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WHAT DOES INNOVATION SMELL LIKE? A CONCEPTUAL FRAMEWORK FOR ANALYSING AND EVALUATING DFID-RIU EXPERIMENTS IN BROKERING AGRICULTURAL INNOVATION AND DEVELOPMENT

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Abstract

The key objective of the DFID-funded Research Into Use (RIU) Programme, which has been implemented across 12 African and Asian countries, involves the notion of enabling 'agricultural innovation and development' as outcomes. Despite that, there seems to be little specification in terms of what country teams should expect as indicators of such desired 'innovation' when it does occur. It was perhaps the right thing to do because a cookie-cutter approach would have proven problematic in field implementation, given that what could count as innovation in one country context may not apply in another. This paper briefly reviews three conceptual frameworks: namely, the national agricultural research system (NARS), the agricultural knowledge and information system (AKIS) and the agricultural innovation system (AIS) concepts. Next, the paper reviews the definition of 'innovation' and proposes that agricultural innovation can occur at four different but interlinked domains. The paper then defines and discusses these domains, and uses evidence from outcomes of the DFID-RIU experiments in Nigeria to explain how these fit into the four domains, and how all these outcomes qualify as agricultural innovation. It concludes by explaining that the programme needs to recognise the whole gamut of impact in different domains in order to make a compelling case for investments in RIU-like approaches.

Keywords: Agricultural Innovation; impact assessment; innovation capacity; agricultural policy; innovation platforms; rural development; agricultural research; agricultural extension

JEL Codes: F55, L26, L33, N5, N55, O13, O31, O33, O38, O55, Q13, Q16

RIU DISCUSSION PAPER SERIES

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LIST OF ACRONYMS

ADPs	-	Agricultural Development Programmes
AIS	-	Agricultural Innovation System
AKIS	-	Agricultural Knowledge and Information System
ARCN	-	Agricultural Research Council of Nigeria
ARMTI	-	Agricultural and Rural Management and Training Institute, Nigeria
CMD	-	Cassava Mosaic Disease
CRT	-	Central Research Team
DFID	-	Department for International Development, UK
FAO	-	Food and Agriculture Organization of the United Nations
FDF	-	Nigerian Federal Department of Fisheries
IAR	-	Institute for Agricultural Research, Nigeria
IDB	-	Inter-American Development Bank
IFPRI	-	International Food Policy Research Institute
IITA	-	International Institute of Tropical Agriculture
IPs	-	Innovation Platforms
NACRDB	-	National Agricultural, Cooperative and Rural Development Bank, Nigeria
NAIC	-	National Agricultural Insurance Company, Nigeria
NALDA	-	National Agricultural Land Development Authority, Nigeria
NARS	-	National Agricultural Research System
NEPAD	-	New Partnership for African Development
NIFFR	-	Nigerian Institute for Freshwater Fisheries Research

NIOMR	-	National Institute for Oceanography and Marine Research, Nigeria
OECD	-	Organization for Economic Co-Operation and Development
R&D	-	Research and Development
RBDAs	-	River Basin Development Authorities
RIU	-	Research Into Use
RNRRS	-	Renewable Natural Resources Research Strategy
STI	-	Science, Technology and Innovation
UK	-	United Kingdom
UN	-	United Nations
UNDP	-	United Nations Development Program
UNU-MERIT	-	United Nations University Maastricht Economic and social Research and Training Centre on Innovation and Technology
USA	-	United States of America
WAAPP	-	West African Agricultural Productivity Programme

1. INTRODUCTION

The debate on how to stimulate agricultural 'innovation' has heated up the literature on rural agricultural development since the early 1970s. In recent years, a number of scholars and practitioners have joined the technical discussion without quite bothering to clearly state their own definition of 'innovation' and the underlying assumptions of their arguments or propositions. The core research question, and therefore the key objective, of the DFID-funded Research Into Use (RIU) Programme experiment, which has been implemented across 12 African and Asian countries, involves the notion of enabling 'agricultural innovation and development' as outcomes.

However, there seems to be little specification in terms of what country teams should expect as indicators of such desired 'innovation' when it does occur. It was perhaps the right thing to do because a cookie-cutter approach would have proven problematic in field implementation, given that what could count as innovation in one country context may not apply in another. Without such a specific corporate or uniform understanding of what the RIU programme sought to achieve as 'innovation', the onus has been on each DFID-RIU country experiment to propose suitable conceptual frames for analysing and interpreting the outcomes. While this is appropriate for an experimental and decentralised project — which RIU is — it increases the challenge and complexity of developing a general template for impact assessment across the diverse RIU country experiments in order to be able to present an overarching report of lessons to DFID. In an attempt to contribute to the work of impact assessment and communicate specific learning points from the RIU Nigeria experiment, this paper proposes conceptual framework elements, which are based primarily on the Nigerian context, but which, we believe, could be adapted for use in studying other RIU Africa country programmes in the context of a programme-wide impact assessment. (Note: For an RIU discussion paper that provides greater empirical detail on the cases discussed, see Ugbe, 2010).

The paper briefly reviews three conceptual frameworks — namely, the National Agricultural Research System (NARS), the Agricultural Knowledge and Information System (AKIS) and the Agricultural Innovation System (AIS) concepts — which have influenced policy analysis and the debate on agricultural innovation and development since the early 1970s. Next, the paper draws on such works as Hall et al. (1998), Arnold and Bell (2001), Barnett (2005), and Hall (2007) in attempting to define 'innovation' and proposing that agricultural innovation can occur at four different but interlinked domains. The paper then defines and discusses these domains, and uses evidence from outcomes of the DFID-RIU experiments in Nigeria to explain how these fit into the four domains, and how all these outcomes qualify as agricultural innovation. The paper concludes that without this framework, it would be easy, though erroneous, to consider only the 'tangible new technologies' in the livelihoods activities domain as innovation, while overlooking the more important but 'non-tangible or 'non-technological' innovations, at ideological and policy levels, for example. In a nutshell, the proposed framework could enable the RIU programme to tell a fuller and more compelling story to DFID.

2. CHANGING PARADIGMS OF AGRICULTURAL INNOVATION, PLANNING AND PRACTICE

There seems to be general agreement among agriculture and rural development scholars, policy-makers and practitioners that despite sometimes divergent ideas and views and changes in concepts, assumptions and paradigms, certain conceptual frameworks have contributed enormously to developments in the study of agriculture-related policy, research, technology, markets and rural development (Chema, Gilbert and Roseboom, 2003; Rivera et al., 2005; World Bank, 2006). Three major conceptual frameworks have successively influenced agricultural policy analysis since the late 1960s. These are (i) the National Agricultural Research System (NARS) developed in the late 1960s and early 1970s; (ii) the Agricultural Knowledge and Information System (AKIS) introduced in the 1980s with short-lived success, and; (iii) the Agricultural Innovation System (AIS), introduced in the late 1990s and still dominant (Spielman and Birner, 2008).

(i) The National Agricultural Research System (NARS): The paradigm of the NARS framework was that optimising public investments in state-run research organisations, such as research institutes, agricultural universities/colleges/faculties and extension services, constituted an effective means of developing technologies to foster agricultural transformation and rural development. Nigeria seems to have been strongly influenced by this school of thought, as evidenced by the country's enormous public investments in 15 national agricultural research institutes, 12 federal colleges of agriculture, four federal universities of agriculture, and expansive faculties of agriculture in about 30 other federal universities.

Furthermore, various federally-funded specialised agencies were founded to provide support services to the agriculture sector. Among these were the National Agricultural Land Development Authority (NALDA), the National Agricultural, Cooperative and Rural Development Bank (NACRDB), the National Agricultural Insurance Company (NAIC), the Agricultural and Rural Management and Training Institute (ARMTI), about 30 River Basin Development Authorities

(RBDAs) and 37 Agricultural Development Programmes (ADPs) across the country (one ADP for each state and one for the Abuja federal capital territory). Unfortunately, these public investments have underperformed, as have most state-owned enterprises across Sub-Saharan Africa. This notwithstanding, the existing organising principle and institutional architecture in the Nigerian agriculture sector is still based on the heritage of the NARS paradigm.

(ii) The Agricultural Knowledge and Information System (AKIS): This framework, which emerged in the 1980s after the NARS framework, viewed agricultural research as part of a tripartite or equilateral triangular arrangement of which extension services and formal education were the other planks; the farmer was placed at the centre of this arrangement and it was believed that knowledge and information were the key resources that these parties would trade among each other in seeking agricultural innovation and development. The AKIS framework, according to Röling and Engel (1991), conceived of "*a set of agricultural organisations and/or persons, and the links and interactions between them, engaged in such processes as the generation, transformation, transmission, storage, retrieval, integration, diffusion and utilisation of knowledge and information, with the purpose of working synergistically to support decision-making, problem-solving and innovation in a given country's agriculture or domain thereof*".

The framework does not seem to explicitly and sufficiently account for, or consider, the potential role of the private sector as one of the planks of innovation and development. There is no evidence to suggest that this school of thought has had a significant influence on the organising principle of agricultural research in Nigeria. Although the entrepreneurial aggression of Nigerians is well-known, the involvement of the organised private sector in the agricultural research system is still far from optimal.

(ii) The Agricultural Innovation System (AIS): Introduced in the late 1990s and still the dominant school of thought in agricultural research, policy and rural development, the AIS concept posits that (i) innovation and development are, or should be, the ultimate goals of

policy; (ii) the research system is part of a larger system comprising the state, the academy and the private sector and: (iii) the performance of innovation systems is a function of the intra- and interrelationships of various sectors (Godin, 2007).

In its application of the AIS concept, the World Bank (2006) defines the innovation system as "*a network of organisations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organisation into economic use, together with the institutions and policies that affect their behavior and performance. The innovation systems concept embraces not only the science suppliers but the totality and interaction of actors involved in innovation. It extends beyond the creation of knowledge to encompass the factors affecting demand for and use of knowledge in novel and useful ways*". This notion represents precisely the working definition of the DFID-funded Research Into Use (RIU) Programme in Nigeria. It should be pointed out that prior to the introduction of the RIU programme in Nigeria, there was no evidence of national policy pronouncements or plans that demonstrated that Nigeria shared in the conceptual shift from NARS to AIS. But since the inception of RIU-Nigeria experiments, the public pronouncements and language of the Agricultural Research Council of Nigeria (ARCN) indicate that a policy paradigm shift is starting to take place among key policy-makers, from the traditional NARS mindset towards the AIS concept of organising the country's agricultural research system.

See Table 1 on the following page for a summary table on NARS, AKIS and AIS.

Table 1: Previous Conceptual Frameworks on Agricultural Policy and Innovation

	National Agricultural Research System (NARS)	Agricultural Knowledge and Information System (AKIS)	Agricultural Innovation System (AIS)
Paradigm	Optimising public investment in state-run research organisations such as research institutes, agricultural universities, colleges, faculties and extension services constituted an effective means of developing technologies that will foster agricultural transformation and rural development	Agricultural research is part of a tripartite or equilateral triangular arrangement of which extension services and formal education are the other planks; the farmer is at the centre of this triangle and knowledge and information are the stock-in-trade of the parties in their quest for agricultural innovation and development	(i) Innovation and development are the ultimate goals of the AIS concept; (ii) the research system is viewed as part of a larger system comprising the state, the academy and the private sector and (iii) the performance of innovation systems is a function of the interrelationships among these sectors
Purpose	Planning capacity for agricultural research, technology development and technology transfer	Strengthening communication and knowledge delivery services to people in the rural sector	Strengthening the capacity to innovate throughout the agricultural production and marketing system
Stakeholders	National agricultural research organisations, agricultural universities, colleges/faculties, extension services and farmers	National agricultural research organisations, agricultural universities, faculties, extension services, farmers, NGOs and rural entrepreneurs	Potentially all actors in public and private sectors involved in the creation, diffusion, adaptation and use of any knowledge relevant to agricultural production and marketing
Outcomes	Technology invention/transfer	Technology adoption and innovation in agricultural production	Combined techno-institutional innovation in agricultural production, marketing, policy and enterprise domains
Organising & Implementing	Using science to create new technologies; technology transfers; capacity development in terms of efficient infrastructure and human development for effective scientific research	Accessing agricultural knowledge; knowledge/information exchange; capacity development for effective/efficient communication between/among rural stakeholders	New uses of knowledge for social and economic change; interactive learning; capacity development and enabling environment for effective/efficient interactions between stakeholders
Role of policy	Prioritise resource allocation in support of agricultural research	Adopt enabling framework	Integrated and enabling/suitable framework

Source, with adaptation from: World Bank, 2006

Agricultural Innovation System (AIS) Concept in Use

Several important reports (for example, DFID 2004; Barnett, 2005) have pointed out that the Agricultural Innovation Systems concept has, in recent years, been endorsed and applied in the formulation and analysis of agricultural and rural development policies, programmes and projects, by reputable organisations around the world, including the Organization for Economic Co-Operation and Development (OECD), the Inter-American Development Bank (IDB), the World Bank, some United Nations agencies, non-governmental organisations, national governments and the New Partnership for African Development (NEPAD). Within this broad acceptance of AIS and the shift from the traditional NARS (sometimes referred to as 'linear' or 'researcher-driven') concept, and due to disillusionment with those traditional approaches in terms of development outcomes, practitioners and scientists alike are increasingly in agreement on the need to include more diverse partners in the R&D system in order to successfully address social and economic development objectives (Hall et al., 1998; Hall, 2007).

Consequently, researchers, development practitioners and donor agencies with an interest in research and innovation have increasingly attempted to apply AIS concept to projects and programmes (Barnett, 2005). The DFID-funded Research Into Use Programme in Nigeria is one of such AIS concept-based programmes — although its interpretation of this concept in terms of operational strategies has shown wide variation. RIU is a research project, and, in line with the programme's global research question, the experimental activities in Nigeria are aimed at understanding the mix of actors, policies, institutions and circumstances that can allow agricultural research to optimally contribute to innovation and development (Hall et al., 2010).

RIU's theoretical proposition is that there are three well known elements of the agricultural innovation processes that seem important in the successful use of research for impact. These three elements are (i) user involvement in research and innovation (ii) multi-actor processes that foster interaction for a variety of purposes; and (iii) the embeddedness and interdependence of innovation processes in local institutional, policy and political contexts.

Also well-known is that, in practice, supporting these three elements of innovation involves the management of a number of tasks that need to be undertaken by an organisation that is not necessarily a direct stakeholder of the innovation process. These intermediaries or innovation brokers perform a bundle of innovation management tasks, including: articulating demand for research; assisting access to technical expertise, markets and credit; facilitating network formation and strengthening; training; and advocacy for policy and regulatory change (Hall, 2010 in preparation). The plans, strategies, activities, outcomes and impact of the Nigeria programme are shaped, analysed and communicated through the parameters of these theoretical narratives.

The RIU-Nigeria programme aims to contribute to agricultural innovation and development through two main strategies. One involves facilitating increased demand for, and use of, outputs from national and international agricultural research systems through the activities of value chain-based, multi-stakeholder Innovation Platforms (IPs) which, in reality, function like chambers of commerce. The other strategy involves research functions — learning and sharing lessons from fieldwork and other experimental activities, and using feedback loops to inform and support national policies, priorities and processes, as well as communicate results to DFID and other stakeholders.

3. SO, WHAT IS INNOVATION? HOW CAN WE KNOW INNOVATION IF WE SAW IT? WHERE DO WE EXPECT IT TO OCCUR?

These basic questions underline the importance of constantly revisiting the primary concepts that we are debating. We need to always clarify the assumptions and definitions upon which our analyses and discussions are premised. This is especially important for three reasons. First, being a research project, RIU is obligated to fully communicate not only the experimental activities and their results, but also the under-girding assumptions and paradigms involved. The second reason is that development interventions can generate unanticipated outcomes; therefore, it is imperative to define our terms so that future evaluations can place in proper perspective and context, the data and information available on the outcomes of interventions. Third, stating where we expect 'innovation' to occur enables the justification of related programme plans, strategies and activities, thereby serving practical uses in both programme management and impact assessment or evaluation functions.

3.1 What do we mean by 'innovation'?

In the true spirit of 'innovation', this paper simply adopts the useful definitions offered by Barnett (2005) and Arnold and Bell (2001) to illustrate the point that innovation does not mean inventing something entirely new, but rather imitating and adapting existing ideas to new uses or contexts. To Barnett (2005), "*'Innovation' . . . means the use of new ideas, technologies or ways of doing things, in a place where people have not used them before. The distinction between 'invention' (the creation of new knowledge) and 'innovation' (in the sense of first application) is crucial*." To Arnold and Bell (2001), "*the dominant activity in innovation is . . . working with and re-working the existing stock of knowledge in a novel way*." Stripped of jargon and verbosity, these definitions can serve as useful pocket-book companions to field practitioners who may face the task of explaining, in the simplest terms, what is meant by 'innovation'.

3.2 Where do we expect Innovation to occur as a result of the DFID-RIU Experiment in Nigeria?

Arnold and Bell (2001) proposed a conceptual framework in which various elements were identified as necessary for a successful innovation system. These include: supportive institutions (financial environment, tax and incentives, education, which the authors call 'framework conditions'); other elements such as effective demand for both producer and consumer goods within the larger economy, an appropriate and efficient system for professional education and research, a vibrant business sector, and supporting infrastructure.

These elements are consistent with the AIS concept as an intra- and interlinked system of diverse but interdependent stakeholders. While the Arnold and Bell framework recognises the key elements that make an innovation system possible, it does not specify where interventions such as the DFID-RIU experiments being implemented in Nigeria and across other African and Asian countries, as practitioners, can precisely expect the potential occurrence of innovation as outcomes. To address this need, therefore, this paper hereby proposes that agricultural innovation can potentially occur in four domains as outcomes of the RIU-Nigeria experiments. The first domain is philosophical or ideological; the second is in the organisation of the agricultural knowledge industry; the third is the economic abdomen in which the myriad transactions and interrelationships are processed, and; the fourth is the macroeconomic infrastructure environment of the country in general. What follows is a brief elaboration of each of these domains and the outcomes and impact that the RIU-Nigeria experiments have generated so far.

3.3 Four domains where agricultural innovation can occur

First Domain: The first domain represents the sum total of philosophical and ideological worldviews, paradigms and national priorities that form the basis of, and are reflected in, policies related to agriculture, financial services, entrepreneurship, rural development, and imports/exports of agro-allied products). These ideologies are sometimes not expressly stated in policy documents, but constitute the meta-policies — the policies about policies — in

agriculture. Hence, if the paradigm is not favourable to free enterprise, the policies would reflect preference for state ownership and control of almost all aspects of the agriculture sector.

'Innovation' in this domain will take the form of changes in paradigms or ideologies. As already mentioned with evidence in Section 2, the NARS concept has strongly influenced the organising principle of Nigerian agriculture research. In historical context, the heavy public investments in agriculture occurred in line with the 1970s trend of state-owned enterprises in all economic sectors across the country, as was the case in most African countries. But since the advent of the DFID-RIU experimental programme in Nigeria, public pronouncements by the Executive Secretary of the Agricultural Research Council of Nigeria (ARCN) and other policy-makers, indicate a recognition that the NARS paradigm, sometimes referred to as 'linear approach', is waning in influence, and that the AIS concept is the new 'approach' for engendering agricultural innovation and development. Given the fact that the ARCN is the national host agency for the DFID-RIU programme in Nigeria, and also the coordinating agency for agricultural research in the country, its public pronouncements are important. It is, therefore, notable and gratifying that various ARCN officials who are closely involved with the RIU implementation have mentioned that the RIU experiments have contributed to the paradigm shift. This, in and of itself, is a *bona fide* outcome of the RIU-Nigeria intervention.

Second Domain: The second domain is concerned with the organisation of agricultural knowledge industry (i.e., the mandates, priorities, processes, ownership and other arrangements for generating, distributing, accessing, acquiring, incorporating and using codified and tacit agricultural knowledge) across the country. This is essentially the policy-operative domain because the organising principles manifesting in this domain are products of the ideologies and paradigms that we identified and discussed in the first domain.

'Innovation' occurs in this domain in the form of changes in the interrelationships among the diverse stakeholders that function or should function in the agriculture sector. For example,

prior to the DFID-RIU programme in Nigeria, the dichotomy and mutual distrust between national agricultural research institutes and the agricultural extension agencies (the ADPs), was well-entrenched. This, coupled with the lack of a unified coordination effort for research and extension services in the country, resulted in what many have observed as dysfunctional relationships between organisations which has been unhelpful to agricultural innovation in Nigeria.

However, under the Cassava Value Chain Innovation Programme facilitated by RIU-Nigeria, the National Root Crops Research Institute (NRCRI), the International Institute of Tropical Agriculture (IITA) and the Abia State Agricultural Development Programme have worked productively with each other and with various agro-allied companies, cooperatives societies, farmers' associations and post-harvest occupational groups, to address issues such as cassava mosaic disease (CMD), lack of access to farm inputs, post-harvest processing technologies and marketing. The collaboration was so successful that the Office of the Abia State Governor sent a letter of commendation to the RIU-Nigeria office, and sought to associate his administration with the intervention. Similarly, under the RIU-facilitated Cowpea/Soybean Value Chain Innovation Platform, the ADPs in Bauchi, Gombe, Kaduna, Kano, Katsina and Jigawa states successfully worked with each other, the IITA, the Institute for Agricultural Research (IAR) and various private companies and service providers in implementing a triple-bagging intervention to address post-harvest crop losses due to weevil infestation.

These examples demonstrate that "*a network of organisations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organisation into economic use, together with the institutions and policies that affect their behavior and performance . . .*" (World Bank, 2006) — as the AIS is defined — can indeed, engender agricultural innovation. It also demonstrates that the ". . . *innovation systems concept embraces not only the science suppliers but the totality and interaction of actors involved in innovation. It extends beyond the creation of knowledge to encompass the factors affecting demand for and use of knowledge in novel and useful ways"* (World Bank, 2006). Keeping in mind Barnett's (2005) definition of

innovation as "*the use of new ideas, technologies or ways of doing things, in a place where or by people whom they have not been used before . . .*" the DFID-RIU experiments have clearly impacted positively on this domain in Nigeria.

Third Domain: The third domain is the emblematic abdomen where interrelationships and economic transactions are processed among myriad agricultural sector stakeholders — researchers, research institutes, the formal education sector, farmers, rural advisory or extension services, agro-allied companies, technology fabricators, banks and other financial service providers, the organised private sector, non-governmental organisations, and other brokers. This domain represents the sum total of the practical activities generated by stakeholders in their pursuit of economic livelihoods as framed by the first and second domains discussed above. This is essentially where the ideological/philosophical rhetoric (of the first domain) and the arcane statements of policy and organising principles (of the second domain) are tested by practical economic logic as framed by, or embedded in, the dominant social, economic and cultural milieus of the country. For example, policy attempts to promote large-scale farming across Nigeria would be challenging because the traditional small-holder rural land tenure system, cultural agricultural practices and many other complex issues will first have to be resolved.

'Innovation' will occur in this domain in the form of changes in the type and quality of services, products, technologies, and the diversity of uses of these by intermediate and final consumers. The involvement of various economic actors in the RIU-assisted Innovation Platforms has enabled interventions to be tested by realistic market logic. For example, under the Cassava Innovation Platform, the outgrowers for CMD-resistant varieties are independent entrepreneurs, and the fact that they have been able to sell out their cassava stems is evidence of the existence of a market demand for the improved varieties developed by the IITA, and by the point that rural farmers are willing to pay to acquire these varieties. This evidence establishes the economic rationale for entrepreneurial investment in that effort.

Similarly, the demand for triple bags produced by private companies under the cowpea IP illustrates the willingness and commitment of cowpea farmers and marketers to minimise their post-harvest losses due to weevil infestation. Policy-makers, too, are part of the multi-stakeholder IPs, and are in a position to observe how policies are tested in the marketplace, thereby getting first-hand feedback from the RIU-Nigeria experiments. For example, the Nigerian Federal Department of Fisheries (FDF), after actively participating in the Aquaculture IP for one year, responded to calls by issuing guidelines for the certification of fish farmers across the country. The guidelines drew ideas from the various discussions that practitioners, researchers and private companies have put forward on how to address a range of challenges such as the high cost of fish feed, the use of growth hormones by some fish farmers, and seasonal gluts in the post-harvest fresh fish market.

Another piece of evidence of the impact of the RIU-Nigeria experiments in this domain is the recently rolled out plan by the ARCN to replicate IP models in a number of 'Adopted Village' sites in collaboration with selected national agricultural research institutes — an initiative funded by the World Bank under the West African Agricultural Productivity Project (WAAPP). This indicates that (i) the IP models are being adopted and mainstreamed by the ARCN in the policy-operative domain, and; (ii) a major buy-in from no less an international resource organisation as the World Bank increases the prospect of sustainable institutionalisation of the AIS concept by the ARCN.

Fourth Domain: The fourth domain represents the totality of the macroeconomic infrastructure — telecommunications, electricity, road networks, transportation, housing, water supply and sanitation, irrigation services, supply-chain facilities for fresh produce, banking, investment capital, law enforcement services, judicial services, and other services that citizens can draw upon in the pursuit of day-to-day living as well as innovation in specific fields. 'Innovation' in this domain will be in the form of availability, efficiency, organisation, ownership and cost of the macroeconomic infrastructure and services which contribute to a community's quality of life.

While RIU is not mandated to work directly in the macroeconomic infrastructure domain, innovations in this domain can impact the agricultural sector, since we know that all domains are interlinked in the AIS concept. For example, there have been reports of how rural farmers have used innovations in mobile telephony to enhance their access to real time information on the prices and sources of supply of, or markets for, farming inputs and produce. Rural farmers have also used mobile phones to transmit or receive payments for goods and services. In Nigeria, inefficient public power supply has been one of the impediments to the growth of the dairy and various post-harvest processing sectors. Therefore, major innovations in the power sector, either in the form of solar technology or improved public power supply, will expectedly enhance innovations in agriculture. (See Table 2 on the following page for a summary of the four domains discussed above).

Table 2: Where can we expect to find Innovation?

	What's this?	RIU-Nigeria intervention activities	Therefore Innovation smells like . . .
Level 1: Meta-policy domain	World view, philosophy or ideology informing the agric policy	Philosophical or ideological debate; ideas on role of the state/, private sector	Paradigm shift, change in ideology, assumptions or world view.
Level 2: Policy-organizational domain	Organization of the research industry, its internal processes and inherent qualities	Catalytic role in provoking, releasing and channelling actions toward specified ends	Change in interrelationships, processes among diverse actors toward common ends.
Level 3: Market domain (abdomen)	Social, economic transactions framed by the dominant culture	Demonstrative activities in methods of producing or providing goods and services in targeted value chains	Quantitative/ qualitative change in methods, types and of goods and services of the value chain
Level 4: Macro infrastructure domain	Telecoms, roads, power, water, housing, public safety, health, education, etc	Jos Tsetse project RIU Best Bet projects Links to govt programmes Tapping into technologies	Hard to claim or attribute

4. DISCUSSION: IMPLICATIONS FOR IMPACT ASSESSMENT OR RIU PROGRAMME EVALUATION

The four domains proposed in the framework in the previous section are, perhaps, a simplification of reality, but, as earlier stated, the framework can be of practical use. For example, as a research project, RIU could more appropriately articulate its research design by indicating which areas in the system the interventions will have impact. It is important for impact assessment or evaluation to consider the fact that 'innovation' really has many different smells, and this paper has proposed four possible domains where innovation can occur have been proposed as outcome of RIU experiments in Nigeria.

Through multi-stakeholder, value chain-based Innovation Platforms, the RIU-Nigeria experiments have demonstrated, as Hall et al. (1998) and Hall (2007) concluded from experiments in India, that diverse partners are necessary in bringing about agricultural innovation. This lesson seems to have registered with agricultural policy-makers in Nigeria, as evidenced by public policy pronouncements, which have extolled the benefits of the multi-stakeholder platform approach over the NARS concept. The ARCN has also adopted the Innovation Platform model for replication in 'adopted village' sites in collaboration with selected national agricultural research institutes, thereby moving to significantly scale up the impact of the RIU interventions. The replication effort has received financial buy-in from the World Bank under the West African Agricultural Productivity Project (WAAPP).

Collaborating with the Agricultural Research Council of Nigeria (ARCN), the national research institutes and the extension agencies, and facilitating productive interactions among these and with the private sector and other stakeholders, the experiments in Nigeria successfully demonstrated, albeit on a micro scale, the enormous potential of value chain-based platforms in agricultural innovation and development. Institutionalisation and mainstreaming of these necessary processes in the policy-operative domain are innovations by themselves. Then, in the third domain which deals with the sum total of practical activities as discussed in the paper, the

new ways of doing things will result in new interactions, products and services that would be innovative in addressing constraints facing the diverse actors.

Triple bagging, an improved storage method for cowpea facilitated by RIU-Nigeria in collaboration with the IITA, the Purdue University (Purdue Agriculture USA), the Bill & Melinda Gates Foundation, state Agricultural Development Programmes (ADPs) and private sector parties, represents innovation occurring in the market domain as a result of an innovation in the policy-operative domain. In another effort, the RIU-Nigeria programme has partnered with two national agricultural research institutes (the Nigerian Institute for Freshwater Fisheries Research, NIFFR, and the National Institute for Oceanography and Marine Research, NIOMR) and two animal feed producing companies (the Grand Cereals & Oil Company Ltd. and the Feed Masters Company Ltd.), for innovation in the fish feed sector. Tracking these technological and non-technological innovations in the way that this paper has done is evidence of the practical usefulness of this conceptual framework. Without this framework, it would be easy, though erroneous, to consider only the 'tangible new technologies' in the practical livelihoods domain as 'innovation, while the more important but 'non-tangible or 'non-technological' innovations could easily be overlooked. In a nutshell, the framework proposed in this paper can enable the RIU programme to tell a fuller and more compelling story to DFID.

REFERENCES

Arnold, E., and Bell, M. (2001). "Some new ideas about research for development". In *Partnership at the Leading Edge: A Danish Vision for Knowledge, Research and Development*. Danish Ministry of Foreign Affairs: Copenhagen, Denmark.

Barnett, A. (2005). "Reducing Poverty Needs an 'Innovation System' Approach" *Science and Development Network* (April 2005) URL: http://www.scidev.net/en/policy-briefs/the-system-of-innovation-approach-and-its-relevanc.html.

Chema, S., E. Gilbert, and J. Roseboom. 2003. A review of key issues and recent experiences in reforming agricultural research in Africa. ISNAR Research Report No. 24. The Hague: International Service for National Agricultural Research.

DFID (2004). *Learning from the Renewable Natural Resources Research Strategy: From Research to Innovation Systems*. UK Department for International Development. Accessed online at http://www.research4development.info/pdf/ThematicSummaries/Brief6_From_research_to_innovation_systems.pdf

Godin, B. (2007). "National Innovation System: The System Approach in Historical Perspective" Working Paper No. 36, Project on the History and Sociology of STI Statistics, Montreal, Canada.

Hall, A (2010 forthcoming). Strengthening RIU's Central Research Team Research Design to achieve Policy Impacts. RIU Discussion Paper Series, Research Into Use: UK. In preparation.

Hall, A. (2007). "The Origins And Implications of Using Innovation Systems Perspectives In The Design And Implementation Of Agricultural Research Projects: Some Personal Observations". United Nations University, Maastricht Economic and social Research and Training Centre on Innovation and Technology (UNU-MERIT), Working Paper Series 2007-013, UNU-MERIT: Maastricht.

Hall, A., Dijkman, J. and Sulaiman, R.V. (2010). "Research Into Use: Investigating the Relationship between Agricultural Research and Innovation". RIU Discussion Paper Series #2010-01, July 2010, Research Into Use: UK.

Hall, A.J., M.V.K. Sivamohan, N. Clark, S. Taylor and G. Bockett (1998). "International Developments In Indian Agricultural R&D Systems: The Emerging Patterns Of Public and Private Sector Activity". *Science, Technology and Development*, Vol. 16, No. 3, pp. 51-76.

Spielman, D.J. (2006). "A Critique of Innovation Systems Perspectives on Agricultural Research in Developing Countries." *Innovation Strategy Today* 2(1): 25–38.

Spielman, D.J. and Birner, R. (2008). *How Innovative Is Your Agriculture? Using Innovation Indicators and Benchmarks to Strengthen National Agricultural Innovation Systems*. The International Bank for Reconstruction and Development/The World Bank: Washington, D.C.

Rivera, W. M., Qamar, M. K., & Mwandemere, H. K. (2005). Enhancing coordination among AKIS/RD actors: an analytical and comparative review of country studies on agricultural knowledge and information systems for rural development (AKIS/RD). Rome. Italy: Research, Extension and Training Division - Sustainable Development Department, FAO.

Rivera, W.M.; (2006); Agricultural Knowledge and Development in a New Age and a Different World; *Journal of International Agricultural Education and Extension*, vol. 13, no. 2, 2006, 57-67.

Röling, N. (1990). The Agricultural Research-Technology Transfer Interface: A Knowledge Systems Perspective. In D. Kaimowitz (Ed.), Making the link: agricultural research and technology transfer in developing countries (pp. 1-42). Boulder: Westview Press.

Röling, N., and P. G. H. Engel. 1991. The development of the concept of agricultural knowledge information systems (AKIS): Implications for extension. In Agricultural extension: Worldwide institutional evolution and forces for change, edited by W. M. Rivera and D. J. Gustafson. Amsterdam: Elsevier Science.

Ugbe, Utiang P. (2010). "It May Take A Little While…: Insights on Agricultural Research for Innovation and Development in Nigeria". RIU Discussion Paper Series #2010-05, October 2010, Research Into Use: UK.

World Bank (2006). Enhancing Agricultural Innovation: How to go beyond the Strengthening of Research Systems. Economic Sector Work report. The World Bank: Washington DC pp. 149.

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