists that the development of agricultural biotechnology research is a direct correlate of investment in the NARS, whether through public or private sources. Much of the other challenges scientists' might face in the process of effective participation could be adequately mitigated by sufficient funding. Funding also serves as an attractant to younger scientists', as it signals prospects for vibrant career development in the field. Spearman rho correlation also showed a significant correlation between estimated annual budgetary requirement of scientists' and their approximation of the adequacy of funding.

Factors that determined how much scientists got for agricultural biotechnology research were determined using the simple linear regression model. The percentage allocation to a scientist for biotechnology ($P < 0.05$) and

availability of private sponsorship ($P < 0.05$) were significant determinants of the funds available to scientists for agricultural biotechnology research. Falconi (1999) suggested that the level of resources available for investment in agricultural biotechnology is one indicator of a country's efforts to strengthen or create these capabilities. Nigeria and indeed other developing nations can only develop strong national capabilities for agricultural biotechnology research when it takes a prime position in the research agenda.

Table 1: Estimated Funding Requirement for Biotechnology Research

Amount (₦)	Frequency	Percentage
>1,000, 000.00	32	43.9
500, 000.00-1,000, 000.00	51	34.4
<500, 000.00	65	21.6
Total	148	100

₦ = Nigerian naira, equivalent to $0.006

Table 2: Adequacy of funding

Variable	Frequency	Percentage
Very adequate	2	1.4
Adequate	2	1.4
Not Adequate	144	97.2
Total	148	100

Table 3: Estimated Annual Allocation received for Agricultural Biotechnology research (in percentages)

Estimated annual allocation in percentages (%)	Frequency	Percentage
1-20	120	81.0
21-40	12	8.1
41-60	13	8.8
61-80	2	1.4
81-100	1	0.7
Total	148	100

Table 4: Accessibility of funds for research

Variable	Frequency	Percentage
Very Accessible	2	1.4
Accessible	16	10.8
Not Accessible	130	87.8
Total	148	100

Table 5: Sponsorship for agricultural biotechnology research

Variable	Frequency	Percentage
Sponsorship Available	6	4.1
No Sponsorship	142	95.9
Total	148	100

Table 6: Contingency table for Spearman rho correlation between participation and funding indices

		Participation category	Annual budgetary requirement	Adequacy of funding	Accessibility of funding	funding from Private sources
Participation category	Correlation coefficient	1.000				
	Sig. (2-tailed)	-				
Annual budgetary requirement	Correlation coefficient	-.077	1.000			
	Sig. (2-tailed)	.354	-			
Adequacy of funding	Correlation coefficient	-.267**	.214**	1.000		
	Sig. (2-tailed)	.001		-		
Accessibility of funding	Correlation coefficient	-.236**	.037	607	1.000	
	Sig. (2-tailed)	.001	.654	.000	-	
funding from Private sources	Correlation coefficient	.026	.113	.079.	-.073	1.000
	Sig. (2-tailed)	.775	.171	.341	-.380	-

** Correlation is significant at the 0.01 level (2-tailed)

Table 7: Regression analysis of factors that determine funding for agricultural biotechnology research

	Unstandardized Coefficients		Standardized Coefficients		
Variables		Std error	Beta	t	Sig.
(Constant)	167193.481	149676.913		1.117	
estimate your annual budgetary requirement for the conduct	.002	.002	.115	1.260	.268
estimate in percentage your allocation for agricultural biotechnology	1.686	.300	.539	5.627	.212
how would you rate the adequate of funding for agricultural biotechnology	-21318.711	70204.157	-.039	-.304	.000
how accessible are fund for agricultural biotechnology	-7247.487	56935.800	-.016	-.127	.762
do you get sponsorship from any private organisation	100325.797	42638.503	.220	2.353	.899

4.0 Conclusion

Funding is a critical determinant of scientists' participation in agricultural biotechnology research. It was found out that most scientists' considered funding for agricultural biotechnology research inadequate and most of them receive a comparably small fraction of their funding requirement for research. Only a very small fraction of scientists access all the funding needed for research. There was also a general lack of sponsorship for agricultural biotechnology research projects. Institutional allocation and availability of sponsorship from private sources were found to significantly affect funding. If Nigeria's and indeed all similar developing countries are to actualize the dream of attaining food sufficiency, nothing short of developing a funding structure targeted at

stimulating growth and providing incentive for efforts at developing homegrown biotechnologies would suffice. It is the only means of delivering the much expected outputs from the innovations that would make the NARS fulfill its promise.

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