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## Challenges and experiences of Agricultural Research Council of Nigeria (ARC�) in making agricultural research work for end-users in Nigeria

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### ARTICLE INFO

### ABSTRACT

#### Key Words

Agricultural Research

Multi-stake holders approach

Agricultural policy

Barriers to agricultural research

The study reviewed the role of agricultural research in policy making for agricultural development in Nigeria. It specifically identified the salient challenges associated with making agricultural research work for end-users in Nigeria and proffered some solutions using the example of some initiatives implemented by the Agricultural Research Council of Nigeria, ARC�. The major end-users of agricultural research in Nigeria identified include: Research scientists and organizations, training and extension agents/organizations, farmers, industries (producers, consumers and cooperative organizations and policy makers). The major challenges identified include: issues with Funding of research and extension systems, Weak linkage between research, extension and farmers/industries, absence of appropriate communication Strategies and Conflicting expectations from research by various end-user groups. The study noted that the barriers to making agricultural research work for end-users must be addressed via multiple actions at all fronts. The experience of ARC� demonstrated that involvement of end-users in the process of technologies development to solve their challenges enhanced their sense of ownership and makes them more receptive. It has also been confirmed that multi-pronged approach to dissemination of agricultural research results would contribute significantly to making research technologies work for the end-users.

## 1.0 Introduction

The importance of agricultural research in the national economy cannot be over-emphasized. Fundamental research in is required to develop the knowledge and discoveries that drive innovations and technological advances. The concepts and knowledge from basic research in agriculture are used by applied and translational research to solve problems relating to the sector. Basic research and applied research are conducted by universities and research institutes, respectively. Applied research operates within the framework of knowledge provided by fundamental research, and extension helps to transform the products of research, both fundamental and applied, to improve agricultural production, farm income, environment, health,

and the quality of life of consumers and producers (NRC, 2014). In order to make agricultural research work effectively in addressing the challenges faced by the agricultural and food sectors, skilled and creative researchers, educators, and extension specialists are necessary.

Solutions to agricultural sector and industry problems are not a one-of-thing but always evolving.

Therefore, there is need to sustain, constantly renew and consistently add to the robust knowledge base through innovations and increases in foundational knowledge to meet diverse human needs and adapt



to ever-changing global conditions are required (World Bank, 2010). Consequently, research institutions with their collaborators and partners must continue to pursue relevant research agenda through various statutory mandates delivered to them and thematic focus of investigations as may be regularly required. Needless to say that making research work for end-users comes with some challenges. Lack of adequate public investment in agriculture, lack of well-trained researchers, inadequate research infrastructures and poor management of the agricultural research and development system are some of the constraints to utilization of agricultural research results (Secket al., 2013). However, these challenges can be surmounted.

In Nigeria, the National Agricultural Research Institutes (NARIS) have been saddled with the responsibility of developing technological solutions to the production, productivity, environmental, welfare, health and other numerous problems facing the agricultural sector. Their efforts have resulted in the development of various types of technology which are being disseminated to farmers. Available evidences through various impacts assessment studies conducted by the Agricultural Research Council of Nigeria (the apex public agricultural research body in Nigeria) has demonstrated that agricultural research technologies have resulted in significant social benefits to end-users (Philips et al., 2010a, 2010b, 2011). However, several technologies still remain on-shelf and yet to be fully harnessed for the benefits of end-users. To address the challenge, the ARCNet shortly after its inception in 2007, in collaboration with the International Food Policy Research Institute (IFPRI) implemented an initiative titled 'managing agricultural research within the innovation systems perspective'. The aim of the initiative was to promote research that works for end-users through emphasis of accompanying technologies with innovation. Follow-up to the initiative, some projects were articulated and implemented with the research institutes and

Federal Colleges of Agriculture to get technologies to end-users. These efforts have continued to pay-off leading to improved participation of end-users in the technological development processes and the adoption of research outputs. This paper examines some challenges associated with making agricultural research work for end-users in Nigeria and proffers some solutions using the example of some initiatives implemented by the ARCNet.

#### *Examples of Agricultural Research Outputs*

- Policy recommendations and options
- Recommendations for further research
- Technologies – biological, chemicals, process/methodologies, equipment

#### *Examples of End-users of agricultural research outputs in Nigeria*

Research scientists and organizations: A research study may raise some questions or knowledge gaps which require further investigations. Therefore, an integral part of research outputs or results is recommendations for further research studies. These further research studies are conducted either by individual/group of scientists or organizations to provide more understanding or proffer solutions to challenges which earlier researches may not have resolved.

Training and extension agents/organizations: Training and extension institutions make use of research outputs to educate their clientele.

Farmers: Farmers are key targets of agricultural research outputs, particularly in the form of technologies. These outputs are usually utilized by farmers to improve the process or productivity and efficiency of production. Worthy of note that research technologies are dynamic and may be time bound. Consequently, they could become out-dated over time and may require upgrade or improvement from time to time.

Industries (Producers, consumers and cooperative organizations): Industries, mainly commercial food, agro-allied and other related companies, make use of research technologies in producing semi-finished and finished products for other end-users. A recent study in Nigeria showed relationships between mandates of agricultural research institutes in Nigeria and six (6) out of the ten (10) sectors of Manufacturing Association of Nigeria (Table 1).

Policy makers: Research studies result in policy recommendations or options. These provide important and critical basis for formulation informed policies by government. For example, some organizational and systems (e.g. research and extension systems) reforms have been informed as a result of research recommendations.

**Table 1: Mapping of NARIs with the Ten Sectors of Manufacturing Association of Nigeria**

Manufacturing sector	IAR	NAPRI	NIFFR	IAR&T	NAER LS	NIOM R	CRIN	NIHORT	RRIN	NIFOR	NRCRI	NSPRI	NCRI	LCRI	NVRI
Food, beverages and tobacco															
Chemical & pharmaceutical															
Domestic and industrial plastic, rubber & foam															
Basic metals, iron & steel/steel & fabricated metals															
Pulp, paper products, printing and publishing															
Electrical & electronics															
Textile, wearing apparel, carpet, leather/bather footwear															
Wood & wood products including furniture															
Non-metallic mineral products															
Motor vehicle and miscellaneous assembly															

Source: RMRDC (2016)

## 2.0 Challenges of making agricultural research work for end-users in Nigeria

### i. Funding of research and extension systems:

The research and extension systems in Nigeria are faced with various funding related challenges one of which is inadequate funding. Although, the nominal funding of research has improved over the years, this still remains inadequate because most of the increases are in the area of personnel and not the actual research sub-heads. Agbamu (1998) reported research and extension budgets of 3% and 2.1%, respectively, expressed as a percentage

of the national agricultural budget. Data from ASTI (2017) showed that Nigeria has one of the lowest agricultural research spending intensity (agricultural research spending as a percentage of Agricultural GDP) with decadal of 0.4%, 0.27% and 0.35% in the 1980s, 90s and 2000s, respectively, instead of the required 1-2%. Research funding is also erratic and untimely most of the time, with no evidence of adequate consideration of the time-bound nature of research activities in most policy decisions. This funding constraint makes it difficult for research to be responsive to the



needs of its clientele and compounds the challenge of long gestation of research.

**(ii) Weak linkage between research, extension and farmers/industries:**

Linkages explain the kind of connection between two or more organizations pursuing commonly shared objectives in order to have regular contact and improved productivity. The linkages are established mainly through communication, feedback mechanisms and working relationship among the organizations. To develop agricultural technologies that work and meet the needs of end-users, researchers, extension workers, farmers and other industry actors must partner in identifying research problems, adapting the recommendations to local conditions and providing feedback to researchers about the developed innovations.

However, the weak linkage between these key actors in the agricultural industry has created a level of disconnect in information flow and limited the benefits derivable from research technologies (Figure 1). This weakness stems from lack of close working relationship between the various actors within the agricultural sector. Also, the level of farmers' education is an important factor affecting information flow between them and extension agents and research (Adesoji and Aratunde, 2012). Scientific research and the application of discoveries through extension and education programs have enabled remarkable advances in agricultural and food production in the last 100 years (Pardey and Beddow, 2013) and will continue to be relevant in promoting agricultural competitiveness globally.

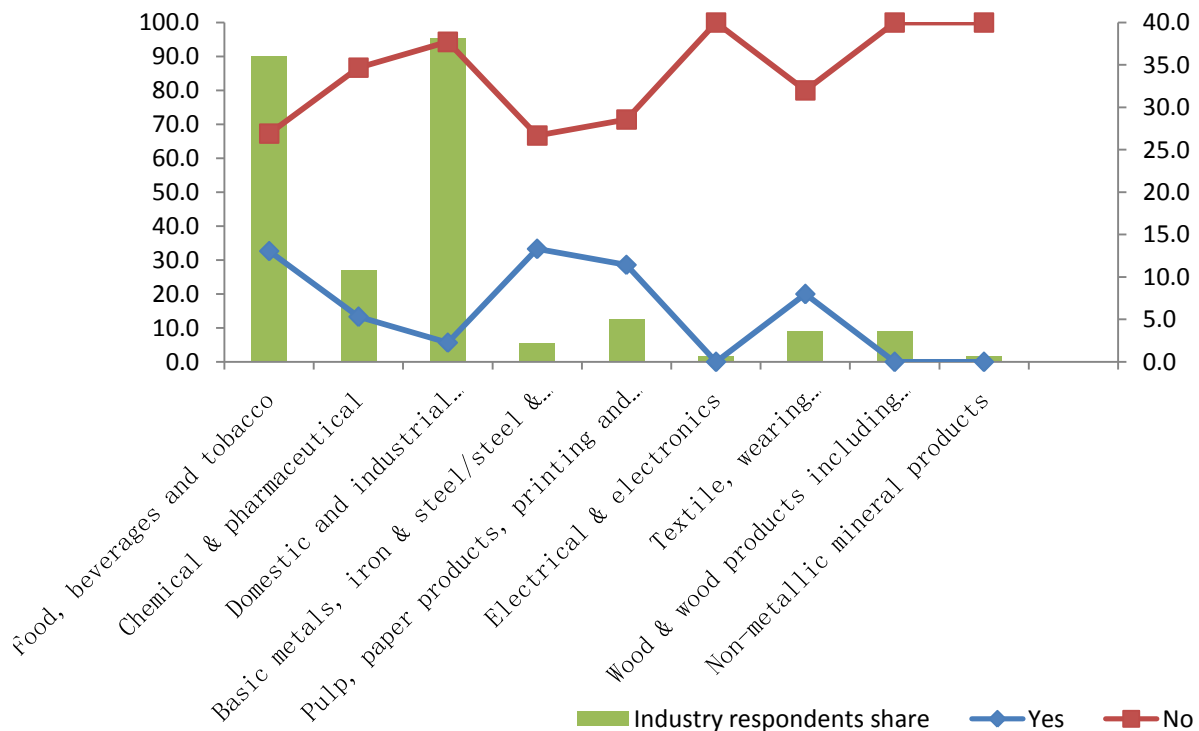


Figure 1: Level of Collaboration between Stakeholders in Manufacturing Association of Nigeria and Research Institutes\* in Nigeria

\*Research institutes (Includes RIs in Agriculture, Health, Environment, Science & Technology) Source: Voh (2017)

**(iii) Absence of appropriate Communication Strategies**

The importance of knowledge sharing and communication in agricultural research and to the key actors in the system cannot be over-emphasized.

Communication in an organization or system could be internal and external. To effectively achieve development, communication actions should be research-based and planned (Ramirez and Quarry, 2004). Effective communication is essential to achieving organizational research objectives and promoting performance. It is paramount to have a communication strategy that addresses the communication needs of the organization, projects and clientele from time to

time. This is because the information needs of the clientele varies and therefore requires different approaches for effective communication. Unfortunately, several research and extension institutions do not have their communication strategy clearly articulated and therefore have no particular mechanism for monitoring and appraising their communication performance and progress. Some of the guiding principles of the communication strategy of CGIAR Programme on Aquatic Agricultural Systems include quality, partnership, knowledge sharing and learning, open access, and focus (CGIAR-AAS, 2012). Table 2 shows examples of strategies for communicating with different stakeholder groups participating in or using research outputs

**Table 2: Examples of research clientele and means of communication from ILRI Model**

Stakeholder groups	Communication types and tools	Major means of circulation
Scientific experts and partners e.g. CGIAR, IARCS and NARS	Experts communications {Specialized scientific publications, including refereed journal articles; project Reports; Proceedings}.	Print and online scientific channels, with scientific abstracts, posters and whole books and papers posted on various websites. Other means are InforServices and virtual InfoCentre and InfoPortal; with databases, decision-support tools and training materials available online
Development professionals e.g. donor agencies, development partners, etc.	Authoritative communications {Annual reports, institutional brochures and other corporate handouts; special reports (high-profile ‘white paper’ reports on international public goods); Research Report Series; Discussion Paper Series}.	Expert consultations (e.g. on national Poverty Reduction Strategies), information packages disseminated at major events, one-on-one distribution by directors to visitors/those visited, website home page and via postings on donor and partner websites
Policy makers e.g. decision, opinion and policy makers, politicians, etc.	Re-purposed/policy oriented communications {Policy Brief Series; Stakeholder workshops; Speeches and presentations at high-profile fora}.	Brochures; tailor-made information packages; websites; repackaging services and broader learning platforms; newspaper and paid-for advertisements, and oral briefings and slide presentations.
Development intermediaries e.g. NGOs, CSOs, women groups, other change agents, government officials etc.	Advisory/advocacy-oriented communications {Issue and position briefs; Multi-institutional brochures; Multimedia productions}	Website top pages, displays and handouts at workshops, conferences and major events, specialized information networks and mix-and-match information kits created on demand.
Media and public e.g. international media and the general public	Popular/lay communications {News releases and feature stories; video clips of staff interviews; Research for Development Bulletins Series}.	Mass and specialized media; media launches, panel discussions and other high-profile fora; website and newsletter; media packs and other printed handouts; national television and radio programs.
End-users e.g. extension agents, farmers, industries, etc.	Educational/instructional communications {Radio interviews and shows; Newspaper inserts; Training manuals and guides; Questionnaires and surveys}	Radio programs, specialized websites; and printed materials and CDROMs distributed at agricultural shows, open days and training courses and by the institution’s downstream development partners

Source: ILRI (2003)





***(iv) Conflicting expectations from research by various end-user groups***

There are at least two different sides to this part of the discussion. The first is the expectation to meet the conflicting needs of the various clientele of agricultural research. For example, small farmers are looking for public good technologies with very high social benefits while private commercial companies are looking for technologies with high commercial values and protected from free access by the general public.

Research institutions must respond appropriately to these needs using different approaches. The EMBRAPA research model is a good example of this kind of balance.

*A case for agricultural research that works for end-users*

Agricultural research that works for and properly serves the purposes of the end-users involves the employment of the multiplicity of strategies and approaches. These include:

i. *Improved funding:* Public research institutions are largely funded by the government but the National Agricultural Research System has not been given enough resources to needed to meet the present and emerging challenges in the agricultural sector. In view of various competing interests for limited resources of any country, there is need to find innovative financing mechanism for agricultural research. The same is the case in Nigeria where the government is responsible for about 90% of the funding of agricultural research funding. In spite of this, the available resources for research activities have be dimly low. However, some reforms in the funding mechanisms for the agricultural research system in Nigeria are underway and would help alleviate some of the funding related challenges. The efforts of government can also be complemented through donor funded projects to address the basic needs of research institutions, which cannot be effectively met through annual budgets. It is important to place emphasis on

competitive financing of agricultural research to continue to promote innovation and support high impact researches. Similarly, private sector investments can be crowded into research through promotion of innovations with limited spill over effects. This is to ensure the return of their investments.

ii. *Matching research focus with clientele's expectations:*

Adequate efforts must be employed to realign research mandates, missions and themes to so that the outputs can match the problems and expectations of stakeholders served by the public agricultural research systems. While the challenge of balancing between public good nature of agricultural research outputs and commercial drive of the private investors have been largely addressed in developed countries, their developing counterparts still have a long way to go. Private investors in developed countries focus their investments in areas where the intellectual property rights (IPR) are strong mainly chemicals, machineries, hybrids and biotechnologies. One of the ways to address this challenge in developed countries is through the introduction of strong IPR for some research technologies to encourage private sector investments.

iii. *Strengthening research linkages with stakeholders:*

Efforts are required to significantly improve linkages between research and the various stakeholders. ARC experiences have shown that multiplicity of extension strategies are required to link the various actors with the agricultural sector. The Research Extension Farmers Input supply and Linkage Systems (REFILS) is one of such approaches. The REFILS are organized into 6 zones and coordinated by 6 zonal coordinating research institutes. There has been some strides at improving the visibility and funding of the REFILS. However, some state governments still



need to improve their support for greater participation by the ADPS. It should be noted that the success of investment in agricultural research is heavily dependent on both the quality of the research and the strength of the links between research and extension providers (Roseboom *et al.*, 2016). The extension system must be complementary to the research system and not compete with it.

iv. *Vibrant reward systems for researchers for innovations and linkage activities:* Researchers at the research institutes spend part of their time in some lesson of knowledge and technologies transfer. However, in the past, the time spent in technology transfer activities was not rewarded during the promotion exercises. One of the outcomes of ARCNI initiative on 'managing agricultural research within the innovation systems perspective', the time spend in technology transfer exercises is now a part of the grading systems for promotion of researchers. This is to serve as incentive to encourage greater participation of researchers technology transfer. However, this needs to be improved and further strengthened.

v. *Building the Innovative Capacity of Farmers:*

Being a critical part of the agricultural innovation system, the innovative capacity of farmers needs to be developed to contribute to making research results work for them. Leeuwiset *al.* (2014) identified the innovative capacity of farmers as the ability continuously identify and prioritize problems and opportunities in a dynamic system environment; take risks, experiment with social and technical options, and assess trade-offs that arise from this; mobilize resources and form effective coalitions around promising options and visions for the future; link with others to access, share, and process relevant information and knowledge in support of the coalitions; and, collaborate and coordinate with others in the

process and achieve effective concerted action. Complementing this with a conducive institutional environment that promotes access to markets will contribute to enhancing the workability of research results for end-users. Enhanced innovative capacity of end-users creates a stronger and more dynamic demand for new technologies and management practices (Roseboom *et al.*, 2016).

**3.0 Using Research-Extension Strategies to make agricultural research work for end-users in Nigeria: ARCNI Experience**

i. *Adopted villages and adopted schools:* A huge yield gaps between on-station and on-farm agricultural yields is a major challenge experienced by smallholder farmers in Nigeria. This may be largely attributed to weak farmers'-research-extension linkages and low inputs utilization (inputs such as seeds, fertilizer, irrigation, mechanization, pests management inputs, etc.). To address part of the challenge, the ARCNI established adopted villages and adopted schools/Agricultural Research Outreach Centres. With 104 villages and schools adopted at its inception in 2012, and the numbers have increased to 572 centres across the country with the West Africa Agricultural Productivity Programme (WAAPP) support (WAAPP in implemented in Nigeria by the ARCNI) (Figure 2).

ii. *Agricultural Innovation Platforms:* This is a channel for effective generation and diffusion of agricultural innovations in selected agricultural commodity value chains. The value chain innovation platforms were established and implemented with the states ADPs.



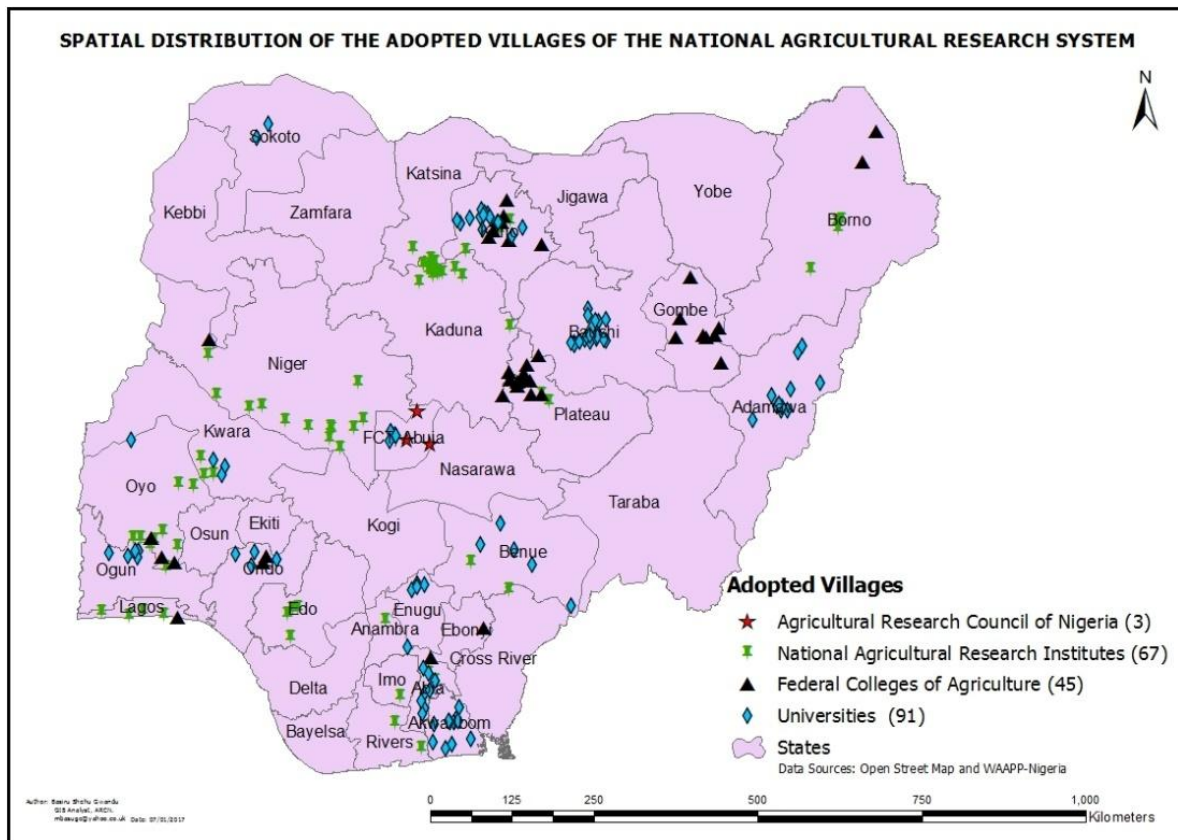


Figure 2: Spatial distribution of some adopted villages in Nigeria

iii. *The Agricultural Technology Transfer Centres (ARTTC):* As part of the continued efforts by ARC to strengthen research technology dissemination system in Nigeria, ARC has commenced the process of establishing ARTTC. The ARTTC is a concept that is based on transfer of technology (TOT) to end-users and domesticated on a research institute sub-station. It is to serve as a one stop shop for technology dissemination and transfer. It is a concept (KrishiVigyan Kendra [KVK]) developed by the Indian Council of Agricultural Research (ICAR) based on TOT from laboratory to farmer's field in all aspects of agriculture. So far, three ARTTC has taken-off at Bagauda, Dadinkowa and Amakama.

In India, policy makers and farmers considers the model as a channel for promoting access to technology from the research system.

Part of the activities to be carried out at the Centre are on-farm testing for identifying location specific technologies, agricultural demonstration to generate production data and feedback information; regular update trainings for extension personnel on emerging agricultural research advances; and short and long term training courses in agriculture and allied vocations for farmers and rural youth with emphasis on teaching by doing and learning by

doing for higher production on farms and generation of self-employment. This was implemented through the support of WAAPP.

iv. *Community-based seed multiplication initiative:* To alleviate the challenges of poor access to improved agricultural seeds, WAAPP implemented a community-based seed multiplication initiative with relevant stakeholders. For example, the programme



collaborated with ICRISAT in multiplication of seeds from improved varieties of groundnut and sorghum in some states in Nigeria. WAAPP also

provided enormous support to states ADPs to support some community-based seed production activities. This has contributed significantly to improved yield and agricultural production output in the country .

#### 4.0 Conclusion

The National Agricultural Research System has the responsibility of developing sustainable innovative solutions to the challenges facing the agricultural sector. This is done mainly through the development of appropriate research technologies. The success of agricultural investments depends on the quality of research output and utilization by end-users. Therefore, the barriers to making agricultural research work for end-users must be addressed. This requires multiple actions at all fronts. The experience of ARC/N has demonstrated that involvement of end-users in the process of technologies development to solve their challenges enhanced their sense of ownership and makes them more receptive. It has also been demonstrated that multi-pronged approach to dissemination of agricultural research results would contribute significantly to making research technologies work for the end-users.

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