

**INNOVATION PLATFORMS IN PRACTICE:
LESSONS LEARNED FROM SARD-SC WHEAT INITIATIVE IN ETHIOPIA, NIGERIA AND
SUDAN**

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Executive Summary

Support to Agricultural Research for Development of Strategic Crops in Africa (SARD – SC) is a multi-national initiative led by the CGIAR and funded by the African Development Bank (AfDB). Within a broader mandate for enhancing food and nutritional security, as well as reduced poverty across sub-Saharan Africa, one specific aim is to improve productivity and profitability of four strategic commodities which have been prioritized by heads of a number of African states: cassava, maize, rice and wheat.

Over the course of the first phase, 27 local innovation platforms were operationalized in 12 countries – 6 in each of the three hub countries (Ethiopia, Nigeria, Sudan) and 1 in each of the other 9 participating countries within Sub-Saharan and West Africa. The intervention point for the innovation platforms were consistent across all countries, and related to the discovery of avenues for improving productivity and profitability potential in order to reduce wheat imports, both in terms of quantity and cost of imports. A genuine desire to move away from historical (linear) processes for technological development and dissemination towards more pluralistic forms of technology generation, dissemination and broad uptake is evident. At its core, the IPs embrace the notion of plurality, in terms of the number and breadth of organizations and individuals voluntarily entering into a partnership, within the spirit of a commitment to knowledge discovery and exchange through participatory learning; and through uncovering choices and options for resolving systemic (and with more difficulty systematic) challenges in order to simultaneously attain multiple outcomes:

Research outcomes - Development of new and improved wheat seed varieties which are: (i) suitable for highland (cool season) and lowland areas (heat tolerant); and (ii) tested on farmer fields at the local platform level. This, together with the identification of avenues for improved efficiency in national seed systems such that critical mass is achieved in continued innovation for varietal development and uptake;

Policy outcomes: Reduced dependency on wheat imports, as a reaction to the 2008 global food crisis, as well as recent instability in national currencies within a number of countries. The initiative aims to enact a “wheat transformation” across Africa and in line with a continental wish that “Africa must feed Africa”.

Developmental outcomes: Improved farm household incomes through enhanced yields of wheat (volume and stability) and when aggregated nationally, improved national food security. Issues related to gender equity in terms of access to knowledge and opportunity for enterprise development were more formally introduced after inception.

Of the 12 countries of intervention, the three hub countries (Ethiopia, Sudan, Ethiopia) provided an avenue for testing the development of innovation platforms and participatory approaches therein, for knowledge generation and dissemination, as well as avenues for scaling this approach both nationally within country and across countries of intervention. Knowledge is defined here within the broader notion of embodied (seeds, equipment, et cetera) technologies and soft (improved production practices, institutional organization, et cetera) technologies; as well knowledge which is introduced through local (existing) availability and that introduced through external sources.

In all three hub countries, conventional wisdom that national production of wheat is not profitable has been overturned. This has led to much interest on the part on national ministries

of Agriculture to embrace the notion of innovation platforms, as espoused by the SARD initiative, and towards the enhancement of national wheat production capacity. In Nigeria, the project has attributed the introduction of wheat into the list of state strategic crops as a policy outcome stemming from the experiences shared within the innovation platforms, such that a minimum guaranteed price for wheat (and wheat seed) has now been instituted nationally. In Sudan, attribution of learning from the innovation platform has been placed on the government's recent policy agenda to subsidize and support state directed production, marketing and milling of wheat. In Ethiopia, the innovation platforms have been instrumental in supporting a national (policy) desire for self-sufficiency in wheat production and in public sector support towards the opening up of new lands for the production of wheat with significant investments in irrigation infrastructure.

Each of the hub countries share one common desire: self-sufficiency in wheat production. In Sudan, the state takes this one step further and wishes to move from a producing nation where only 15% of domestic consumption is produced locally to a wheat exporting nation. What implications the manner in which each nation proceeds in terms of achieving self-sufficiency will ultimately determine the future outlook of the innovation platforms. While all of the platforms across countries were conceptualized from the same framework, they appear to be heading in very different directions. This is not an assessment and nor a criticism, but rather a point of observation. Innovation platforms are dynamic in that they (should) embrace change and respond to change. Whether they remain intact as originally conceptualized or transformed on the basis of change is a contextual matter; and time will tell how national policies and global economic pressures influence the functioning of the innovation platforms which are now operational, as well those new platforms which will surely be set up.

Innovation systems are social systems in so far as they relate to interactions between humans in varying positions of authority and in different roles. Trust and reciprocity are fundamental underpinning of functional and effective innovation systems. It is clear from all accounts within the visits to the field that the innovation platforms, as vehicles for mobilizing innovation systems, have improved trust and measures of reciprocity between actors within national systems of innovation. This has been more pronounced in the case of Sudan, but of great importance in terms of outcomes achieved in Ethiopia as well as Nigeria.

Innovation platforms are costly to setup and expensive to maintain. Are state governments aware of the costs of maintaining innovation platforms and the human resources required in order to keep them functional? Within each of the country visits undertaken, we heard from government officials on how the innovation platforms have great potential for other crops and that plans are in place to expand the 'model'. Confusion continues to exist on whether innovation platforms are organizational entities, with a governance structure and formal rules for delivering services, or whether they are institutions which provide an avenue for facilitating mutual exchange through the acquisition and dissemination of knowledge. Organizations are characterized by rules and enforcement. Institutions relate to norms, customs and attitudes which define what is acceptable socially, culturally, economically and politically within a contextual environment. Organizations mature into institutions over time. Framed in this manner, state and programmatic objectives for expanding the number of innovation platforms suggest a prevailing view within the hub countries, and SARD itself, that the platforms are organizational structures which can be replicated in different environments. The alternative is to view agricultural innovation platforms as test cases within localized environments, aimed at influencing a move away from 'business as usual', and towards refined norms and practices

which espouse strong linkages between research and development; as well as in fostering mutually beneficial economic interactions between a wide variety of stakeholders within a value chain, within a sector, and across sectors. Which perspective one takes will lead to a different answer on whether an innovation platform is sustainable. An organizational perspective will concentrate on a defined set of metrics, some of which are provided in section VI. An institutional perspective will rephrase the question to whether the innovation platforms have affected conventional norms and practices, such that efficiency and equity in knowledge acquisition and dissemination have been enhanced, and how the *approach* can be replicated as opposed to a *model* for replication.

Notwithstanding semantic confusion over perspectives, how have the innovation platforms fared in terms of attaining a state desire to reduce (and over time diminish) wheat imports? With restrictions on foreign exchange availability, together with international embargoes (for example, Sudan), imports of wheat have significantly decreased within all three hub countries, such that filling of excess capacity for domestic flour mills has limited the impact of downward pressure on grain prices paid at the farm gate. This decline in prices would have been anticipated given increased production and availability in local markets, through the adoption of more productive improved varieties – in some cases three-fold – and if imports of wheat were not constrained. This has naturally led to an increase in farm household incomes, which are well over the project targets of US\$600 per household.

Not all of these outcomes can be fully attributed to the engagement of SARD, given that innovation platforms work in areas which are of relatively small size, and it is likely that initiative was never ambitious enough to claim such relative measures of outcome within the first phase. Quite clearly, however, the innovation platforms have had an influence on policy in all three countries in terms of raising concerns which were not previously known (or appreciated) and in relation to issues of access to seed quality, equity in opportunities to access knowledge; as well as in the importance of the need to embrace more contemporary (system based) approaches to agricultural innovation. SARD SC, and through the innovation platforms, has also had a clear influence on strengthening the resolve for national governments to push forward on mandates aimed at achieving wheat self-sufficiency, and through the use of innovative science in developing contextually appropriate seed varieties. Whether this goal of self-sufficiency is realizable or not, and at what cost, are policy relevant research questions which can be raised, but perhaps not immediately pertinent given that SARD was conceptualized as an initiative specifically designed to support national governments in achieving a vision of self-sufficiency. From this perspective, the innovation platforms have delivered on the outcomes desired. Whether or not they evolve into institutions in the future will be answered in time, and dependent upon both political will as well as evolving global economic environments. In the main, they continue to remain models for replication within the three countries studied, and as evidenced by the willingness of states to transfer the models to other strategic national crops.

I. INTRODUCTION

Support to Agricultural Research for Development of Strategic Crops in Africa (SARD – SC) is a multi-national initiative led by the CGIAR and funded by the African Development Bank. With an aim to enhance food and nutritional security, as well as reduced poverty across sub-Saharan Africa, the specific focus is on improving productivity and profitability of four strategic commodities which have been prioritized by heads of a number of African states: cassava, maize, rice and wheat. This report concentrates on activities related to wheat under the SARD – SC initiative, led by the International Centre for Agricultural Research in the Dry Areas (ICARDA), and specifically in terms of a review of the *innovation platforms* that have been operationalized within the three hub countries of Ethiopia, Nigeria and Sudan.

Wheat in Africa is predominantly grown in temperate climate areas (northern and southern Africa) and to a limited extent in tropical areas, and generally at high elevation (eastern Africa). However, due to historical wheat deficits, coupled with rising demand for wheat products, the boundaries for wheat production have been pushed to non-traditional hotter and dryer areas within some parts of Africa. Recent global events such as the 2008 food crisis as well as depreciating currencies within Africa - particularly for oil and resource dependent economies - have also placed significant pressure on national governments to limit imports.

Agricultural innovation platforms have recently taken on great interest, and particularly so given concerns over what have been argued to be lower than desired rates of adoption for technologies developed and tested in the field. In large part, this focus is a result of concerns related to increasing amounts of funds devoted to agricultural research and less than expected outcomes in terms of broad uptake of technologies and knowledge generated through research. There are many reasons for why technologies are not always adopted by farmers, and particularly so within environments which are afflicted by adversity of weather and sustained bouts of drought; however, one common argument espoused for lower than expected adoption rates is a concern over efficacy in (historically) linear approaches to technology development and dissemination. In focusing on innovation systems and platforms, there is an implicit desire to promote multi-stakeholder participation in the process of technology development and dissemination, and through processes which enhance beneficial interactions between stakeholders.

As one type of mechanism to organize interaction with different stakeholders within an agricultural innovation system, innovation platforms provide space for negotiation, joint planning, learning and working within clearly stated boundaries and purposes. Innovation platforms can help in situations where there are multiple stakeholders, who deal with complex issues which require coordinated action, where there are institutional barriers hampering development, where competition or conflict is likely to occur, and where there is space for experimentation. While conceptually appealing, there continues to be much confusion over what an innovation platform is (or is not), how it differs from alternative approaches to facilitating interactions between multiple stakeholders, and whether an innovation platform is an organizational entity or a vehicle for institutionalizing a change in the historical manner within which knowledge is generated and disseminated. Perspectives matter in this regard, and they matter because of the potential for innovation platforms to gravitate themselves towards practices which are ‘business as usual’.

This exercise of studying innovation platforms initiated under SARD SC, and within the three hub countries of Ethiopia, Nigeria and Sudan is *not* based on a desire for evaluation. To be sure, the primary interest is in learning how each hub country contextually approached the development of an innovation platform, what were the initial challenges and constraints targeted, which of these influenced the entry point for the platform to become functional and how did the innovation system assemble and gel. This, of course, does not negate a critical (but fair) assessment, together with recommendations for strengthening the good work which continues to be undertaken and with notable development outcomes

There has also been an interest in understanding whether the current set of innovation platforms within the hub countries exhibit a sense of sustainability and if so, what are the criteria to assess sustainability. If not sustainable, what are the options? While this report provides more generic metrics for assessing sustainability, based upon conventional wisdom within a circle of those studying innovation systems, the report concludes by asking whether the question is appropriately phrased. There is much discussion within the literature on assessing the value of innovation platforms as long term approaches for improving the efficacy of knowledge generation (research) and dissemination systems (extension and advisory services), as well as the beneficial interactions between actors within an innovation system such that informed and profitable choices are made in the decision to adopt technologies at broad scale (scaling out).

Innovation platforms are expensive to set up and expensive to maintain. In the absence of funding, they are unlikely to survive unless managed by national entities – typically state bodies. In this case, they are susceptible to take over as organizations for delivery of state mandates and programmes. There is, therefore, some merit to the argument that innovation platforms are better conceptualized as avenues for facilitating institutional changes to both organizations as well as norms and practices related to national systems of innovation. This entails viewing innovation platforms as organizational entities in the short term, and ones which mature into institutions over time. Institutions here in the deeper sense of being immersed in the norms and practices of how innovation is undertaken, without having to lean on organizational structures for rules and enforcement.

Through a mix of both field visits to innovation platform sites in Ethiopia, Nigeria and Sudan, together with an interweaving of contemporary thoughts on innovation systems and innovation platforms, this report provides a relatively unbiased perspective on learning from the first phase of the SARD wheat initiative. While the field visits were biased to the extent that they were coordinated by project staff and with influence on who was personally interviewed and invited to focus group discussions, there is an element of independence in the sense that the author has not been involved in the design of the project initiative, nor in any of the ongoing research and project planning initiatives. Some project staff may feel that there are omissions or missing information which would help be helpful for a better understanding of the outcomes and processes under which these outcomes have been achieved. There is much validity to this argument if raised. However, the short duration of the visits to the fields and demands for timing the visits with field days' place constraints on how many sites can be visited, as well as how many independent stakeholders can be interviewed. Every attempt has been made to keep the report factual and to avoid gross generalization. There will certainly be debate over some of the perspectives taken herein and this is welcomed. These perspectives have been scribed in the spirit of inquisition and in the name of research.

II. METHODOLOGY

The opinions and analysis presented herein are based on three visits to each hub country:

Ethiopia – November 12th to 16th, 2016

Nigeria – March 21st to 26th, 2016

Sudan – April 2nd to 9th, 2016

For each country visit, both focus group and key informant discussions were held. The bulk of material presented is however based on the accounts, perceptions and reflections of project staff. Readers should, therefore, be aware that bias exists within the arguments presented herein, but that the author has attempted to remain as neutral possible; and to question those notions which appear not to be fully justified on the basis of evidence or observation.

For each country, a context specific overarching guiding question was developed, based on discussions prior to the visits to the field, as well as secondary information acquired:

Ethiopia – How has SARD SC assisted the state in moving towards wheat self-sufficiency?

Nigeria – How has SARD SC influenced the introduction of wheat as a strategic crop nationally?

Sudan – How has the initiative facilitated support for wheat production, marketing and milling through state supported avenues?

Across all three hub countries, the following two questions are cross-cutting:

- What has SARD SC done which is different from contemporary thoughts on innovation systems and innovation platforms?
- How has SARD SC contributed to an environment for sustained innovation?

Where beneficial and required, secondary data has also been acquired and reported on in order to strengthen the arguments presented.

III. INNOVATION SYSTEMS – CONTEMPORARY THOUGHTS

The rapidly changing context of agriculture has resulted in a transformation of the way knowledge is generated and applied. Agricultural development is increasingly taking place in a globalized setting, which implies that domestic markets alone no longer define demand. Agricultural systems are increasingly complex and knowledge from other domains and locales is increasingly more important. Affected by technical, social, economic, political and environmental issues, the range of issues that must therefore be addressed to foster agricultural development is vast and often unknown. Hence, what is required is a different approach towards the generation and application of agricultural knowledge; traditional approaches to agricultural research and extension are no longer sufficient to enable agricultural innovation and development to take place effectively. Over the years, perspectives on the role of agricultural research for development have shifted considerably, moving from linear Transfer-of-Technology (ToT) models in the 1960s to 'Farmer First' and Farming Systems Research approaches in the 1980s and 1990s. Participatory approaches that came into vogue in the 1990s contributed to technology generation and adoption that further brought in economic, market driven value chain thinking into agricultural research and extension. However neither participatory approaches nor value chains addressed the organizational and institutional factors required for technological changes to sustain. Thus far, agricultural research has focused strongly on improving production and processing techniques such as breeding new varieties, improving cultivation practices or in improving profitability of both staple and cash crops.

More recent views focus on **Agricultural Innovation Systems** (AIS), builds on systems thinking. **Systems thinking** is an approach to probing and dealing with the complex situations that actors face in a particular sector – looking at the whole and making links between the various parts. Systems are defined as “relationships and linkages among elements within arbitrary boundaries for discourse about complex phenomena to emphasize wholeness, interrelationships and emergent properties” (Röling 1992). Integrated systems are complex wholes in which a range of social and bio-physical processes interact across various levels and scales. Re-orienting the dynamics of systems in favour of realizing desirable outcomes is essentially about changing the way people interact with each other and respond to their changing environment. (Leeuwis et al 2014). As such, recent approaches to agricultural innovation are increasingly rooted in (soft) systems thinking. The focus on actors, their perspectives, their intentions, and their interrelationships within the wider context makes it a useful approach for dealing with the complexity in which smallholder farmers operate. The new perspectives that emerge through focusing on actors and using a soft systems approach, challenge predominant reductionist, linear, transfer of technology approaches. (Sanyang et al, 2014). AIS argues that both development and adoption of contextually relevant technologies and innovations are more likely to be successful when there is a process of continuous learning, jointly undertaken by research organizations, farmers, marketing agents, donors, NGO's, financial service providers, policy makers, and relevant civil society actors.

Agricultural Innovation Systems perspectives can help to address systemic constraints shared by multiple actors operating in complex systems with competing forces at play. The AIS perspective places great emphasis on understanding the nature of relationships between actors, and the attitudes and practices that shape those relationships. Relationships promote interaction and interaction promotes learning and innovation (World Bank, 2007). An innovation system can be

defined as “a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect their behaviour and performance” (FAO working definition, Rajalahti, 2012, Hall et al., 2006). They are seen as a way of operationalizing interaction and learning among actors, and enable the reshaping of institutions and relationships. (Swaans, et.al., 2014)

Innovation Platform: one mechanism for operationalizing an AIS perspective

One mechanism for facilitating effective agricultural innovation systems is through the development of innovation platforms, which are premised on the fact that effective innovations in agriculture occur due to interactions between technologies and practices, and the networks forged between individuals and organisations. Along with technologies, the AIS perspective considers the role of social and institutional factors that bring actors together as equally important. Building partnerships for innovation is crucial to facilitate innovation processes. Innovation platforms are mechanisms to organize interaction with different stakeholders within the agricultural innovation system (Nederlof et al. 2011). Multi-stakeholder innovation platforms have become common tools in agricultural development and research projects and programmes. They provide space for negotiation, joint planning, learning and working within clearly stated boundaries and purposes (ibid). Innovation platforms can help in situations where there are multiple stakeholders, who deal with complex issues which require coordinated action, where there are institutional barriers hampering development, where competition or conflict is likely to occur, and where there is space for experimentation.

Nederlof et al. (2011) refer to an innovation platform as “a diversity of interdependent actors who jointly attempt to positively change the way they operate by trying out new practices.” An ILRI policy brief on capacity to innovate (Homann-Kee Tui et al. 2013) states that an innovation platform is: “a group of individuals (who often represent organizations) with different backgrounds and interests: farmers, traders, food processors, researchers, government officials, etc. coming together to diagnose problems, identify opportunities, and find ways to achieve their goals. They may design and implement activities as a platform, or individually...” An earlier ILRI publication has a more concise definition: “Innovation platforms are equitable, dynamic spaces designed to bring heterogeneous actors together to exchange knowledge and take action to solve a common problem” (ILRI 2012 cited in Cadhlon 2013). No matter which definition is chosen, a number of key characteristics are essential for a stakeholder interaction mechanism to be considered an innovation platform. These include:

- **Different types of actors**, with varying views, interests and experiences collaborate through joint action and reflection.
- The collaborating actors are **bound** to each other; they are interdependent.
- The glue binding these actors together is a **common, often complex, problem** or opportunity.
- Platforms provide stakeholders a physical or virtual space for exploring opportunities to address those common issues and to find and implement joint solutions.
- One of the intentions of the platform is to **experiment** with new ways of operating in order to solve problems or take advantage of opportunities.

There is a lot of variation in the way innovation platforms are organized and operationalized. Configurations of innovation platforms vary for example according to the theme, sector or (combination of) commodities covered. However, while they may be flexible, IPs generally follow a series of phases or steps (Homann-Kee Tui *et al.*, 2013): initiation with stakeholder identification, identification of common objectives and problems on which to focus, to identify options for resolution, to experiment and adapt, to develop capacity, to implement and scale up, and to analyse and learn. Most commentators within the innovation systems literature, and leading thinkers on the subject, share a common understanding that an “ideal” innovation platform provides a forum/venue for:

- Prioritizing problems and opportunities (joint learning);
- Experimenting with social and technical options (and approaches) to alleviate identified problems/challenges; and assessing the tradeoffs which arise from the implementation of these options (participatory research for development);
- Mobilizing resources, forming alliances, and building coalitions in order to create and sustain an enabling environment for innovation to prosper (sustainability);
- Linking with other local, national and regional processes and systems to disseminate knowledge gained and lessons learned (knowledge as a public good)

Students of agricultural innovation systems literature will also find general agreement in the notion that platforms are one type of mechanism for out-scaling research outputs, and only within limited geographical boundaries. The expenses related to set up and maintenance make them prohibitively expensive for outscaling across regions and nationally. When undertaken efficiently, innovation platforms are, however, suitable mechanisms for informing policy dialogue and in instilling policy change through demonstration of potential opportunities and evidence of outcomes attained. The platforms initiated within the three hub countries of SARD SC, within the wheat initiative, have a number of examples in this regard and continue to provide both policy as well as research relevant lessons in terms of bridging the interface between research, policy and (social and economic) development.

IV. HUB COUNTRY EXPERIENCES

The experiences from each hub country summarized below are based on observations attained through visits to the field and with corroboration from secondary data sources. Given limited time and selection of innovation platform sites visited, the summaries are by no means comprehensive. Project staff may find that certain important elements are missing. It may be argued that in a significant number of cases, this is likely due to the fact that these elements were either not raised during the many interviews and focus group discussions held or that they were relevant to an innovation platform site which was not visited. As best as possible, the summaries identify key issues of relevance across innovation platform sites within each hub country and where important more contextual specific instances which highlight areas of either concern or opportunity.

ETHIOPIA

It was early morning on November 12th, 2015 and we were headed to a field day in Sinana district of Bale zone. Comprised of 18 districts, this was one of 2 within which the SARD wheat initiative is engaged. The other being Gololcha district. Despite poor rainfall that year, both in terms of volume and timing, an undulating landscape of wheat provided one with enough of an indication of the importance of this key crop produced on farmer's fields. We were expecting to see farmers from both districts present at the field day, as well as officials from Oromia region (heads of research units, directors of seed enterprises, and representatives from regional ministry offices). Unfortunately, however, the timing of the field day coincided with a market day where farmers were vying for sale of their produce in local markets; and thus the presence of participating and knowledge seeking farmers was minimal. Their absence cemented a well-known understanding that farmers produce a multiplicity of products, and while wheat may be a key strategic crop, stability in livelihoods requires attention to diversity in income sources.

"If we come together, we can achieve anything" was the message heralded on the blow-horn by the Bale zone administrator as he declared the field day officially opened. The message

SNAPSHOT

4 regions (6 innovation platforms)

- Oromia (Sinana, Gorolcha)
- Amhara (Bichana, Shabalbaranta)
- Tigray (Ofa)
- SNNP (Gadabanu Ghuthazar Walale)

Percentage of land under wheat to total arable land

- Oromia (62%)
- Amhara (17%)
- Tigray (46%)
- SNNP (22%)

280 tons of improved seed varieties distributed to all IP sites within Ethiopia

300 lines selected from more than 1000 imported varieties and placed within national research systems (over half being highland varieties)

9 wheat varieties officially released

- 4 for lowland irrigation production systems
- 5 for highland (rainfed) production systems

was clear and reiterated by a female farmer who proclaimed that prior to SARD “we were household goods and not consulted”. A focus on gender is clearly evident, in so far as the participation of women farmers within the “farmer cluster” approach being facilitated. As in all three hub countries, gender was not initially (well) incorporated into the initiative during the early stages of conceptualization



“Prior to SARD, we were household goods and not often consulted....”
(Female farmer at a field day in Sinana district)

and design and in Ethiopia. The engagement of a gender facilitator within the project team has been a recent addition since 2015. Through her engagement, an increase in female participation of roughly 10% in the early days has grown to well over 30% today. Yet, participation does not necessarily translate into a process of gender transformation and empowerment, both of which are fancy words bandied around to express a desire for shifts in cultural and social norms which provide equity in access to opportunity for social and economic engagement, as well as for mutual respect between sexes, across generations and communities. Opportunities for expanding gender related research within a second phase of the programme exist (discussed in section V) but does not discount the valuable efforts which have been made thus far and particularly in terms of providing female headed farm households with small land areas, access to knowledge and inputs in order to improve their (wheat) productivity potential.

Conceptualized in order to approach issues related to land fragmentation (small land parcel sizes), farmers with common interests in producing quality wheat for seed stocks have been clustered together in order to achieve efficacy in the supply of technical knowledge and primary inputs – improved seed varieties being a primary component within these inputs. Initiated with 20 farm households comprising 50 hectares, the cluster within this district has now grown to well over 100 farm households comprising 114 hectares. The numbers tell a tale of how smaller farmers have joined the clustering approach given an initial average of 2.5 hectares per farm household with 20 farmers to 1.14 hectares per household with 100 farmers.

Shortages in high yielding seed varieties have been a critical (historical) issue for wheat production in Ethiopia. While much of this is due to high farmer demand and issues of efficiency in transportation and storage systems, stripe rust outbreaks are also a compelling factor in the lack of stability in supply. The last of these outbreaks in 2010 caused significant economic hardship through the destruction of an estimated 400,000 hectares of wheat. Much of this was caused by susceptibility of existing wheat varieties to the debilitating disease which stunted and weakened the standing crop. Research initiatives undertaken through a partnership between the Ethiopian Institute of Agricultural Research (EIAR) and ICARDA since 2010 have helped to strengthen the national wheat breeding programme and in the breeding of cultivars which possess an all-round resistance to rust disease within a variety of

environmental and climatic conditions. Funded by a grant from USAID, the project was instrumental in affecting a reform of policies related to varietal release, from an average of 5 to 6 years, down to less than a year. In large part, this was necessitated in order to ensure the availability of seed to farmers of high yielding varieties and equally important, resistance to rust. Resistance will be broken every two to three years, so we are told by scientists at EIAR and ICARDA, and thus continuous innovation is required in terms of varietal development. SARD builds on the momentum of this ongoing collaboration between the two centres of agricultural research.

Wheat varieties are broken into two distinct traits, durum wheat (for pasta) which maintains a high protein content, and bread wheat which, as the name suggests, is utilized in baking of breads and pastries. ICARDA has a long history of research on durum wheat and in the development of varieties which are suited to lowland irrigated production systems. CIMMYT's advantage lies in varietal development of bread wheat. Institutional collaboration between the two is therefore critical in terms of mitigating susceptibility to rust and in providing choice to farmers in access to seed varieties. The innovation platforms mobilized under SARD in Ethiopia are therefore beneficiaries of historical and continued research engagements, but also flag bearers for the role of continued research in varietal development. Over the course of the first phase of the SARD initiative, 9 wheat varieties have officially been registered and released under the umbrella of SARD. Of these, 4 are suitable for lowland irrigated production systems and 5 within highland rainfed systems. Within the latter 5, only one is a durum wheat variety. Within Sinana district, the innovation platform has been instrumental in distributing 6.5 tonnes of improved wheat seed varieties since the inception of SARD.

In Ethiopia, the initiative maintains a revolving seed purchase agreement with participating farmers. An approach for providing a package of inputs (fertilizer and seed) has not been implemented, and likely reflects an overarching objective to address constraints in access to seed which have continued to persist, as well as constraints in the availability of working capital for the purchase of fertilizer. Seed provided to farmers for multiplication is returned in equal quantity.

The notion of traditional principles of fairness is incorporated into the approach with project staff indicating that 95% of seed distributed as inputs is recollected under the agreement. The 5% outstanding should not be understood as default, but rather rejection of seed due to issues of quality, and in order to ensure that redistribution to farmers within the revolving scheme, as well as through other avenues, is based on quality seed provision. In principle, given that high yielding seed varieties are distributed, the total stock of seed within local communities is rising.



Wheat plays an important role within production systems in Ethiopia but is challenged by the threat of heat, affliction to rust and lack of equitable access to credit. Innovation platforms initiated by SARD SC are providing important policy relevant lessons; and uncovering contextually relevant opportunities for improving the productivity potential nationally.

One question is whether the initiative should adopt more of a business model on seed distribution and purchase as opposed to a social model which espouses the principle of equal return to equal input. From the perspective of inducing farmer to farmer dissemination, the approach has much to be desired; yet the ability to scale the dissemination of seed to areas outside of the cluster and areas within close proximity of the cluster of farmers engaged



Innovation systems are social systems in the sense that their effectiveness is affected by the quality of human interactions and trust. Innovation platforms can provide a potentially profitable venue for mutually beneficial interactions.

is limited by a depreciating stock of seed housed by the project. Equally noteworthy are contracts executed between the 72 Sinana district developmental agents (19 female) and farmers on the basis of 50 kilogrammes of seed per hectare per farm household regardless of land area sown. The notion of equality is again present within this approach in terms of return of seed equal to that provided at the time of sowing. It remains unclear as to where the balance of seed produced, after the return of the 50 kilogrammes per hectare, is destined. How much of the production volume is disseminated to neighbouring farmers on a farmer to farmer approach, how much is destined for flour mills (local or within larger urban centres), and how much is consumed by the producing household is not entirely clear? However, a field visit to the IP site in Gedebano-Gutazer-Wolene (GGW) provided some resolution through discussions with project staff.

A national policy which places a premium on wheat seed at 15% above the price of grain (bread wheat) prices ostensibly provides significant incentive for farmers to sell their seed to four national seed enterprises:

1. Oromia seed enterprise
2. Ethiopian seed enterprise
3. Amhara seed enterprise
4. Southern seed enterprise

These sales, of course, are limited to those farm households where there is an excess supply of seed at the time of harvest, which is over and above the needs of the farm household in consumption. For smaller household producers, it is quite possible that the promise of seed production and dissemination may be limited by the need for consumption within the household.

Of specific note is the observation that within the fields visited in GGW, *danda* variety of wheat is prominent. Discussions with local agricultural bureaus suggested that over 3800 hectares of *danda* are now under production on close to 7000 farm plots within the district. While substantive, this represents less than 10% of the total land area under wheat within the district. When informed that *danda* is able to achieve a yield of 6.2 tonnes per hectare in ideal conditions, 5



Through effective research collaboration between ICARDA and national institutions for agricultural research, 9 wheat varieties were officially released under SARD SC. Given issues of resistance to rust, efforts are being made to uncover long term approaches for continuous innovation and development of rust resistant and (contextual) climate tolerant varieties

tonnes under average conditions and relative to production of 2.2 tonnes with traditional varieties, the low rate of adoption is puzzling. Challenges to adoption raised by farmers within the IP suggest that soil acidity is a constraint to production, with access to lime as a critical input constraint. With approximately 3 tonnes per hectare of lime required, at a cost of 3000 Birr per tonne (\$135), a lack of affordable access to working capital is a barrier to attaining the productivity gains achieved on ideal demonstration plots. Governmental loans are only available for the purchase of fertilizer at an annual interest rate of 9.5%. Limited to a 700,000 Birr ceiling (approximately \$32,000) for the whole district, and spread over 21,000 needy farmers, this equates to 33 Birr (\$1.50) per farm household on average. An observation of lower than recommended fertilizer rates, and limited application of lime, is therefore not surprising given constraints in access to working capital.

Within the GGW IP site, 69 quintals (approximately 7 tonnes) have been sold by participating farmers to the Southern seed enterprise for cleaning, storage and onward sales to grain producing farmers. This, in addition to the revolving seed distribution fund within which 1186 farmers have been participating over the past three years. Interestingly, while the sale of *danda* seed was to the Southern seed enterprise, access to *danda* seed is attained through the Oromia seed enterprise. The latter resulting from interactions between the SARD initiative and the seed enterprise company, wherein *danda* seed has been distributed through the Oromia seed enterprise. One implication of this is that SARD, through the IPs, may have inadvertently found an avenue for distribution of seed across seed enterprise companies; thereby expanding both choice of seed as well as quantity of seed varieties to farmers nationally. Is this enough to ensure availability of seed in the long run, in order to meet the state's desire for self-sufficiency in wheat production, and in the production of flour to meet the demand for bread (both subsidized and at market prices)?

Where are the millers in this story? Absent in the early stages of setting up the innovation platforms, some project staff suggest that their reluctance to engage was in part due to what they saw as a threat to their profit margins through organization of the production sector. Others opine that there have been historical concerns related to the quality of wheat produced

nationally. Given that the varieties adopted and produced within Ethiopia have been bred through access to international lines, and when acknowledging that bread flour is a mix of varieties and not comprised of a single variety, this argument holds little weight in so far as varietal quality is concerned. If issues of quality exist, these are likely to be manifested within the value chain past the farm gate. A further claim is that erratic supply from national producers has led to a reliance on international markets for wheat in order to meet minimum milling capacity for cost recovery.

A meeting with the Ethiopian millers' association in Addis Ababa provided much weight to the argument that shortages in national supply were of serious concern to national millers such that over the past decade an increasing number of millers are joining the association. The vice president informs us that roughly 200 of the approximately 300 millers within the country are now members, and that the association has expanded its mandate into a shared



A desire for national self-sufficiency in wheat production will inherently fall on the shoulders of small farm households. How to ensure the production of, and access to, high yielding and rust resistant seed varieties is of immediate priority for the innovation platforms.

for profit enterprise. Plans are being laid to lease out land for wheat production through an arrangement with the investment office arm of the Ministry of Agriculture and within the ambit of a governmental initiative to bring in 200,000 hectares of irrigated land in lowland areas under production. Within this initiative, the association has requested EARI to multiply 2000 quintals of seed which is suitable for production in lowland areas. With only 20% to 30% of milling capacity filled from national production, and 50% from imported grain, the association is aiming to fill the excess capacity of 25% through its own production of wheat, as well as to displace a portion of the 50% which it currently imports. Of the latter, 15% is imported by the government and supplied to 42 millers who are under a quota based contract to supply subsidized flour to bakeries within Addis Ababa. Flour, bread and grain purchase prices are controlled by the state and we are informed that these have been static for the past five years. Subsidized flour is directed to bakeries licensed to utilize subsidized flour and in the distribution of subsidized bread. With fixed payments for transport of flour to bakeries, millers in regions outside of Addis Ababa find the scheme uneconomical. The remainder of imported grain, above that purchased by the government to support subsidized bread to urban consumers in Addis Ababa, is procured under quota and tender, with the government restricting free imports of grain under a scheme of currency rationing. A reliance on national production is therefore now forced on the millers in light of both currency restrictions as well as a national strategy for self-sufficiency in wheat production.

Are the millers now convinced that quality wheat can be produced nationally - and if so why? A simple answer is that the millers have no choice but to rely on national supply in light of

restrictions on imports. A more complicated answer builds on the analysis above and the economic potential for profitability in controlling both volume and quality of supply to its mills. Is production under the association umbrella a short term response to constraints in importation or is there a serious attempt at producing quality wheat efficiently; and with efficiencies in cost such that production on the envisaged 200,000 hectares is competitive with prices for grain on the world market? Why, as an alternative, would the association not consider seed multiplication and distribution under an out grower model with private farmers? The latter would directly address an issue which all stakeholders within the Ethiopian wheat sector agree on, and that is in relation to the inability of, and lack of capacity within, the four national seed enterprises to effectively multiply and disseminate the volume of seed required in order for Ethiopia to achieve wheat self-sufficiency. An outgrower model could provide an opportunity for production of both stable quantities of seed supplied as well as quality of grain supplied at affordable prices.

An opportunity for the SARD initiative to collaborate with the miller's association would appear to be promising, in so far as provision of high yielding seed varieties is concerned, as well as in influencing the development of large scale seed multiplication enterprises which focus on sustainable out grower models for seed production. In the absence of large scale initiatives aimed at producing seed to meet growing demand, a state objective for meeting self-sufficiency in wheat may be compromised. The positive aspect of this compromise is that it opens the door to policy dialogue on the merits of self-sufficiency, and opportunities for investigating alternative options for enhancing wheat security, within a broader objective for food security. SARD SC innovation platforms show some promise in terms of lessons learned on how to effectively cluster farmers in order to reduce transactions costs in input provision, to ensure quality in production, and stability in the supply of better quality wheat. These are important lessons as potential entry points for collaboration with the millers. A more enabling policy environment to support access to inputs, particularly agricultural finance, would go a long way towards achieving sustainable measures in the *capacity to innovate* nationally; and on this note, there may be some lessons to be learned from the experience in Sudan.

SUDAN

Four and a half hours by road from Khartoum, the vista en route to the River Nile State is one of shifting landscapes – some in fallow, shifting to desert and where water exists, irrigated production. We were scheduled to have a meeting at the Ministry of Agriculture for the state, where a group of 15 people were awaiting our arrival. From extension officers to farmers, managers and employees of the seed administration and directors of research, a healthy discussion of progress on various agricultural related initiatives ensued. Much of the discussion was in Arabic, and thus of little comprehensible value to a non-Arabic speaker, but intermittent translation and the ability to ask questions through an

interpreter provided interesting insight into the nature of SARD SC initiatives in Sudan, and specifically within the IP sites in the River Nile State.

One unique aspect of the intervention in Sudan is the role of microfinance, and the role that the innovation platforms play in enhancing access to microfinance. Previous efforts led by both private and state efforts failed in terms of reach of finance to farmers producing wheat, but an approach for distributing microfinance through the innovation platform appears to have taken hold. One key reason for success is the ability for the state to deliver finance through registered microfinance institutions, on the basis of a contract with farmers to produce and sell wheat to the state, and with risk of production loss mitigated through the provision of extension services to farmers within the catchment area of the innovation platform. The importance of mitigating crop loss through efficient extension services is valued by the microfinance banks to the extent that it now pays a stipend to the innovation platform extension facilitators. This stipend provides an incentive for performance, given that the extension facilitators are civil servants seconded to their positions within the innovation platform and earning relatively meager public salaries. Profitability in the extension of loans directed to the production of wheat, together with an avenue for mitigating risk, has further enticed private investors to enter the market for credit provision. Yet, despite governmental buyback schemes for wheat, quotas placed on the amount purchased by the state place downward pressure on average prices received as production which is surplus to state production is sold into local (lower priced) markets. This is not true for all farmers, as we heard that in the North, much of the wheat

SNAPSHOT

4 states (6 innovation platforms)

- Kassala (2)
- Gezira (2)
- Northern (1)
- River Nile (1)

Percentage of land under wheat to total arable land

- Kassala (17%)
- Gezira (22%)
- Northern (43%)
- River Nile (11%)

XX tonnes of improved seed varieties distributed to all IP sites within Nigeria

XX wheat varieties officially released

production is for home consumption, with the sale of food legumes providing much needed cash. In general, however, relatively easy access to credit, coupled with access to extension services and state buyback plans for grain have provided significant contemporary incentives for farmers to produce wheat in Sudan.



In stark contrast to Ethiopia and Nigeria, access to high yielding and heat tolerant seed varieties did not arise in

Prior to the innovation platforms, access to microfinance was limited and risky for lenders. SARD SC has had an influence on the modalities for how microfinance is delivered to farmers in the production of wheat; and in reducing the risk of default through ensuring timely and effective provision of extension and advisory services in tandem with public schemes for access to inputs, machinery and marketing.

our discussions with farmers as a critical constraint to wheat production in Sudan. In large part, this is due to a historical programme of collaboration between ICARDA and CIMMYT on a heat tolerant research platform which predated SARD SC, and for which SARD's wheat initiative is a benefactor. Discussions with farmers in the Nile River State led to an understanding that where lack of access to finance, and inequities in access to both irrigation and equipment were challenges to farmers in the past, the contemporary challenge to farm profitability in the production of wheat is effective marketing and access to markets. Despite a government buyback scheme, both farmers and project staff indicated delays in announcements on quotas and prices at the time of sowing to be of concern. We hear that the state is considering a reform of the current purchase and financing scheme but in what direction and to what extent remains unclear. The outcome of policy reform in this area will be of significant importance for all innovation platforms nationally, both in operational terms, as well as in terms of longevity of the platforms themselves. A shift in transformation of the platform mandate towards a more state directed mandate or towards more private sector engagement will require strategic maneuvering; and particularly so in order to ensure that marginalized farm households are included into any future schemes in the provision of credit and material production inputs, but more importantly, in equitable access to knowledge.

A chance meeting with the undersecretary to the Ministry of Agriculture provided valuable insight into how the Ministry and the state have internalized some of the lessons learned from SARD, as well as where they see the future of the innovation platforms initiated within Sudan. From the perspective of the ministry, food security and sustainable management of natural resources are of primary importance. With overwhelming emphasis being placed on the uncovering of avenues for increasing yields of key strategic crops, the undersecretary provided an opinion on how he personally sees the innovation platforms as a vehicle to mobilize resources within rural areas, inclusive of finance and material inputs, as well as in support towards capacity building within rural populations through efficacy in advisory services. Equally important was insight into a current plan to transform existing farmer unions into 'producer societies' through joint collaboration between the ministries of agriculture and

justice. These new producer societies will be mandated to: (i) assist in the production of production plans at the local level and feeding into a national plan, (ii) offer training on farm management, (iii) dissemination of knowledge on how to obtain state delivered finance, and (iv) enhancing export capability through support in financing. With figures provided of 38 million feddans of land under rain fed production, relative to a total arable land base of 42 million feddans, the government is clearly targeting rain fed areas within the republic. Explicit mention was made of the need to address low crop densities within 'traditional' agricultural practices and a state strategy to achieve not only self-sufficiency in wheat production, but to also strive for exports of wheat in the near future. This is a tall order considering that a value chain analysis undertaken by SARD indicates that only 15% of national demand is produced domestically.

Leaving River Nile State, and heading towards Gezira state, there is indication that an answer to how the republic could potentially achieve its desire to move from a wheat import dependent economy to one which is an exporter. The innovation platforms in Gezira promote a farmer field school approach to dissemination of technologies and while project staff are quick to suggest that the schools are a cornerstone of the innovation platforms in Gezira, field observation and a better understanding of how the platforms operate would suggest that this may be an overemphasis. Without undermining the importance of farmer field schools, there are greater forces at play, and these relate to the nature of interactions between actors within the innovation platforms. If there is a cornerstone, one could easily argue that this is the Gezira scheme programme, and more specifically the manner in which the administration of the scheme provides access to finance, equipment, transportation of harvest and assistance in settlement of sale at harvest. The farmer field schools are then approaches for how to ensure that technical knowledge is generated and disseminated in an effective manner, and with due attention to local knowledge enhanced with scientific knowledge and backstopping.

The chairman of the Gezira scheme, Awad Zuber, stated that approximately 100,000 farmers are engaged in the production of wheat on 338,491 feddans of land. Unlike Ethiopia and Nigeria, access to high yielding and heat tolerant seed varieties are not a constraint to production. Within the Gezira scheme 50,000 feddans of land are under seed production and through the involvement of approximately 16, 700



Access to working capital, equipment and directed marketing by the state have provided significant incentives for wheat production within Gezira state. ARC in Sudan is playing a key interlocutory role in bridging private versus public interests and in (re) building trust between farmers and public entities.

farmers. Yet, due to constraints on finance from the state, only 20,000 feddans worth of seed were purchased. Discussions with farmers suggested that while public finance mechanisms were restricted, there was growing availability of private options for obtaining finance. The benefit of subscribing to public schemes was the ease of which cash is obtained through the

Gezira scheme, together with support in the marketing of harvest. The drawback of subscribing to the public scheme is that the prices paid are relatively lower and access to machinery is often subject to long waiting periods due to high demand. While an effort in increasing the number and types of equipment on the Gezira scheme is being planned, as we were informed by the chairman, concerns were also raised in relation to profitability of other crops produced within a system of rotation with wheat and the lack of profitability with these associated crops. How the innovation platform works to improve profitability within a system of production, as opposed to only wheat, is likely to become a growing concern in time.

How have the innovation platforms improved the efficiency of the Gezira scheme? An appropriate answer to this question requires some historical background and as narrated by project staff. Prior to 2005, farmers resisted state mandated cropping plans for a variety of reasons. Fearing social unrest, the state relaxed the regulatory requirements on cropping patterns in 2005 together with the release of a significant number of extension staff.



Regular interactions with policy champions and ministries provide an opportunity for ongoing dialogue and sharing of lessons learned. The approaches developed by SARD's wheat initiatives in Sudan have encouraged the government to transfer lessons learned to other key crops nationally.

At the inception of SARD in Sudan, participation of stakeholders, inclusive of policy and ministries of agriculture was weak. The Agricultural Research Corporation (ARC), the national centre of research played a significant brokering role in inculcating trust between and within partners. As an implementing partner to SARD SC, ARC continues to remain the interlocutor between private and public interests. Since 2012, and with the support of ARC as well as the functioning of the innovation platform, numbers of publicly funded extension staff have increased appreciably to a close to 150 officer today. This is a marked improvement from the 12 extension officers trained by a parallel initiative led by ICARDA on food security, and collaborating with the SARD SC initiative within an adjoining platform. Building social relations and trust are therefore hallmarks of the achievements attained by the innovation platform within Gezira.

Similar to Ethiopia and Nigeria, we heard of the wish of the state to extend IPs into sorghum, cotton and ground nut. In what form these platforms have been initiated is not clear, but discussions would indicate that the transfer has been in the form of an approach for enacting beneficial multi-stakeholder interactions; although an element of linear transfer of technology appears to still be inherent though modified in order to improve on the approach and the modalities for transfer of technology. Equally important was the assertion that given ARC's national mandate, its 27 research stations spread across all states and with 600 research staff and 3000 support staff nationally, the geographical spread of innovation platforms as an approach for bridging research and development is being undertaken effectively. To their

credit, project staff were also quick to point out that resource availability offered through SARD has facilitated this spread and that without such flexibility, geographical spread would have been slow to attain. As pointed out in a meeting with project staff, “intention is matched with resource availability”.

The involvement of ARC as an interlocutor is also of importance in terms of seed selection and availability. Through its centre for varietal maintenance and basic seed provision, ARC has played a key role in access to improved seed varieties, including in partnership with millers involved in the testing of varieties and selection. Through these ongoing partnerships, historical concerns over the quality of national production have dissipated, with some millers such as SEGA securing seed from ARC in order to produce wheat on their own managed fields.



ARC's centre for varietal maintenance, with technical backstopping from ICARDA, is improving the efficiency and functioning of national seed systems, as well as the legitimacy of innovation platforms within rural communities in providing avenues for improved profitability in wheat production.

Given the overwhelming significance of ARC in the effective functioning of the innovation platforms and with the state playing a critical role in supporting the production of wheat, there are of naturally long term questions of what the innovation platforms will look like over time. Either the innovation platforms will take on more of a state mandated role and direction or there will be more private sector involvement in terms of provision of inputs (including knowledge) and marketing. Will the millers purchase directly from farmers over time? In an ideal situation, a mix of public support as a safety net for farmers and private provision in attaining profitability would be optimal. Which side of this ideal situation the innovation platforms sit on over time will depend very much on how long existing international embargoes on Sudan are maintained, and in whether Sudan is able to achieve wheat self-sufficiency and export status as desired by the state.

NIGERIA

Our drive from Abuja to Zaria on March 21, 2016 provides us with a vista of shifting landscapes. Lush and green as we leave the outskirts of Abjua, and relatively drier as we approach Zaria. We are scheduled to visit Professor Ibrahim Umar Abubaker from Ahmadu Bello University who, in addition to holding the post of director of the institute for agricultural research, is the regional hub coordinator for West Africa lowlands within SARD SC's wheat initiative. Professor Abubaker informs us that it has been a good year for production and the national millers have pledged to mop up all of the supply. There is speculation that farmers may also sell seed stocks to the millers, who currently maintain significant excess capacity within their operations. If this materializes, one implication is

that it will exacerbate a historical constraint in access to improved seed varieties. SARD SC initiatives have helped to mitigate this constraint since 2013, and particularly so in terms of access to varieties which are suitable to heat stressed environments and more specifically, terminal heat stress at flowering stage. Economic challenges, in light of a serious depreciation of the Naira, and significant divergence between the official rate (197 to the US\$) and the black market rate (315 to the US\$) make national production of wheat more competitive, but with a potential danger for eroding research and developmental gains in enhancing access to, and adoption of, improved seed varieties.

Institutional policy and support for wheat production has generally been lacking in Nigeria from what we heard. According to the chairman of the national wheat farmers' association, SARD SC has been instrumental in bringing wheat onto the national agenda through acknowledgement of the strategic role which wheat plays in agricultural production and food security. Through corroboration of other accounts, one take-away message is that there has been a fundamental shift, away from a miller focused mandate which favours imports of wheat, to a farmer focused mandate which relates to profitability in production and marketing. In addition, it is clear from visits to the field that the innovation platforms have played a key role in improving the efficiency of interactions between millers and farmers, as well as in building greater confidence in the ability for farmers within the IP sites to provide a stable supply of wheat to national millers.

SNAPSHOT

4 states (6 innovation platforms)

- Kano (Al Kamawa, Kadawa, Bagwai)
- Gombe
- Jigawa
- Kebbi

Percentage of land under wheat to total arable land

- Kano (16%)
- Gombe (?)
- Jigawa (?)
- Kebbi (?)

XX tonnes of improved seed varieties distributed to all IP sites within Nigeria

Evaluation of genetic potential of over 175 germplasm varieties for identification of suitable traits for further improvement

4 wheat varieties officially released

- 2 of which are rain fed varieties, the first rainfed varieties released in Nigeria

Profitability in the production of wheat has been enhanced as a result of improved productivity and stability in supply. This is attributable to greater access to heat tolerant higher yielding varieties (number and volume); as well as in light of increasing demand from national millers for domestic wheat. SARD SC can clearly attribute the former to its list of notable achievements in Nigeria; however, the latter is a result of artificial demand created as a result of restrictions on imports and rationing of foreign currency reserves not necessarily attributable to the functioning of the innovation platforms. While the two aspects, productivity increases and increased demand are necessary for increasing profitability, one needs to be careful in defining the



The innovation platforms initiated by the SARD SC have brought to light issues and concerns which were not previously known and particularly in relation to seed access and seed quality

(Mounir Dan'Agundi, Deputy Chairman - House of Representatives)

extent of attribution to the innovation platforms. Increased confidence in the ability for farmers within the innovation platform sites to supply a stable volume wheat to millers does not necessarily translate into increased demand. In a contemporary era of import restrictions and foreign currency constraints, rising demand for nationally produced grain is induced by an economic need to displace imported wheat. How stable this demand for national wheat is in the long run will depend very much on the competitiveness of nationally produced wheat to international wheat and whether the government continues to regulate the volume of wheat imports in order to promote national production.

Whether the government chooses to provide price support mechanisms to induce farmers to produce wheat is equally important and over the course of our visit, we heard of an upcoming proclamation that the government was to institute a minimum guaranteed price for wheat at the farm gate. Minimum guaranteed prices are beneficial for farmers in an environment where national production is not competitive against foreign produced wheat. It is also cheaper for the government to subsidize in national currency rather than to expend foreign currency on imports, and particularly so when foreign currency is in short supply. Who is influencing this decision? What is the objective? Who are the target groups for support and what is the role of SARD in this decision? What is clear is that according to the deputy chairman for the house of representatives, Mounir Dan Agundi, the current cost of 635 billion Naira (\$2 billion) in annual food imports is not sustainable. Secondary data obtained through various project reports also indicate that the country is the world's largest importer of US hard red and white winter wheat. Yet, the figures noted within project reports are somewhat contradictory in that the estimates of wheat alone are reported as \$4 billion annually. Without delving too much into the figures, there is clear indication that the volume of wheat imported into Nigeria on an

annual basis is a significant burden on the national treasury and therefore a need to promote national production of wheat. How to provide the correct incentives for production of quality grain, together with effective and equitable systems of knowledge generation and delivery are key components of functional innovation systems and as facilitated through effective innovation platforms.

Public extension remains underfunded, a situation which is not unique to Nigeria, and calls into play more global thinking on the role and function of effective innovations systems. The ability for project staff in Nigeria to negotiate an agreement with the Sasakawa Foundation for provision of rural advisory services shows buy in from both national organizations as well as public service entities. We were informed that no formal memorandum of understanding exists between ICARDA, as the lead centre on the SARD wheat initiative and the Sasakawa foundation, at least in terms of the provision of extension and rural advisory services. To the credit of project staff in both organizations, this has not deterred ongoing collaboration on initiatives which have the potential to influence existing norms, practices and systems related to knowledge provision. Isaac Eni from Sasakawa casually mentions that there is an interest from SARD in formally collaborating with Sasakawa through formal induction into the innovation platform and within an 'extension role'. This partnership has the potential to strengthen the notion of sustainability in *capacity to innovate* nationally, different from the sustainability of the innovation platform, and as one mechanism for binding together an effective innovation system (see section III).

From all accounts presented, Saakawa was the implementing agency for a SG 2000 programme initiated in 1992 and charged initially with improving crop productivity of wheat and maize production systems in collaboration with the Lake Chad Institute. In 2009, a shift towards greater focus on strengthening extension advisory services through market driven value chain approaches has resulted in a collaboration with the Ministry of Agriculture to second 30 public extension officers as community based facilitators in the training of lead farmers as para-extension agents. More importantly, is Sasakawa's formal collaboration with the SARD SC maize initiative and support of external funding from the Nippon foundation to carry out its work. Taken together, the potential for forging linkages between two SARD SC initiatives (wheat and maize), through a third party facilitator, bodes well in terms of taking on more of a production systems approach to productivity enhancement - as opposed to a commodity centred perspective. With extension and advisory services additionally provided through 28 full time staff, and with 30 public extension officers currently seconded to Sasakawa in 3 states, the innovation platforms are likely to look a lot different should the official partnership prevail. Issues related to governance and facilitation of the platform will surely need to be addressed, but these are positive developments in so far as innovation platforms are dynamic mechanisms which should be amenable to change; and with a conceptual underpinning that change is required in order to bind together the many actors within the innovation system.

Priorities for farmers within the innovation platform sites visited (Al Kamawa and Kadawa of Kano State) would appear to have shifted since the interventions of SARD SC. Where access to seed was a key issue at the inception of the project, there is now an overwhelming demand for mechanization as well as access to more organized markets. This demand, quite apart from reflecting a shift in priorities is also important in terms of relaxing a long standing concern of millers that debris was a significant issue in the delivery of grain from small farm households.

The role of the innovation platform in monitoring these shifting demands, and the attendant implications in terms of tackling other constraints and challenges along the value chain, is an indicator of stability and sustainability of functional innovation processes. Shifting priorities of stakeholders engaged within innovation systems are consistent with the dynamic nature of innovation processes, and in the provision of an enabling environment for



Innovation platforms have alleviated a challenge of access to high yielding seed varieties for farmers within the catchment area. A new priority for resolving the constraint of access to mechanization has surfaced, and reflects the dynamic nature of innovation platforms in embracing change and dealing with change.

negotiating change through participatory process within the functioning of the innovation platforms. Having said that, and notwithstanding localized success stories within the innovation platform sites, access to seed continues to remain a national concern, and particularly so in terms of quality.

One element within an ongoing issue related to access to seed is the lack of breeder seed availability. Currently restricted to production with the Lake Chad Institute, with whom a memorandum of understanding exists with ICARDA on the SARD SC wheat initiative, discussions with Dr. Turaki of Lake Chad (and national coordinator for SARD in Nigeria) as well as Professor Abubakar indicate that discussions are underway between Lake Chad Institute and the Institute for Agricultural Research at Ahmadu Bello University to enter into an agreement for the production of breeder seed. A similar set of discussions are also underway between Lake Chad Institute and Sasakawa Foundation. Of particular interest is the observation that the Director of Lake Chad Institute, Dr. Olobanji is the focal point for the ICARDA led SARD SC initiative in Nigeria while at the same time wearing the hat of programmatic lead for the nationally executed initiative – Agricultural Transformation Agenda (ATA). A statement that SARD SC initiatives, and particularly the innovation platform approach has influenced ATA's mandate may actually have a two sided influence in that ATA may have also influenced the development of the innovation platforms and organizational makeup. A more important question, moot in some sense, is whether the gains made and outcomes achieved are reflective of the efforts of Dr. Olobanji –as a person and personality – or in his dual position as head of Lake Chad Institute and focal point for ICARDA on the SARD SC wheat initiative. Equally important is that the introduction of wheat into the national Agricultural Transformation Agenda (ATA), was spearheaded by Dr. Adesina at the time of his mandate as Minister of Agriculture and rural development. Dr. Adesina is now President of African Development Bank, the primary benefactor of SARD SC. Personalities and timing of engagement of specific and influential individuals are an important component of well-functioning innovation platforms.

A second element within the concern on access to seed comes about through knowledge gained from an evening meeting with staff from the national seed council (NASCN). Free to speak at will, the venue provided lively discussion on the constraints to seed access and seed quality in Nigeria. In summary, discussions were centered on the topic of the implications of producing wheat “at any cost” and specifically in terms of laxity in procedural issues related



The sale of seed is big business in a closed market. Lax enforcement of seed production and distribution standards leads to inefficacy in approaches aimed at improving productivity potential. Innovation platforms at each site have a potential role in alleviating this challenge through legitimizing the role of farmers' associations and holding these associations accountable to the constituencies which they serve.

to enforcement and in effective regulations related to seed quality and control. Poor motivation of NASCN staff, due to low salaries and a lack of operational funds to fund travel into the field, incentives for farmers to sell seed into the grain market, and a lack of commitment from the seed council to buy back seed is claimed to have led to an environment of a lack of trust between farmers, NASCN and seed companies. Equally important were claims that the buyback scheme for seeds under the Agricultural Transformation Agenda (ATA) of the government was too lucrative for seed companies, such that the provision of a list of out grower farmers for seeds were not being provided to NASCN for verification and certification. Poor quality control on contracted seed production has the potential for poor productivity of grain, and with claims of incidences of mixed seed and debris on the rise, the argument made by millers that national production is of inferior quality continuous to gain momentum.

Humans consume flour, not grain, and flour is produced from a variety of sources. A regulation enacted more than a decade ago stipulates that millers are to produce a composite flour of cassava and wheat for any shipments destined to bakeries and confectioneries. Internet sources suggest that in 2005 the stipulation was 10 percent cassava to 90 percent flour. On the basis of our visit, we were informed that the current rate is 40% cassava to 60% wheat. The validity of ratios is of secondary concern in an argument that while the state seeks to promote national wheat productivity in order to decrease the import burden of wheat, there is a parallel interest in protecting national cassava producers who, taken together, rank Nigeria within the leading nations in the producer of cassava. With cassava being one of the SARD SC mandated crops, and given the importance within production systems in Nigeria, together with maize, it was somewhat surprising to note the lack of absence of other CG centres *effectively* collaborating within the wheat initiative innovation platforms. Leveraging of activities between the lead centres on different commodities within the broader SARD engagement remain weak. This was admitted by project staff, and initiatives aimed at strengthening partnerships are being conceptualized. One of these relates to a ‘megaplatfrom’ in Kadawa which would operate under joint collaboration between a number of CG centres (ICARDA,

CIMMYT, IATA, ICRISAT). Not surprisingly, issues related to management control and leadership are thorny issues of discussion and resolution at the time of writing is still not clear. The other, perhaps, less sticky avenue for cross centre research collaboration is through the engagement of Sasakawa, as mentioned earlier, and in their role as an intermediary facilitator and broker of rural advisory services to different centres and programmatic initiatives.

Moving from skepticism to optimism in the role of national wheat production for enhancing food security. In the 1980's, we were informed that wheat was produced under the military regime and that the state's interest was simply to reduce foreign exchange pressure. Attention to quality was not present and national millers were reluctant to purchase local wheat. In a more contemporary era, the former minister of agriculture was also convinced that the production of wheat in Nigeria was not sustainable and nor cost competitive. SARD SC initiatives, while at a relatively small and localized scale, have overturned conventional wisdom and led to a realization that national production can be sustainable; whether or not it is (or will be) competitive with international wheat is still too early to gauge.

Lessons learned through the platform have brought to light issues and concerns which were not previously known, or at least not widely discussed. Attempts at adopting more of a production systems perspective within the innovation platforms appear to be taking root, but the modalities under which collaboration and governance within the innovation platforms will materialize over time continue to remain murky. There is hope, however, and particularly so within an environment of significant outcomes attained through research for development engagement, some luck in timing, individual and influential personalities, as well as significant buy-in and ownership from the state.

V. GENDER

Inclusivity of diverse categories of men, women, youth, and more marginalized members of society, is essential in order to foster resilience and sustainability of effective innovation systems. Women's participation and inclusion in innovation processes have the potential to address systemic issues related to access and control over resources. However, within innovation platforms that are heavily biased by technological concerns, there is a tendency to accord insufficient attention to gender and social disparities. Inclusion is generally limited to "smallholder farmers" without further attention to the diversity of sub-categories within this typology. A similar argument holds for those innovation platforms which have been conceptualized without significant contribution from the social sciences.

Innovation systems are social systems, and innovation platforms are one mechanism for facilitating interactions within innovation systems; and ultimately for shifting norms and customs. When inequities in access to knowledge, resources and value for labour expended are tolerated within society, they soon become accepted as cultural norms. A

social science perspective assists in uncovering the nature of inequities, how they have become entrenched over time, and in uncovering contextually relevant and sensitive approaches for releasing constraints to equity in opportunity to access knowledge and services (public and private) such that tolerance to inequity is mitigated.

That a research component on gender was not strongly embedded into the original project design is likely attributable to an overarching technical focus on productivity gains in wheat, the main pathway of which was conceived to be through improved access to high yielding and heat tolerant seed varieties. Over time, appreciation of the need for including research on gender, and in uncovering opportunities for gender transformation has resulted in much more thought on inclusivity and equity within the innovation platform. Much remains to be done in this regard and of particular importance within a potential second phase of the SARD initiative.

In each of the hub countries, one can easily see that women are represented within the platforms in terms of participation in production activities. This was most evident in Ethiopia



Women figure prominently in labour devoted to threshing together with youth. Access to machinery would reduce drudgery and potentially lead to gains in indexes of household well-being.

and Nigeria, while in Sudan the participation was largely seen in terms of the initiative on improving baking quality and in the benefits attained in improving the quality and variety of baked products produced in home kitchens. There are likely similar initiatives for women's participation in wheat production activities within Sudan, but it is quite possible that time constraints limited the opportunity to see these first hand. While participation is important, in of itself, it does not automatically imply that their specific gendered needs and interests are sufficiently taken into account. It also remains uncertain as to what extent farmer representatives are able and willing to relate to and to voice the needs and interests of the diverse constituency to which they are supposed to represent.

Gender equity and inclusion do not appear to have been taken up with significant rigour within the innovation platforms visited; and appear to be much more of an afterthought as opposed to strategic design. This is a significant oversight, especially as women are widely recognized as the “guardians of household food security” (Meinzen-Dick et al. 2011). Clearly distinguishing between food security and food self-sufficiency has merit in so far as the former appeals to household production systems and different interests within the household; whereas the latter relates to issues of production and productivity. A focus on female participation, as opposed to transforming potentially inequitable interactions between sexes and across generations is understandable, at least within initiatives such as SARD which are driven by technological concerns for productivity improvement.

In Nigeria, a thresher provided to the innovation platform in Al Khamawa by SARD in 2015 has not been utilized to date. Quite apart from a technical issue in relation to a broken weld, there has been no consensus within the innovation platform on how the thresher will be allocated for use among the farmers, what price will be charged, who takes charge and responsibility for the rotation of use and issues of maintenance.



Cultural norms have a tendency to entrench marginalization of women in terms of inequitable access to machinery services. Innovation platforms have a role to play in facilitating equity, but require champions for this cause.

From a gender perspective, threshing has historically been a shared responsibility between women and the youth. Yet, the thresher is ostensibly in the hands of male members of the innovation platform within the local communities. When asked if the women would have any role in the operation of the thresher, there were roars of laughter. Whether this was due to what they perceived as a nonsensical question or whether the response was an answer to the question is not clear. What is clear is that strategic interventions aimed at improving equity in opportunity to services, particularly in terms of reducing drudgery, has not been well thought through and requires much more inclusion of a social science research and developmental perspective in order to leverage the strong technical components for which SARD has

achieved significant outcomes. The example provided does not minimize the efforts made in Nigeria on gender related initiatives. The intention is to provide a specific example of how more inclusion of social science perspectives can assist in achieving greater efficacy in initiatives undertaken and with potentially greater impacts in relation to forging more productive, equitable and healthier relationships and interactions between men and women.

In Sudan, the participation of women in agricultural production (specifically in Gezira) has been limited, and presumably for cultural reasons. Availability of microcredit at reasonable terms, through a publicly supported scheme, have provided the innovation platforms with space to play an important role in enhancing access to credit for women and through access to locally manufactured ovens, together with training on



An initiative aimed at enhancing the extension of microfinance through the state, and training in baking methods through private flour milling plants, is being facilitated through the innovation platforms in Sudan.

improved baking methods. With support from national flour mills in providing training and support in logistics for women to attend trainings, the River Nile microfinance institute has disbursed more than 400 loans to households for the purchase of ovens. The requirement for a co-guarantor has not impeded marginalized women with no access to collateral, as the local women's society is able to co-guarantee the loan. Linkages between this interesting developmental related activity and the overarching objective of SARD in helping national governments to affect a wheat transformation in Africa is not entirely clear, despite figures such as 120 women trained by SEGA flourmills through a mobile school are notable. On a more positive note, this signals inclusivity within the platforms, and opens the door to uncovering other productive avenues for how microfinance can be disbursed to marginal members of rural communities, within the spirit of innovation, and in order to forge legitimacy of the innovation platform.

Project staff in all three hub countries mentioned that a metric of 30% of female participation was required and that the participation of women in project initiatives has far exceeded this figure. What does the metric tell us in terms of how participation has affected intra-household relations? What trade-offs have occurred through participation? Within the intervention related to purchase of ovens for women, how has food security (and more importantly nutrition) improved within households? What are the pathways through which improvements in food and nutritional security have been achieved? What inequities exist in access to equipment and services (public and private)? These questions may be under analysis, and if so, that is a significant achievement. Yet, project staff appear to be ill informed of these research endeavours if they are being undertaken within the innovation platform sites.

VI. SUSTAINABILITY (OF WHAT?)

Gildemacher et al. (2011) points at a number of good reasons for why an innovation platform need not continue to function: (i) it has met its objectives and done what it was set up to do; (ii) it is no longer worth the investment – its contribution to innovation ceases to be significant or there are no funding sources available to support continuation; (iii) there is no motivation to continue among the actors; and (iv) other interaction mechanisms fulfil the mandate. Innovation platforms take time to solidify and to harness evidence of long term sustainability of both research and developmental outcomes. Of the indicators listed above, none can be said to have materialized, and thus the validity for the platforms to function today are as relevant today as they were when they were implemented at the start of the initiative.

Sanyang et al (2014) distinguishes between three dimensions of sustainability:

1. sustainability of the changes that happen through the platform (“the innovations”);
2. sustainability of the innovation platform itself as a mechanism or entity;
3. sustainability of the capacity to innovate among stakeholders.

On changes which happen through the platform, and the outcomes attained, there is clearly no doubt that there has been much to report on in terms of scientific output and developmental outcomes. The notion that innovation is a continuous process is well embraced across all three countries, more so in Ethiopia where diminishing resistance to rust will require continuous innovation, but equally important in Nigeria and Sudan for heat tolerant varieties. The mandates of national partners, as key members within the innovation platforms, ensures the sustainability of science and varietal improvements over time, and through collaborative agreements with international centres of agricultural research. While the attribution of SARD wheat initiatives to increases in incomes for wheat producing farmers is bolstered by an environment of restricted wheat imports, and therefore higher (relative) domestic prices, the desire for governments to focus on national production is likely to bode well for farm incomes. Yet, what is good for wheat may not be necessarily good for other crops for which national support in the form of subsidies and assistance in marketing and the potential implications for mono-cropping weigh heavily on future indicators for soil health as well as sustainability of water resources. This is an area which has received very little attention within the euphoria for wheat self-sufficiency as promoted both nationally within the countries under study and regionally in more general terms.

Should national governments, and through lessons learned from the SARD initiative, wish to define innovation platforms as organizational entities, and thereby models for replication, then the question of replicability becomes an important indicator for sustainability (point 2). Indeed, the case studies undertaken do show this desire and particularly so given mention that innovation platforms have been set up for crops other than wheat, and based on the lessons learned from the wheat initiative. How sustainable replicability is will depend very much on whether funds continue to flow in order to initiate and maintain the innovation platforms into the future (indicator ii for why an innovation platform may not continue to function).

When the perspective of an innovation platform as a mechanism for facilitating mutually beneficial interactions between stakeholder within an innovation system is invoked, a focus on *capacity to innovate* takes on greater value as opposed to sustainability of the platform as an entity. This is particularly true for integrated production systems which are complex arenas

within which a whole host of social and bio-physical are interacting (and reacting). Realizing long last developmental outcomes requires a change in the way that people and organizations interact with each within the process of innovation and how they accept or react to change.

Leeuwis et al (2014) argue that in order to foster an effective system of innovation a key set of core capacities are required in order to define a systems capacity to innovate:

- *the capacity to continuously identify and prioritize problems and opportunities in a dynamic systems environment;*
- *the capacity to take risks, experiment with social and technical options, and assess the trade-offs that arise from these;*
- *the capacity to mobilise resources and form effective support coalitions around promising options and visions for the future;*
- *the capacity to link with others in order to access, share and process relevant information and knowledge in support of the above;*
- *the capacity to collaborate and coordinate with others during the above, and achieve effective concerted action.*

In supporting the above, those with a mandate or willingness to catalyse system innovation processes will need to develop:

- *a conceptual understanding of how change comes about in complex systems and how to intervene effectively;*
- *the ability to orchestrate and facilitate interaction in support of the above;*
- *the ability to inform societal agents and embed research activity in ongoing processes of change.*

VII. WHERE TO FROM HERE

While there are many success stories to report from observational analyses of the innovation platforms within the three hub countries, there are also a host of questions which are raised in terms of how these innovation platforms will look like into the future. Equally important are questions related to ownership – of both process and organization – as well as funding sources to support continued innovation. Are there alternatives to achieving food security for nation states in Africa without having to invoke a desire for self-sufficiency in wheat?

Given that the intervention point for the innovation platforms across all hub countries was influenced by national (and regional) political mandates, limited attention to systems analyses within the SARD SC wheat initiative is not particularly surprising. The initiative has characterized and mapped out the value chain for wheat production in each country of intervention, together with challenges to, and opportunities for improving efficiency, participation and equity within the value chain for wheat. Analyses related to the impact of expansion of land into wheat production and implications for reducing the import burden of wheat are being undertaken. Yet, there has been little attention paid to the value of systems analysis in uncovering alternative options for enhancing food security; and in reducing the burden of food imports, inclusive of wheat, but extended to other crops for which the country may exhibit competitiveness or strategic desire for national production.

Embracing a systems approach attempts to understand the linkages between production (crop mix) choices, public subsidies on production and consumption, labour movements, as well as issues related to equity in access to knowledge and markets (input and output). Systems analyses are better able to address questions related to: (i) how national production of wheat is likely to respond to shifting exchange rate regimes and liberalization of import policies; (ii) whether there are optimal crop mix choices which could lead to improvements in incomes and nutritional security while reducing the financial burden of food imports; (iii) environmental, economic and social costs which are likely to accrue from a desire in achieving self-sufficiency in wheat production, and (iv) the impact that improvements in the efficiency of flour milling (grain to flour out turn) can potentially have on releasing land out of wheat production and into the production of other crops, thereby reducing both grain and flour imports.

Through a variety of tools for systems analyses, answers to these questions may assist in the uncovering of options and alternatives which can be tested within the innovation platforms, analyzed for generality through further systems analyses, and potentially important in the delivery of lessons for national consideration as alternatives to a state led drive towards wheat self-sufficiency. Systems analysis provides an avenue for uncovering a wider choice in sets of interventions, and assessments of trade-offs, such that a range of beneficial outcomes are likely to be attained, more consistent with public, private and environmental interests, and likely different in form from those attained through politically driven mandates. Admittedly, this may be asking too much within a first phase where emphasis was on approaches and gathering of evidence related to productivity potential and profitability of wheat production. For long terms sustainability of outcomes, however, these areas of interest are likely to be of immense value within a second phase, at the least, in terms of assessing the impact on rural livelihoods and well-being as well as in terms of food security. Avenues uncovered for approaching these issues are likely to be amenable for testing within the innovation platforms. Through this lens, the innovation platforms may be viewed as laboratories through which sensible and politically sensitive interventions may be tested for validity and generalization.

With a growing interest in collaboration between research centres engaged on SARD SC mandated crops (Nigeria as an example), integrated initiatives within platforms which embody research on production systems are likely to be better placed in terms of attaining food security.

Equally important are considerations of gender and gender research. What trade-offs have occurred through greater participation of women within the innovation platforms? Within the intervention related to purchase of ovens for women, how has food security (and more importantly nutrition) improved within households? What are the pathways through which improvements in food and nutritional security have been achieved? What inequities exist in access to equipment and services (public and private)?

What is the cost of setting up and maintaining an innovation platform? Given contemporary research and developmental interest on innovation platforms, there has been very little research undertaken on this topic. While the exercise is relatively straight forward from a project expense perspective, placing a value on contributions made in kind from public institutions, private individuals and civil society organizations is tricky. How can (or will) national governments take ownership of the innovation platforms, will they be able to absorb the costs of maintaining the innovation platforms, are there risks in handing over the platforms to national organizations and are there alternative mechanisms which can be tested and promoted in order to enhance efficacy within the continuum between research and development?

Alternatively, is there a growing appreciation for the notion that innovation platforms are short to medium term vehicles for inculcating change in 'business as usual' practices related to how agricultural innovation has historically been undertaken? Change is the only constant in the process of innovation. Enhancing capabilities at the level of individuals, communities, research and developmental organizations, policy and private and public networks requires a better understanding of how change occurs and how to effectively intervene in order to attain desirable developmental outcomes. What core capacities, within the notion of capacity to innovate exist within the countries studied, and where do efforts need to be placed in order to either strengthen or develop these needed capacities?

The research questions noted above would be in keeping with a desire for producing both regional and international public goods, in the form of knowledge, and with an aim for enhancing developmental outcomes from the application of science. Research within the first phase has heavily been oriented towards crop breeding, extension and dissemination activities. Provision of comfort in the knowledge that developmental outcomes are equitable and long lasting will require a greater role for social science research within ongoing and future activities, and particularly for those related to the conceptualization, functioning and continuous reorientation of innovation platforms within an environment of continuous change. Adapting to change, and transforming change, is one metric of sustainability in the capacity to innovate.

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