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**AFRICA MATTERS: EMERGING LESSONS
FROM THE RIU COUNTRY PROGRAMMES**

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DISCUSSION PAPER SERIES

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AFRICA MATTERS: EMERGING LESSONS FROM THE RIU COUNTRY PROGRAMMES

Jeroen Dijkman¹

Abstract

This discussion paper presents recent empirical evidence of the RIU Africa country programmes, after positioning these ongoing activities within current debates about innovation in the rural and agricultural sector. The case findings presented confirm innovation as a process of accessing, developing and locating knowledge and technology from different sources within the appropriate institutional and organisational setting. They also provide new lessons on the role of intermediation and intermediates and research capacity, and highlight that while entrepreneurship is often essential to innovation, the common understanding of what such entrepreneurship comprises may require adjustment to take advantage and stimulate ongoing sector development processes. In that respect, while the private sector may be ideally placed in some sectors, local circumstances may currently limit their role in many areas. In light of this, coalitions of private, public and civil society sector actors are important for developing, accessing and using knowledge and technology for agricultural and rural system innovation. The paper concludes that rather than investment in research and technology initiatives only, rural innovation may be significantly promoted through the establishment of independent brokering bodies.

Key words: Agricultural Research, Innovation, Development, Policy, Entrepreneurship, Africa, Networking, Partnerships

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RIU DISCUSSION PAPER SERIES

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LIST OF ACRONYMS

ADPs	-	Agricultural Development Programmes
CGIAR	-	Consultative Group on International Agricultural Research
COMACO	-	Community Market for Conservation
CRT	-	Central Research Team
DFID	-	Department for International Development, UK
FAO	-	Food and Agriculture Organization of the United Nations
IFPRI	-	International Food Policy Research Institute
IITA	-	International Institute of Tropical Agriculture
IPs	-	Innovation Platforms
ISAR	-	Institut des Sciences Agronomique du Rwanda (Rwanda Agriculture Research Institute)
JICA	-	Japan International Cooperation Agency
NAC	-	National Aquaculture Centre, Malawi
NERICA	-	New Rice for Africa
NGOs	-	Non-Governmental Organisations
NYAMIG	-	Nyagatare Maize Investment Group
OECD	-	Organization for Economic Co-Operation and Development
OIBM	-	Opportunity International Bank of Malawi
PAID	-	Partnership in Agricultural Innovation for Development
PIAD	-	Presidential Initiative on Aquaculture Development, Malawi
QDS	-	Quality Declared Seed
R&D	-	Research and Development

RDO	-	Rwanda Development Organisation
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
UPoCA	-	Unleashing the Power of Cassava in Africa
USA	-	United States of America
WFC	-	World Fish Centre
WFP	-	World Food Programme

1. INTRODUCTION

Agricultural innovation and its support through science and technology initiatives has been one of the mainstays of development assistance in Africa. Initially deployed as a way of tackling food-based poverty, more recently it has been re-emphasised because of the recognition that agriculture and rural-led growth can be an effective way of reducing poverty. The contemporary understanding of innovation as a process of mobilising knowledge and technology from multiple sources, however, requires a re-think about the sorts of capacities needed to support development: scientific capacities that underpin agricultural research are not sufficient to drive innovation in today's multi-dimensional agricultural sector. Instead, the notion of investment in capacity for innovation needs to be expanded to encompass the complex set of activities, players and policies involved in developing, accessing and using knowledge and technology for agriculture and rural system innovation. What this new type of investment entails and how it should be directed are, however, still open questions.

As part of its broad portfolio of activities RIU established country programmes in Malawi, Nigeria, Rwanda, Sierra Leone, Tanzania and Zambia. These Africa country programmes were established with an explicit agenda of experimenting with ways of building capacity that enables research to be put into use. The main tools deployed as part of this agenda were innovation platforms: a family of approaches focused on linking organisations relevant to various topics where the private sector is or should be prominent.

Although the RIU country programmes in Africa initially struggled to work out how to explore the *research into use* question, over the past twelve months the scope of the country programmes has been slimmed down to ensure a more manageable set of experiments, and they are now starting to build evidence on ways of strengthening innovation capacity by connecting different parts of the innovation systems in which they are working. This discussion paper first take a closer look at the contemporary notion of innovation capacity in relation to food security and rural development. Next it presents empirical evidence from

the reorientation of parts of the country programmes, followed by an analysis of some of the emerging policy-relevant lessons, ending with an outline of the shifts in emphases that are required for the international community to promote and support such changes.

2. INNOVATION IN THE CONTEMPORARY AGRICULTURAL SECTOR²

There is growing recognition that innovation as a process of using knowledge and technology for economic and social progress is at the heart of the international development process. Agriculture is a critical element of this agenda and it will not be accomplished without significant and sustained innovation in national and global food and agricultural systems.

The food price crisis and the recognition that agricultural development is a key strategy for reducing poverty has put agriculture firmly back on the development agenda. In response, for example, the World Bank is doubling its lending for agriculture in Africa to \$800 million from 2010 (FAO, 2009; Newsweek, 2008)³. Philanthropic organisations such as the Bill and Melinda Gates Foundation are also investing tens of billions of dollars in research and development activities focused on increasing food supply in Sub-Saharan Africa. Similarly, the Consultative Group on International Agricultural Research (CGIAR) has used the food crisis to support its position that further investments are required in agricultural research. A number of donors — notably DFID and JICA — have also substantially increased their contributions to the CGIAR (DFID, 2008; CGIAR, 2010).

There are historical reasons why most investments and interventions to promote global food security give emphasis to a research-driven approach to agricultural innovation. During the 1960 and '70s food production in Asia — particularly in India — was dramatically increased by the development and introduction of high-yielding varieties of wheat, maize and rice, combined with a package of irrigation, pesticides and nitrogen fertiliser. This was the so-called Green Revolution.

² A version of this section was previously published as Nov-Dec. 2009 LINK Look editorial, titled “Will a Time of Plenty for Agricultural Research Help to Feed the World,” (Hall and Dijkman, 2009).

³ The World Bank’s Group Agriculture Action Plan 2010-2012 (World Bank, 2009) raises agriculture spending from around \$4 billion to \$8 billion a year, and since agricultural research constitutes approximately 7% of the overall budget this means \$560 million a year for research.

What is often forgotten, however, is that this revolution involved a unique partnership between public sector plant breeders in India and elsewhere and the research centres of prominent philanthropic organisations (the fore-bearers of the CGIAR). This was built on many years of earlier research. It required a complex food policy regime that involved price support, procurement policies and infrastructure, and a linked public food distribution system. And, significantly, it required public supply of inputs to areas with favourable production environments.

The contribution of research was undoubtedly critical, but more important was its combination with other activities and policies. The Green Revolution took place in a region (again, particularly India) with a state-dominated economy where bold, publicly orchestrated interventions of this sort were politically and administratively possible. The approach was a rather blunt policy instrument, being inappropriate for areas without access to water and other inputs and being insensitive to food preferences and sustainability issues. Unsurprisingly the approach could not be replicated in the complex social, economic and political mosaic of sub-Saharan Africa.

Innovation in the Contemporary Agricultural Sector

The contemporary setting of the agricultural sector is very different to that of the Green Revolution era. Notably, there are strong linkages between farmers and local and global markets and thus a much stronger role for the private sector both locally and in global value chains coupled with a less prominent role for the State in most economies. Globalisation also brings an increasing degree of unpredictably and rapid change which farmers need to respond to. The recent food price crisis is a good example of this trend. This suggests that even a more nuanced narrative of the Green Revolution is unlikely to be appropriate today as a strategy for achieving agricultural development and food security.

Today, innovation in food production, processing, utilisation, and distribution usually takes place where different players in the agricultural sector are well-networked together,

allowing them to make creative use of ideas, technologies and information from different sources, including research.

Evidence from the development and diffusion of the New Rice for Africa (NERICA) — a family of rice varieties specifically developed for African upland production conditions — is illustrative. A study by Dalahoun et al. (2009) suggests that NERICA has been widely adopted in parts of Benin and that this has increased farm incomes and food security. This has, however, not resulted from efforts of a large-scale promotion campaign supported by the international community — although NERICA was developed by an international agricultural research centre. Instead the success in Benin has been due the emergence of an informal coalition of rice millers, seed merchants, politicians and banks. The catalyst for this was rice millers who recognised that NERICA was a superior variety, but they could not procure it because farmers did not have access to seed to plant it. The millers managed to create political support for the promotion of NERICA and this was used to make credit facilities available to seed merchants to invest in the production of rice seed. This combination of linked players and activities, coupled with the new varieties, led to a major innovation for income generation and food security.

These findings resonate with a World Bank (2006) study of agricultural innovation processes and capacities. Based on studies of diverse cases from small-scale food processing in Bangladesh to fruit exports in Ghana, this study made the following broad conclusions:

- Agricultural innovation is rarely driven by research and is usually opportunity-driven, with entrepreneurs (micro or corporate) responding to market opportunities and threats
- Underpinning the capacity of these entrepreneurs to innovate is the network in which they are embedded and which they use as a way of access, knowledge, information and technology — information about the changing state of the market, about new technology and about expertise to address opportunities and threats

- Poorly-developed linkages between players with complementary information are the major constraint to innovation capacity; this is often related to long-standing routines, practices and policies: for example, the reluctance of the public sector to work with the private sector. The market has not been able to provide strong-enough incentives for linkage formation and this is a role that public policy needs to play
- Research is usually poorly embedded in these networks and this undermines its ability to contribute effectively to the innovation process

Thus, while agricultural research remains a necessary part of any global food security strategy, there is now widespread evidence that this on its own is not sufficient to increase food production and access. The focus of capacity strengthening efforts is, thus, no longer on the science suppliers alone, but on the totality of actors and policies involved in innovation. This may include farmers and their organisations, entrepreneurs, traders, industrialists, financial organisations, decision-makers, development organisations and civil society organisations. Only by building such types of networked capacity can sectors and countries solve problems and improve practices, and, in so doing, cope, prosper and compete in a world that itself is continuously changing (Spielman and Pandya-Lorch, 2009). This holds true for the challenges of agriculture and food security as it does for other development challenges.

3. RIU AFRICA COUNTRY PROGRAMME CASES

While country programmes could and should have been nimble in responding to opportunities to put research into use in local innovation systems, the programmes went through a formative period generally typified by rather mechanistic and often ill-conceived methods. As a result, the strategy of putting research into use in Africa initially focused mainly on developing structures — in a fairly blueprinted fashion — variously described as ‘innovation platforms’ and ‘national innovation coalitions’. These involved a variety of activities that tried to address some of the most intractable research and development (R&D) problems, often identified by country scoping studies, using approaches that were generally based on large-scale demonstration and technology dissemination efforts.

In Malawi, for example, a cotton innovation platform tried to deal with research and development problems in a stagnant sector by promoting technologies and practices for boosting cotton production and productivity. The rationale was to demonstrate the potential to increase farmers’ seed cotton yield per unit area through the application of recommended technologies. This had rather limited impact, but was typical of the approach that most R&D practitioners would traditionally have taken.

Similarly, in Zambia, a ‘conservation agriculture platform’ tried to increase the adoption of water-saving agricultural practices through a large number of ‘integrated’ demonstration plots, much along the lines — albeit at a larger scale — of what had been tried over the past 20 years. With the increased autonomy and flexibility of the RIU Africa programmes, combined with a new research design and analytical framework (Hall et al., 2010a) and demand-led advisory and mentoring services that add intellectual oversight on learning lessons and integration into national and regional policy debates, however, many of these activities have now been refocused and reoriented.

While not denying the importance of addressing long-standing rural development conundrums, reorientation of part of the country programmes has indicated that investment

in new and dynamic rural sector opportunities may have better pay-off in increasing the sector's contribution to economic growth and poverty reduction. The following examples from the country programmes present a flavour of some of this emerging empirical evidence.

Case 1: RIU Malawi

Although demand for pork in Malawi has recently increased significantly, much of this requirement has been met by importing animals from South Africa. Pig rearing, however, is widespread in Malawi and numerous project-based interventions have encouraged a rapid increase in the production and availability of improved breeds. While such projects may have addressed perceived management and genetic problems, they have not been able to establish the stable market that would take local pig rearing beyond sustenance production.

Recent brokering efforts by RIU Malawi using an innovation platform mechanism, however, are rapidly transforming the sector, as the facilitation of linkages and negotiation among key public, private and civil society stakeholders in the pork value chain is solving some of the sector's most 'pig-headed' issues. As a result a constant local supply of quality pigs is being provided to processors and consumers through the establishment of decentralised pig marketing structures.

Much of RIU Malawi's work focused on establishing effective linkages among actors that don't normally interact. This was achieved by the facilitation of group and one-to-one meetings to discuss and analyse sector issues and to discover the incentives that would create trust and coherence among these diverse groupings. The brokering activities that led to the establishment of these decentralised pig marketing structures involved negotiations over quality requirements and sales contracts between producers and buyers; public health and food safety policy advocacy; the facilitation of training of pig farmer associations in business management and marketing; and the provision of grant funds and technical coordination to the livestock platform for construction of formalised pig market structures. The platform mechanism also gave sector actors the opportunity to review and plan the

activities and construction of decentralised pig markets, and it continues to provide an evolving forum that allows a broad range of actors, both 'new and old', to share experiences and lessons and to explore sector opportunities and challenges.

The active participation of meat processing companies in establishing new marketing structures gave confidence to many individual pig farmers. Other platform members are teaming up to become pig buyers due to the promising market prospects. This capacity-building has also attracted funding from other donors; for example, in the supply of basic processing and cold storage facilities to enable the servicing of a larger range of clients.

While the situation in each location differs, it has been the private sector that has assisted marginalised pig producers to unite in piggery associations. It also takes the lead in activities related to decentralised markets, e.g., establishing modalities for the markets' management, establishing contacts with relevant stakeholders and authorities in the local district/ town assembly and organising access to, and providing, pig production input services.

The fisheries sector is very important to Malawi's economy and its overall food security. In recent years, however, fish caught from lakes and rivers has declined due to over-fishing caused predominantly by the increase in human population.

Fish farming/aquaculture has thus been touted as an option to respond to the growing formal and informal demand for table fish in Malawi, with the Presidential Initiative on Aquaculture Development (PIAD), launched in 2006, seeking a tenfold increase in the contribution of aquaculture to total fish production from 550 in 2005 to 5000 tons per year by 2011.

Until recently, however, challenges such as the absence of quality input supplies (e.g., fingerlings and feed) and a range of other services, as well inefficient marketing systems (for fingerlings and table fish, for example), have held back progress on the achievement of such objectives.

To unpack the potential of the sector, RIU Malawi has been organising meetings among stakeholders in the aquaculture sector, who were not normally interacting to identify opportunities and support required to unblock bottlenecks, such as the availability and supply of quality fingerlings, the development of a marketing strategy and hatchery guidelines; and the provision of business-related services.

The membership of the forum established through these meeting is fluid — depending on the issues that the platform addresses at any particular time — but its member roll call has included: premier aquaculture research institutions in Malawi such as the National Aquaculture Centre (NAC) and World Fish Centre (WFC); private companies such as Maldeco Aquaculture limited and African Novel Resources (the latter being an aquaculture technology-transfer company); commercial farmers such as Mandebvu Integrated Farm and Solace Fish Farm; the Aquaculture and Fisheries Science department of Bunda College; the Economics Department of Chancellor College; representatives of fish farmers' associations, NGOs such as World Vision International and Project Concern International; government ministries; and the Opportunity International Bank of Malawi (OIBM).

Contacts and contracts established and negotiated through the forum have allowed producer' associations to be linked to quality fingerling supplies, to established and emerging markets and to research in order to mainstream brood of an improved strain of *Oreochromis shiranus* to hatcheries. While the private sector was initially reluctant to join, this changed not only through the realisation that the issues dealt with by the platform reflected their own challenges, but also that the platform was perfectly positioned to influences policies that it had been unable to change on its own, having been designated the *de facto* implementing arm of PIAD. This is, for example, illustrated through the platform's lobbying for the approval of sex reversal technology, which has now been agreed by the Technology Clearing Committee. This will now allow private companies such as Maldeco to compete effectively in the export market.

With hatchery guidelines for fingerlings production finalised by the platform and the certification of fingerlings and a table fish marketing strategy in place, around 5 million quality fingerlings of the improved strain will be produced and marketed by 2011. This will increase the incomes of thousands of fish farmers as well as put quality animal protein on the tables of numerous poor consumers.

Case 2: RIU Nigeria

While cowpea faces many challenges throughout its lifecycle, post-harvest weevil infestation is its biggest threat, rendering the crop unsuitable for human consumption in a matter of days. Few staple foods, however, command higher market prices in sub-Saharan African countries. Cowpea production, marketing and processing offer very lucrative livelihood options, and its many small-scale producers, traders and consumers have tried various methods of preserving the seeds post-harvest. Chemicals, such as phostoxin and acetylic dust, kill the cowpea weevils in storage and are popular, but misuse of these chemicals contaminates the crop, making it poisonous for humans and frequently leading to severe illness or even death.

Scientists at Purdue University in the United States developed an airtight bag which can kill the weevils and preserve cowpea seeds in storage, thereby eliminating the need for the application of chemicals. Significant funding from the Bill & Melinda Gates Foundation and a link with the Consultative Group on International Agricultural Research (CGIAR) subsequently enabled the wide-scale promotion of this initiative in cowpea-producing regions across Nigeria.

It was, however, not until RIU Nigeria negotiated a multi-agency collaboration with this programme and a range of other key sector stakeholders (including the state-funded Agricultural Development Programmes, a private sector plastics company, independent consultants and local researchers) by facilitating meetings and stakeholder dialogues, policy advocacy, and providing suitable incentives, that the invention found the appropriate

traction. Indeed, such has been the success of this initiative that even poor quality 'counterfeit' bags have started hitting the market!

Intervention by RIU Nigeria has led to the direct involvement of target communities and establishment of vital linkages among stakeholders, which facilitated the provision of necessary support services, training and local production and availability of high-quality storage bags in different sizes. This networked capacity has also allowed the sector to deal with second-generation research questions based on feedback received from cowpea farmers and marketers based on their experiences of using the storage bags.

Aquaculture has replaced poultry as the fastest growing sector and avenue for the most widespread, high-potential, small-scale investment in Nigeria. Recently, however, the lack of quality input supply, and other services, has been seriously hampering this growth. Despite such urgent needs, it was not until RIU Nigeria started organising meetings among fish farmers, farmer associations involved in fish processing and marketing, federal department of fisheries, resource organisations, non-governmental organisations, communities, private partners, financial institutions and research institutions, that such needs started to drive sector innovation.

These discussions prompted negotiations that have, for example, led to a sector-driven unification of the three aquaculture research organisations' agenda. In addition, the power of collective agency also allowed legitimate private sector service suppliers to be identified and promoted, and allowed public and private providers to tailor services to sector preferences and market demands. Producers gladly pay the premium prices that authentic inputs and services command, while trade in, for example, genuine fingerlings and brood stock and advisory services is booming. Inter-ministerial involvement and collaboration proved vital for consistent policy messaging, certification and enforcement to provide the enabling environment.

This is yet another example of how innovation can occur when sector stakeholders are effectively networked, and in this specific case how it can enhance access to market information, increase business opportunity, and enable sector actors to respond to old and new market preferences.

Case 3: RIU Rwanda

Brokering activities by RIU Rwanda has knitted together the network required to deal with the regeneration of local potato production in Gicumbi District and spawned a profitable business in the production of basic potato seeds or micro-tubers.

As a result, a variety of activities (e.g., the import, multiplication and large-scale distribution of two new disease-resistant varieties from neighbouring Uganda and the implementation of positive selection in informal seed systems) involving a large number of sector actors is regenerating potato production in Gicumbi District. RIU Rwanda has, therefore, provided income-generating opportunities for poor households by stimulating dialogue and interaction among key public, private and civil society stakeholders in the potato sector.

Another line of activities facilitated through the innovation platform combines *in-vitro* planting material supplied by the Rwanda Agriculture Research Institute (ISAR) and the entrepreneurship of a farmers' cooperative. It aims to solve the chronic lack of potato mini-tubers through the establishment of the first commercial unit to produce basic potato seeds in a greenhouse in Gicumbi District. RIU paid for the in-country training of agricultural experts from the cooperative that runs the seed production unit, and is covering part of the running costs of the operation's first production cycle until earnings kick in. Certification and other required follow-up/mentoring services by specialised institutions, such as ISAR, are provided and accessed through other platform members.

With the first 7,000 *in-vitro* potatoes planted in mid-May 2010, the initial sets of micro-tubers produced in Gicumbi District will be in the fields by October 2010. Demand for the

micro-tubers, however, is already such that at least two additional commercial units are envisaged to be operational by the next planting season in October 2010.

The Nyagatare Maize Platform was established with the intention to address bottlenecks related to access to and proper use of knowledge on maize crop intensification. Its members, however, had other topics on their mind: access to markets and the profitability of maize production. A number of working sessions with market professionals, brought in by RIU, soon made it clear that the only way to cope, compete and prosper in the maize business was to create a trading arm. The Nyagatare Maize Investment Group (NYAMIG) was established in May 2009, and some 70 individuals and organisations, including 30 farmers' cooperatives, subscribed to NYAMIG as shareholders. RIU assisted NYAMIG to be registered as a company by the Rwanda Development Board.

RIU also paved the way for negotiations with the World Food Programme (WFP) and the company landed its first contract to supply 400 tons of maize in April 2010 for a unit price of 150 FRW/kg. NYAMIG shareholders directly benefit from this contract as stock is sourced from its own collection centres. Both the quality control measures certified by the Rwanda Bureau of Standards and the nature of the company were overriding criteria in winning the contract and the World Food Programme is now looking to extend the partnership with NYAMIG. The Rwanda Development Organisation (RDO) was tasked by RIU to provide support to NYAMIG in terms of management, operations and training.

Notwithstanding this initial success of NYAMIG, farmers are often forced to sell their "products" before harvesting to cover urgent family needs. In the absence of rural credit services, farmers' only option is to sell their 'futures' to traders for below-market prices — a practice known as "*Kotsa*" in Kinyarwanda. The Maize Platform decided to address this issue through a proposal for the piloting of a 'warrantage' system. Through the assistance and intermediation of RIU and RDO an agreement to implement the system was concluded between NYAMIG and Duterimbere Bank, a financial institution that is a member of the platform.

The pilot, currently under implementation, uses NYAMIG's stock of maize as collateral for a bank loan. Farmers who wish apply for a loan make individual applications, with Duterimbere Bank debiting the NYAMIG account accordingly. Contracts between NYAMIG and the cooperatives ensure that members who get bank loans reimburse them by providing an equivalent quantity of maize. The joint management of the maize stock by the bank and NYAMIG ensure stocks are sold when market prices are high.

Case 4: RIU Sierra Leone

RIU established a Partnership in Agricultural Innovation for Development (PAID) in Sierra Leone in July 2008. The partnership draws members from government ministries, research organisations, NGOs, universities, civil society, farmers and farmers' organisations. It currently has over 150 members and is officially recognised by the Ministry of Agriculture, Forestry and Food Security. PAID membership claims to represent about 23% of the country's population and approximately 45% of the total farming population. Through RIU Sierra Leone's facilitation, PAID has become an inclusive social-business network, bringing together actors in different parts of the value chain.

PAID was conceived as a platform for members to exchange information and services and to create awareness of the role and potential of agricultural research in poverty reduction and economic growth. It is aligned with various local policy frameworks, such as the Agricultural Advisory Group and the Agriculture Technical Team, and several PAID members are involved in agricultural and natural resources policy formulation. Over time it has evolved to become a main driver of key rural development themes such as market access, rural youth employment, and the use and role of agricultural research in Sierra Leone.

PAID members also took the bold step of registering as a limited liability company but with members rather than shareholders and no share capital. As a result PAID now acts as a private sector 'partnership of service providers' and as a source of independent advice on how government, the NGO community and other key national umbrella organisations can

effectively create an environment that would best support the fledgling but vital community of rural entrepreneurs. In fact, PAID has started to act as a broad-based private sector rural development think tank — perfectly positioned to impact on policy and institutional change in Sierra Leone.

PAID is also paying dividends in other ways: Contacts and linkages established during the platform meetings have given renewed momentum to a number of solar drying and fruit juice processing initiatives. The solar drying platforms — for cassava leaves and chilli peppers — were set up with the intention of having rapid impact, but had become stuck in a typical cycle of training and community involvement only, which, although undoubtedly important, did not pay off until these new skills and organisational mechanisms were effectively linked to existing market opportunities and much-needed investment.

The activities which started with the training of local artisans in the construction and maintenance of solar driers — an RNRRS output — and the training of women's groups in selected communities in their use and hygiene aspects, potentially enabled communities in 4 districts to deal with the wastage of fresh produce. However, the scheme only really got into its stride when contacts established during PAID meetings brought together a vacuum packaging facility, set up by a private sector enterprise with funding from the Ministry of Agriculture and the retail outlets of traders in Freetown. RIU has since assisted in contract negotiations to establish out-grower mechanisms and bulking centres for the dried cassava leaves and chilli peppers prior to transportation and vacuum packing for retail sale. RIU enabled contacts with the IITA UPoCA project, which has also provided access to mosaic virus-resistant varieties of cassava, potentially enhancing both tuber and leave yields. More recently, negotiations among an enterprise development NGO, the association of pepper growers, and a private sector company have brought in funds to rehabilitate a pepper processing centre and skills to implement phyto-sanitary protocols and obtain the organic accreditation necessary to access high-value markets in a number of European countries.

A similar development has also combined the capital and skills of two other PAID members. One, a vocational training NGO, had received a donation from UNDP in the form of a juice processing plant, but had not managed thus far to make the plant operational. The second is an association of private sector companies looking to exploit a growing fresh-fruit juice market in Freetown. Contacts and meetings subsequently organised by RIU provided the association with assistance from a bi-lateral donor to develop its business plan and the required start-up capital, as well as the establishment of outgrower arrangements ensuring the sourcing and supply of pineapple and mango. Local knowledge on the operation and maintenance of bottling plants, accessed through a soft-drink multi-national based in Freetown, provided the additional equipment for prospecting and acquisition that has since led to the establishment of two joint-venture fruit juice plants to market their produce to retail outlets in the country's major cities.

Case 5: RIU Tanzania

As in many other countries, population growth, increasing urbanisation and rising incomes has stimulated demand for animal protein in Tanzania. But unlike many other nations, the increased importation of frozen poultry and the rearing of commercial broilers has not been able to meet demand as consumers continue to prefer the taste and food preparation qualities of the local *kuku* (chicken).

While this market is exploited by some small-scale producers and traders, there has not been the enabling environment to allow systemic sector changes to occur. In a significant change to this situation, RIU Tanzania has built linkages among key sector stakeholders. This has not been achieved by an easily definable set of actions, but required persistent interaction, dialoguing, negotiation, knowledge sharing and sector-wide meetings. These actions are slowly establishing a local poultry sector network that is turning increased urban demand for poultry into an opportunity for marginalised households and rural entrepreneurs by adapting and utilising new and existing research outputs and facilitating the provision of a broad range of input and output services.

While innovation in the local poultry sector may be consumer-led in some areas, or investment-led in others, it has been the networked capacity that has been built in the sector through the brokering activities by RIU Tanzania that has enabled new ways of working, access to information and services, and investment. This is an evolving story but the outlook is good. Fundamental changes in interactions among sector actors and the new modes of operation by producers and entrepreneurs has provided new solutions for problems and opportunities to be identified and dealt with quickly, as well as bringing in new actors who can deal with the issue.

As farmers expand the numbers of local poultry raised and receive training in entrepreneurship, demand grows for flexible saving schemes to safeguard their profits for re-investment and expansion of their businesses. At the same time, farmers need simple mechanisms to ensure availability of quality inputs and services when needed.

While the majority of people in urban centres enjoy efficient mobile money transfer services, rural areas are currently not so well catered for. In addition, when small-scale farmers have cash they often come under intense social pressure to use their money for pressing needs in their extended families and communities. RIU Tanzania, a selected animal health company and RIU-supported hatcheries are, therefore, piloting the use of mobile-phone money transfer services. These enable farmers to pre-pay for advisory services and production inputs. This exciting initiative prevents cash needed for re-investment in the next poultry production cycle from being diverted to meet unpredicted social needs, while at the same time guaranteeing access to quality services and production inputs.

Thus far only a few thousand households are involved but advocacy and empirical evidence from RIU Tanzania has caught the attention of policy-makers and rural development investors and is informing policies and ways of working that will contribute to sector changes that will allow more poor producers, entrepreneurs, service suppliers and market agents to take advantage of the opportunities offered by producing and marketing local poultry.

Case 6: RIU Zambia

Renewed market interest in local rice varieties is proving beneficial not only for producers but also for the environment. RIU Zambia's investment and brokering activities in the rice sub-sector in the Chambeshi floodplains have created the potential both to respond to unmet demand and to reduce pressure on local wildlife and forests.

By forming a partnership with the Community Market for Conservation (COMACO, an offshoot of the Wildlife Conservation Society) and upgrading and expanding community trading centres, RIU Zambia has increased producers' access to commodity purchasing, processing, branding and distribution to higher-end market outlets while enabling the use of rice-related research outputs. This mechanism allows farmers to benefit from finance that assures a timely market for their local rice at a premium price through a variety of equitable 'contract-farming' arrangements. This provides a large number of subsistence farmers with new opportunities in an area where a lack of income-generating and livelihoods options was increasing reliance on forest exploitation and poaching.

The facilitation of linkages among the public sector (ministries and research organisations), private sector, farmer organisations, local authorities and other relevant community-based organisations through RIU Zambia's efforts at organising meetings and dialogues, removal of bottlenecks and provision of incentives has not only leveraged policy-relevant issues and lessons through an existing national rice stakeholder forum, but also allows access to the broad resources and expertise needed to address new sector challenges and opportunities.

Such evolving networked capacity is well-illustrated in the response to a recent set of events. As local rice production and the number of producers increased, the availability of certified seed to meet the market demand for quality products became an issue. Brokering by RIU Zambia and the established linkages among producers, traders, the Seed Control and Certification Institute and seed research organisations has facilitated improved productivity of the local rice seed that has now reached the status of Quality Declared Seed (QDS).

Involvement of the private sector in the multiplication of seed is also ensuring that enough QDS will be available to producers including small-scale farmers.

4. EMERGING LESSONS

Although the country programmes have at least only another 9 months to run under current RIU funding arrangements, it is nonetheless possible to discern a number of emerging, generic lessons relevant to policy-makers and development investors. Such lessons fall into the following broad categories:

Solving Problems versus Identifying Opportunities

The re-orientation of the country programmes towards an opportunity-led agenda indicates that investment in new and dynamic rural sector opportunities offers opportunities to increase the sector's contribution to economic growth and poverty reduction. While this does not imply that addressing some of the most intractable problems should no longer be on the development agenda, it does indicate that alternative rural development options can and should be exploited. Rural development interventions and investment should not be solely about solving problems but also about pursuing exciting new options.

This also applies to what are generally called 'unexpected outcomes', or opportunities that arise during implementation, or that are identified outside the original intended programme of activities. Flexibility in varying or adding to existing programmes — as well as a ready availability of funds that can be allocated to such unforeseen openings — has been shown to pay significant dividend in certain cases.

The Role of Research in Innovation

While research and technology are, in one way or another, integral to all the country case examples, in none of these instances has research or technology driven innovation. Even in the case of Nigeria, a technical solution developed in splendid isolation needed a capacity building process for it to be put into use, i.e., the rate-limiting step is not technology development or promotion but the level of innovation capacity. These case studies also suggest that rather than simply promoting research products, it is more valuable to link research processes to activities led by entrepreneurs and other users of new ideas.

Dissemination of technological interventions alone is unlikely to contribute significantly to take-up; what is needed is the diffusion of the process instrumental in systems innovation.

In all the cases presented here research was initially largely peripheral to developments. It is only after production increases and linkages are developed that researchable issues, or so-called 'second generation' research issues, arise. This is an important observation because it not only gives further weight to the observation that investment in research capacity alone will do little to enhance innovation and rural development, but it also provides important indications about the type of research capacity that needs to be present for it to be relevant to rural sector innovation and growth. With researchers in most countries still ensconced in research organisations that set long-term priorities, there is often not the required capacity or institutional flexibility that would allow research to respond to the types of needs described above. In terms of strategies that would increase the integration and relevance of research to rural innovation and development, a crucial aspect will, thus, be the degree to which at least part of the available research capacity can respond to real needs.

Institutional Architecture

Some of the country programmes are led by private companies; others are an integral part of policy bodies or ministry departments. These differences in institutional arrangements have led to a number of different ways in which the country programmes are linked into the wider policy and economic environment. A crucial aspect appears to be the ability to discern when different strategies may be more or less effective in influencing policy and investment choices, and to build the capacity that can respond accordingly.

Notwithstanding these differences in institutional architecture, by slimming down operations over the past 12 months, the RIU country teams have evolved from active implementation to facilitation of the necessary linkages or the elimination of obstructions — roles now described as 'innovation brokering'. The impact of these activities on the ability of the systems in which the country programmes operate to cope, respond and prosper under changing conditions indicates that these brokering functions fill an institutional hiatus.

However, this also poses significant questions about who will take over such roles at the end of the RIU programme. It suggests that in addition to investment in research and technology initiatives, agricultural innovation and rural development may also require the establishment of independent rural development brokering agencies.

Private Sector?

The case studies clearly indicate that most market-oriented rural development initiatives need strong private sector involvement to succeed — particularly in light of the continuing retreat of the State in most developing economies. Entrepreneurship in Africa, however, is not uniformly developed across all sectors and all nations. The absence of such private financial initiatives has led to the emergence of a new member of the institutional architecture, often rooted in civil society or the public sector. These budding organisations use public or donor money to perform private sector brokering and other private sector roles (Hall et al, 2010b). The case studies also provide examples of private sector agents performing a variety of functions that would normally be considered to belong to the public sector domain. In institutional landscapes where both private and public sector functions may variously be under-represented or underdeveloped, competing and prospering requires each sector to undertake activities that would usually be considered outside their traditional roles and competencies.

Similarly, the emerging type of entrepreneurship presented in the various case studies doesn't conform to commonly recognised industry models either; they often consist of networked business models covering a broad range of necessities that their clientele, generally located in the lower socio-economic strata of society, have. Such *Bottom Billion Businesses* may well be starting to rewrite the commerce development handbooks in Africa. Results obtained in the RIU country programmes in funding the activities of these nascent groups are indicative of new avenues where development donors may want to direct their investments to stimulate rural innovation.

5. CONCLUSION

The policy implications of these findings in building innovation capacity in the RIU African country programmes clearly indicate that agricultural innovation, rather than simple investment in research and technology initiatives, may also require the establishment of appropriately-funded rural development brokering agencies — or bodies with a similar function, which address this obvious gap in institutional architecture.

While the interpretation of what constitutes agricultural research has broadened considerably both in terms of the scope of activities and the scope of partnerships involved, development practice still maintains firm administrative and operational distinctions between development and research. Moreover, many of the large-scale investments in agricultural innovation capacity by the international development community remain firmly focused on the strengthening of agricultural research only. The empirical evidence presented in this paper confirms that while research is — in many cases — necessary, in the absence of concomitant institutional and organisational changes it is unlikely to be sufficient for innovation. Moreover, the results suggest that for research capacity to be relevant to rural sector innovation and growth, *per se*, it requires the capacity and institutional flexibility to respond to evolving and emerging sector needs. In this respect, redirecting at least part of the funds allocated to the strengthening of research and research infrastructure could significantly enhance the pertinence and response capacity of these investments to sector development needs.

In addition, while the private sector may be ideally placed in some sectors, local circumstances may currently limit their role in many areas. In light of this, coalitions of private, public and civil society sector actors are important for developing, accessing and using knowledge and technology for agricultural and rural system innovation.

These findings raise important questions about how global public research and development efforts could or should reorient themselves to be able to respond.

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