

**Theme 3: Institutional arrangements, policy options, and knowledge sharing mechanism to support agricultural innovation systems.**

## **Application of innovation-system concept in the field: Experiences from a Research Team in Uganda**

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### **Abstract**

Overtime, a series of workshops to reform the national agriculture research system in terms of functions, structures, procedures and competences to meet development challenges have been held in Uganda, targeting NARO researchers and research managers. These reforms are in line with the concept of Integrated Agriculture Research for Development (IAR4D) Field experience and interactions with researchers and managers in public research organizations who participated in the series of workshops show that (1) embedded mindsets concerning technology development (supply along scientific disciplines or commodity lines, researchers as ‘expert’ and trainer of farmers, compliance to research station mandates, doing “good science”) and (2) organisational procedures and culture are slowing the pace of institutionalising reforms, including the application of new approaches such as innovation systems. Reflective sessions with a research-station team in Bulindi, Uganda illustrate the efforts of researchers 'on the ground' and the stumbling blocks encountered in their own functioning, in their institutional environment and in the expectations and mindset of farmers and other partners. Empirical data suggest that the challenge for researchers is the operationalization of the new approaches in an organization that still largely functions according the conventional established routines and institutional beliefs and culture. The development partners especially the non-governmental organizations, the private sector and the new government program of privatising extension are equally confining themselves to their organizational mandates and approaches. The farming communities still ‘thinks’ in supply - driven mode despite the calls for them to demand for research and development services. They expect researcher to come with technologies and associated inputs. Experimentation is something that may pay off in the long run, but for farmers benefits need to be more tangible. The competencies of farmers to articulate their priority needs, change their own mindsets, as well as capacity for R&D actors to forge partners and manage an innovation system need strengthening.

Key Words: innovation systems, mindsets, institutional arrangements, partnerships

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## **Introduction**

The last two decades have witnessed renewed emphasis on the need for agricultural research and development to be holistic and integrated in its approach. Recently, the concept of innovation systems is gaining ground in agricultural research programs. Whereas before the word innovation was used loosely for everything (technology) being new, it stand now for the recognition that technology generation is not a linear process but a complex dynamic one, involving a range of actors beyond the ones who use or apply the technology for production purposes (Hagmann, 1999; Hall, 2004; Dantas, 2005; Spielman, 2006; Worldbank, 2006,). This shift in perspective allows understanding of technocratic context while capturing intricate relationships between diverse actors, processes of institutional learning and change, market and endogenously determined technological and institutional opportunities. GTZ (2003) argues for embedded-ness of diversification, sectoral linkages (between agriculture and non-agricultural economic activities including service provision) and innovations in the rural economy to support market orientation while fostering value addition to rural products for enhancing impact orientation.

Innovation systems approach takes an action and systems perspective (Hall, et al, 2001; Biggs and Matsuert, 2001; Flood, 2002). Conventional research approach tended to embrace reductionism where by phenomena is studied in constituent parts in terms of their cause and effect relationships (Sellamna, 1999 and Flood 2002). Sellamna (1999) observed that reductionist science is at the heart of the linear ‘teaching’ model of transfer of technology model and in general the diffusion of innovation model that has dominated science. To Chambers and Jiggins (1987), this model is traditionally oriented towards the technology and the products rather than towards clients.

Taking on an innovation system approach means a way of working that take into account the complex dynamics of multiple actors in a fast changing environment. For researchers this implies a different way of doing research which involves many new partners, concepts and skills. This paper illustrates intended transformations associated with adopting an innovation systems approach and how these transformations are put in practice by research teams in the context of Uganda to provide insights of enabling and impeding factors from the research process. Experiences of a research stations, namely, Bulindi Zonal Agriculture Research and Development Institute (ZARDI) under the auspices of the National Agriculture Research Organization (NARO), Uganda, are discussed. This paper will repeat the message that uptake of new approaches such as innovation systems approach implies changing the established routines, status quo and mindsets. It requires skills or competencies of both a scientific and non-scientific kind; it requires linkages between producers and users of knowledge; it requires the types of relationships and institutional setting conducive to knowledge sharing and interactive learning. The central issue that this paper aims to bring forward is that uptake of new concepts and skills – such as those associated with innovation system approaches require not only training, but also continued stimulation of putting these concepts and skills in practice in order to learn and further increase the skill, co-learning from and conditions to do so.

## **Background**

### *Agriculture Research systems in Eastern Africa*

#### *Dynamic context*

The history of agricultural research in Africa represents the long lasting search for a paradigm for the development of national agricultural research systems that has the expected impact on

farmers livelihoods (Byerlee, 1998; Eicher, 1989). After underlining the idea that the impact of agricultural research has been unsatisfactory, agriculture research is pressed for tremendous reforms in this region (ASARECA, 1997; Omamo, 2003, Schreiber, 2003; IAC, 2004, FARA 2005). The lack of demonstrable impact from research investments has been raised as a concern by governments, donors and civil society alike and is leading reduced budget allocation and to emergence of alternative funding mechanisms such as the competitive grants schemes. In response to these concerns, a new way of working that encourages researchers to designing research process beyond experiments along linear models being promoted in the NARS. The associated institutional change process currently being called for is part of this process. An ASARECA (2005) commissioned study shows the major reform areas dominating the current NARS reform agenda include:

- *Pluralism in agricultural research; reducing dominance of public institutions and encouraging formation of partnerships and innovation systems*
- *Decentralization of agricultural research: geographically and decision making;*
- *New funding mechanism that encourage competition for research funds*
- *A need to re-align research programmes to address and integrate research and development issues to ensure efficient commodity chain value addition*
- *The need to establish stronger innovation systems that will enhance the scaling out/up of successful technologies.*

#### *The concept of innovation system approach*

Innovation is often confused with research and measured in terms of scientific or technical outputs ( Hall and Dijkman, 2006). However, the concept of 'innovation' refers to the search for, development, adaptation, imitation and adoption of technologies that are new to a specific context. We are working from the premise that an effective innovation system is one where institutes facilitate flow of information and mutual partnerships between actors ( Biggs and Matsaert, 2004). An innovation system is therefore a network of organisations within an economic system that are directly involved in the creation, diffusion and use of scientific and technological knowledge, as well as the organisations responsible for the coordination and support of these processes. The approach to put the concept of 'innovation system' central in the production of scientific and technological knowledge has gained ground in policy and academic circles over the last two decades (Dantas 2005; Hall and Dijkman, 2006). It has, for example, already been endorsed by an array of international and national bodies, including the Organization for Economic Co-Operation and Development (OECD), the Inter-American Development Bank (IDB), the World Bank, and various United Nations agencies, as well as non-governmental organisations and governments in both developed and developing countries (Dantas, 2005) The approach represents a major change in the way knowledge and technology are generated, viewed, and thus supported by different actors. It shifts attention away from research and the supply of science and technology, towards the whole process of innovation, in which research is only one element. The role of the governments in funding research has changed and new trends in governance – participation, decentralisation, consensus building, and intellectual property protection -- are impacting on many areas of research and development practice ( Hall and Dijkman, 2006). Globalization is a development that is apparent in the performance of markets, in regulatory and trade regimes, and has had a major impact on knowledge generation processes ( Hall and Dijkman, 2006).

#### *NARs in Africa and the innovation system concept*

In response to the need to show impacts and work in non-conventional research while working in complex environments, NARS are compelled to take on new research methods

such as represented by the Innovation Systems concept. In the first instance, the complexity in the environments is exemplified by the diversity of actors [research, extension, NGOs, farmer groups] with different interests and view points. Hence, innovations in place are as a result of interactive processes between many actors, including companies, universities and research institutes combined. Secondly, innovation process does not follow a linear path that begins with research, moves through the processes of development, design and engineering, and production, and ends with the successful introduction of new products and processes (Dantas, 2005). Thus, the innovation system concept provides a coherent analytical tool for handling the disparate processes of knowledge creation, distribution and use of knowledge and experiences with national research organizations (NARS).

*IAR4D: in essence an innovation system approach.*

NARO of Uganda has embraced IAR4D approach as a way of making research relevant and impact oriented (Alacho 2003; Clesensio 2003; Kibwika, 2006). Within IAR4D innovation system concept is emphasised in learning workshops for the ZARDI teams. In all the meetings NARO managers encouraged NARO researchers to “*think outside the box*” in order for NARO to be relevant to the society. Researchers and research managers are obliged to spear-head integration and synergistic coordination of the research work by the different actors in the research process. The focus should be ‘*to make the national agricultural innovation system work as a system*’, rather than strengthening certain components only as has been the case for many years. The synergistic interplay and the relationships between the components of the system are the crucial points to reach effectiveness and impact in the new National Agricultural Research System (NARS).

While reviewing reform process in NARO, Hagmann and Blackie (2002) noted that in Uganda like other African countries, the innovation process was made more ‘scientific’ and ‘academic’ and remained removed from the control of the users. The division of research and extension became increasingly strong and inhibited effective feedback loops in the system – with the same result as in most African research systems until today: low impact, supply and discipline driven agendas, rather than an interdisciplinary response to demand-led challenges which are cross-disciplinary and systemic by nature. Over time, the innovation process was bureaucratized, compartmentalized and control-oriented. The new NARS through reforms process is aimed at bridging these traditional gaps.

Researchers in learning workshops realized that with the new NARS, the boundaries and the ‘members’ of the system are flexible, depending on the product to be developed or the desired outputs/results. The pure research component is just one component which can not function unless all the other components work and interact with each other.

*Capacity building for innovation system approaches: the NARO/MAK/ICRA initiative*

In response to call of accelerating attainment of impacts, the National Agriculture Research Organization (NARO)/ Makerere University ( MAK)/ and International Center Research in Agriculture (ICRA) Learning together initiatives funded by DFID has endeavored to build capacity of the NARS to the address the impact-challenges by building effective research systems that embrace the innovation systems concept, IAR4D and integrated natural resources (INRM) approaches for greater impact given the multifaceted farmers problems and needs and the advocacy for stakeholder participation. The assumption is that the new approaches will help to avoid the projectisation of research through a multitude of interest from donors and other investors and from supply-driven disciplinary interests of researchers ( Kibwika,

2006). There are relatively few initiatives that seriously address this issue and have designed a process preparing the researchers and their managers to tackle the new challenge of embracing new research and development approaches.

The learning initiative consisted of a trajectory of competence development workshop integrated with field work in the context of institutional reforms that were taking place within NARO. Basically, the learning initiative was designed consisting of five residential training workshops where new skills and knowledge were acquired by workshop participants. Some of the new skill and knowledge covered aspects such as linking research to markets; innovation systems approach; participatory monitoring and evaluation; team and partnership building. The residential workshops were followed by application/field phase periods in between. During the application periods the participating teams apply the acquired skills and knowledge on their own or they are coached in the application of what they learned by a team of mentors.

The general objective of the initiative was “to strengthen human and institutional capacity to undertake integrated Agricultural Research for Development (IAR4D) as a new way of doing business. The more specific objectives of the initiative are:

- *To enhance and mainstream within NARO the capacity of teams to apply IAR4D approaches as a new way of working;*
- *To strengthen and institutionalise the ability of MAK to provide capacity-enhancing opportunities in IAR4D for a range of stakeholders at various levels*

The initiative is under the auspices of the Director Outreach and partnerships within NARO. The Director Outreach invited ICRA, MAK and a process consultant to design the training trajectory together so as to enhance building of effective and efficient interdisciplinary teams and multi-institutional partnerships to resolve complex problems. The training trajectory was supported by planning Implementation Team (PIT) and facilitators who acted as mentors to the teams when they went back to their respective research institutions. Participants in the learning workshops were researchers from zonal research institutions.

#### *Phases of the NARO/MAK/ICRA learning initiative*

The phase of the residential learning cycle that lasted between April 2004 and February 2005 interspersed with field work periods. Funding for this training was pulled by NARO through its various donor-supported projects and programs (COARD – DFID, ARTP II – World Bank, EU), with ICRA providing staff-time and materials free of charge.

Out of the 7 ZARDI that sent representatives in the workshop, this paper describes experiences from two viz., Bulindi and Mbarara. The teams from Mbarara and Bulindi participated in five learning workshops and also got engaged in four field phases to apply the new knowledge acquired from the learning workshops. Data collection procedures entailed conducting focused group discussions and semi –structured interviews with key informants working with respective ZARDI.

#### **Putting lessons into practice**

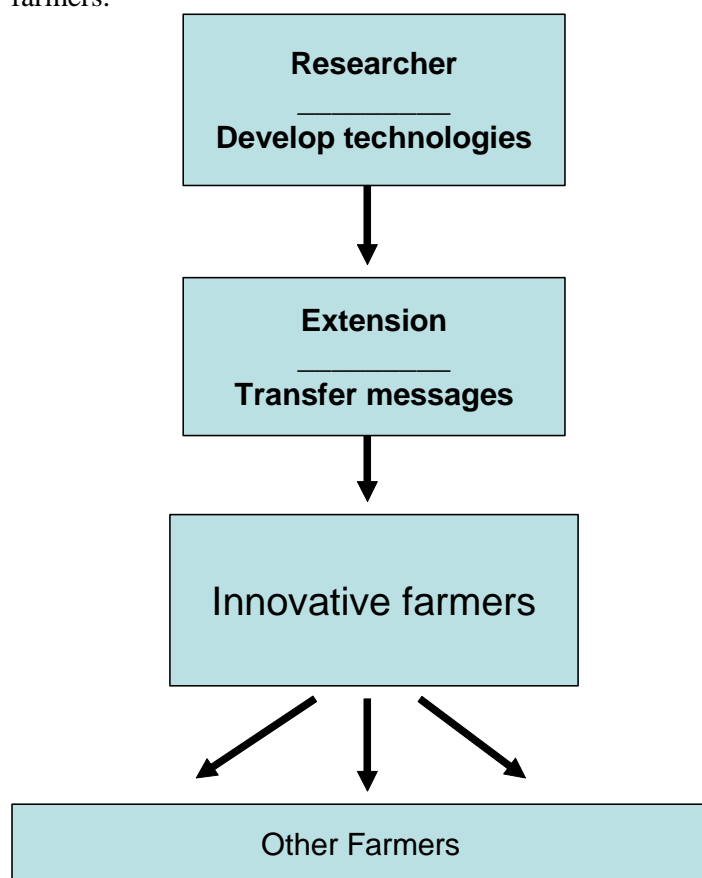
This paper highlights the experiences of researchers and managers who were also participants of the NARO/MAK/ICRA learning process, in particular the team of the ZARDI in Bulindi, located in western Uganda. It describes some reflections and current practices. The zonal research teams interacted with their stakeholders and communities after the various learning workshops as a way of putting the new skills and knowledge in practice. These interactions generated expectations and community priorities based on reality on ground. After each of the five learning workshops, Project implementation team (PIT) members and workshop

facilitators internally reflected on progress, using three main questions; what was going on well, what was not going on well and what modifications are needed.

**“Before” situation**

The field team of Bulindi ZARDI had participated in the learning workshops. Later, with the team, back their research station, their practice of research under the conventional paradigm was reviewed. Researchers and managers participating in the learning workshops commented in group interviews and focused group discussions that commodity-orientation and yield-increase related goals dominated their research practice. The conventional research system entailed a linear technology development and dissemination process. They had been challenged by donors and politicians to show impact of their work.

**Fig 1:** Illustrating a simplistic conventional research system with technology flowing from researchers to extensionists to farmers continuous lines) and relative weak feed back from farmers.



In focused group discussions the staff members of Bulindi ZARDI were able to map the trend of research before the onset of participatory approaches (fig 1). It represents a relatively simplistic system of technology development that only involves researchers, extensionists and farmers in a linear way. Most importantly, the figure illustrates that researchers were viewing themselves as the source of innovations, knowledge and approaches. Feedback from farmers to researchers was weak if not absent. The research team identified what had been major limitations in this approach;

*(i) Weak communication and interactions with farmers*

The research teams indicated that communication between researchers and farmers was weak. The researcher tended to be “locked up” in research institutes and there was

limited interaction with farmers or private enterprises. Work did not demand otherwise than meeting farmers to explain what data to collect, to check on the experiments and to pick-up the data-sheets. One of the leading team members pointed out: *“I have worked in a potato program and we generated good experimental data with support from farmers. The ideas for experimental treatments were suggested to us by... and we planned our work accordingly. There was however little incentive and opportunity to implement researcher’s research findings in a commercial context nor considering the contingencies of needs of farmers and export markets. We also had rigid institutional distinctions between research and extension organizations that tended to reinforce this separation of research and application”*.

Conversely, the extension work was the intermediary of communicating and delivering information and technology to the farmers and then getting feedback to the researchers. But the extension staff we worked with was constrained in logistics; they did not have field cars, gasoline or travel allowances. As a consequence, the interactions with farmers and the feedback was weak. And, input of the extension staff, the people who presumably were closer to the farmers than the researchers, was little if any.

*(ii) Organisation of the research institution*

*Commodity and discipline oriented.* Further team discussions and interviews emphasized the commodity-orientation of the research work of the team. The research was also organized along the lines of commodity research departments. In Bulindi there were adaptive crops trials, livestock, forestry/agroforestry sections. Initially, the researchers supplied the technologies that the extension officers then presumably transferred to the farmers, representing a the linear model with little direct interactions and feed back between researchers and farmers. The major concern of the researchers was to generate data and high quality scientific data in their disciplinary field that allowed scientific publications which could be submitted to conferences and be published. The research was therefore mainly conducted on station. Where community level experiments were conducted they were at plot level, not going beyond addressing the needs of the individual farmer. Interactions with colleague researchers, working with other commodities was minimal: there was no reason to interact other than social talk. This has fragmented the research along professional disciplines. A breeder at the research station said: we work in our sections and departments and we come together occasionally with scientists from other sections especially during station review and planning meetings”.

*Hierarchical structure and separated mandates.* Decision making in the organization is hierarchical and centrally directed, from the directors at the headquarters to the station managers and eventually the researchers at the research station. The researchers gave prescriptive instructions to extensionists and at times to farmers on how to conduct experiments. The Bulindi team also noted that within the country, there is separation of roles and mandates between Public Research Institutes (PARI) for the strategic research and the Zonal Research and Development Institutes (ZARDI) for down stream evaluation and diffusion. This created an ‘artificial rift’ in the operation of the two institutions and reached out to the farmers. For example, Kawanda and Namulonge stations are the lead PARIs that would ‘develop’ the technologies and ‘bring them’ to the ZARI where the associated researcher for the particular commodity would facilitate the evaluation of the technologies on station or contract farmers within the community to host experiments.

The leading team member said he felt that indeed this represented a system of supply-driven technology generation and testing. One was just following the normal line of working, from the time onward when one joined the organization. The researchers joining the NARS thus got inducted on what to do and aligning to how others were 'going about things' reinforced existing mind sets, confirming the paradigm that structure determines peoples attitude and practice, whereby people continuously re-make the structure. According the researchers, a strong driver in their way of doing research is the reward mechanism within the research organizations. This was (and still is) based on the technologies released and the number of scientific papers.

*(iii) Professional value*

An important part of the individual professional value is formed by one's recognition of being an expert along the scientific disciplines they were responsible in. In the discussions, researchers and managers at the research stations concurred that professionals from the different sciences were trainers of farmers and were giving farmers instructions.. One team member noted that when basic research experiments were conducted on the farmers field, they instructed them on the data to collect, while the farmers provided labour and land on which they received compensation from the researchers ( box 1).

***Box 1: Characteristics of conventional research***

The team leader of the Bulindi team said "researchers conducted their experiments based on their workplans which they followed rigidly. No farmer meetings were conducted to solicit farmers' opinions on their constrains and how to address them. Bulindi and many other farmer district institutes were used as demonstration center for the technologies and information coming from the national agriculture research institutes. Additionally, the prevailing extension approach was predominately, transfer of technologies (ToT), top-down and linear model of reaching farmers with the belief that research offer the fix to their production problems".

- *Using short-term blanket recommendation based on the intuition of the researchers voice and concerns of the farmers was less included in research agenda*
- *Social concerns such as partnership policies, collective marketing and management of technologies for equitable sharing of benefits not catered for*

The Bulindi team members added: "we used to have a reductionist approach, where by researchers had controlled experiments, extracted from the farmers information of their interest for communication with peers in the scientific community such as yield, data, germination rate and fertilizer rate applications while looking at farmers as though they know nothing." The local context within which the farmers operated was largely ignored.

*(iv) Separation of mandates:*

The researchers and managers had observed that the use of conventional research approaches are waning over time. The realization is coming about because not all technologies released or recommended are being utilized by the intended beneficiaries, the farmers. Researchers have felt themselves that their work did not make a difference to the farmers. This was however not a major concern since the research team apparently responded satisfactory to the organisations' policy and conditions. However, looking back, the situation was also not very demotivating. There was nothing as a professional to be really proud of. Ambitions were

related to the career path and related salary. Moving up the ladder would allow better salary and a job post on a research station closer to Kampala were a normal family life is much feasible (e.g. schooling opportunities for their children, allowing spouses to both have professionally attractive jobs)

***“Now” Situation : from commodity to innovations systems***

The participatory and IAR4D approaches and the use of innovations system concepts are meant to move research agenda beyond the traditional mandate of technology development . The Bulindi team indicated that working along the lines of the innovation system concept, brings many non-traditional partners into the research process (Fig 2). They say: NARO policy is now putting emphasis on integration and team work, but we are not yet fully there on ground. In addition, a team leader said that due to the many activities going on at the station, the respective researchers are left to organize themselves and in some cases it works and in some cases it does not because of many activities compete for the time of the researchers and coordination is not yet become a straight forward routine. It is a question of ‘finding our feet’ in this new business. Both team leaders and members recognize they are very much on their own to implement the new approaches and associated mindsets they have been trained in.

**Fig .2:** The number of partners the Bulindi team is now engaged with, illustrating the application of the innovation systems concept (adapted from map drawn by Bulindi team, November 2005)

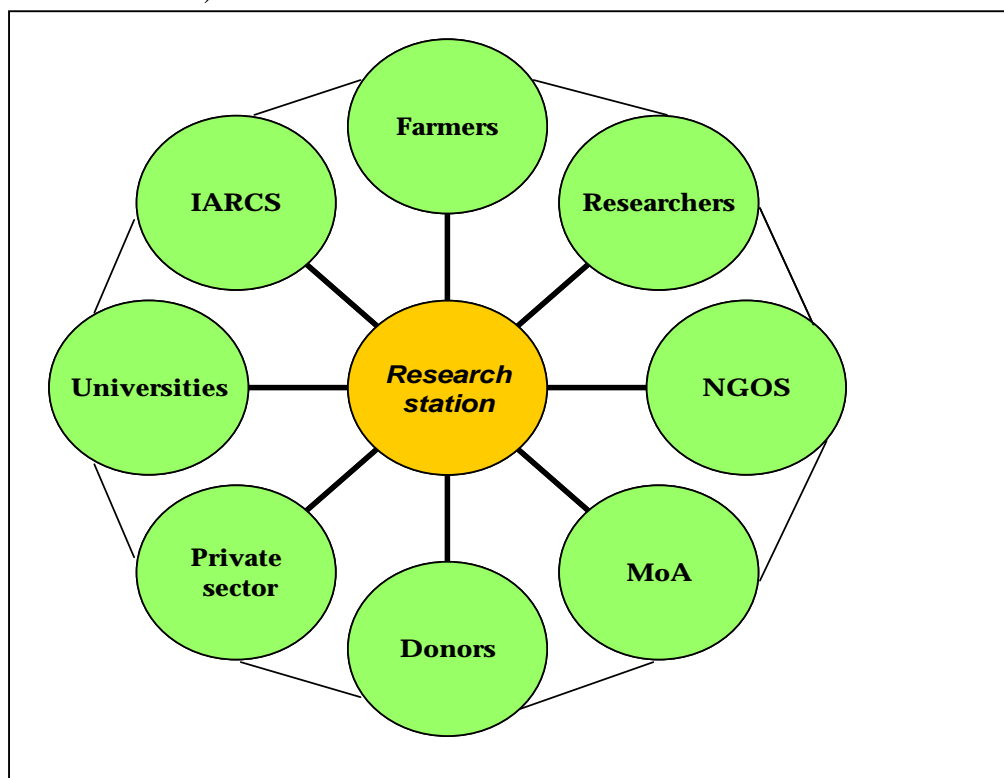


Fig 2 shows the way researchers such as the Bulindi team now look at research from the perception of the researchers such as those in the ZARDI Bulindi. In the discussions, the team members indicated that they now experience what they have been discussing in the learning workshop. At that time, it was still abstract, but now, it has become real. They have experienced that it is not an easy job to get all the partners on board for the joint agenda setting. In practical terms it meant that they had to go out, invite the partners for a meeting,

following up and pursuing attendance of the partners to the agreed meeting. Apart from this being time consuming, they also found partners are not always interested in attending and have busy agendas as well. This includes farmers, who in addition have to be picked up and brought back to their homes. Then in the meetings, it is obvious that the diverse partners come with different bodies of knowledge, approaches and expectations. On paper this should generate the institutional synergies while minimising duplication of efforts. But in practice it is a very difficult exercise to focus the discussions and have meaningful interaction. The research managers argued that with innovation systems, social and technological institutions become larger and more complex, requiring substantial competence of the researchers to coordinate and facilitate. Despite the learning workshops, the researchers feel short in their competences to do a good job in this respect and resources are most often not there. Actually, the introduction to the coordination and facilitations skills in the learning workshops has also made them aware of the level of skills required for satisfactory functioning. They know they can only improve through practicing.

In a brainstorming session, the team elaborated on the characteristics of the new ways of working or mindset (Box 2) below.

***Box 2 The view of research team members and farmer on the new ways of working***

Some characteristics of the new ways of working include application of new skills by the research team to broader topics that include; collective action for farmer -group marketing while managing a production-market links; facilitating community and team meetings, feedback, participatory diagnosis, planning, monitoring and evaluation of technologies with farmers, influencing policy makers through feedback to outreach programs director and senior management meetings by the center manager. These are the concepts that researchers see themselves faced with and which they have to translate in the day to day activities.

A technician said - ““when farmers are happy I am happy, more so when farmers tell me that they have improved their knowledge and farming practice as a result of my interactions with them a given technological intervention. Farmers who used to host experiments under the old mind set see a clear change in the way we interact because we go to them and ask their views on how the technologies are performing, we also encourage them to make modification and adjustments on say agronomic practices to fit their interest”. In discussing the farmers, the leader of a farmer group said: “I had never seen or known what technologies NARO people have. Now I know as I interact with the Bulindi team in our experimental plot or during our monthly group meetings and we also go to the station on field days or annual planning meetings to see what Bulindi is doing for us”.

Another technician in a meeting said, “while collaborating with the public agriculture research institute (PARI) researchers in basic research activities, I used to take new crop varieties to farmers land for experimentation, planted and collected data. The farmers did not know what the experiments were all about as we used to contract their land and hired their labour”. Now this has changed. Another technician said - “when farmers are happy I am happy more so when farmers tell me that they have improved their knowledge and farming practice as a result of my interactions with them a given technological intervention”. Farmers who used to host experiments under the old mind set see a clear change in the way we interact because we go to them and ask their views on how the technologies are performing, we also encourage them to make modification and adjustments on say agronomic practices to fit their interest”. In discussing the farmers, the leader of a farmer group said: I had never seen or known what technologies NARO people have. Now I know as I interact with the Bulindi team our experimental plot or during our monthly group meetings and we also go to the station on field days or annual planning meetings to see what Bulindi is doing for us”.

### *Changed research orientation*

Within NARO, new themes (understanding people, livelihoods and impact of technologies, strengthening innovation processes and partnerships, enhancing natural resources management, developing technologies that respond to markets and linking, linking producer, markets and policy) have been developed as a mechanism to foster new ways of working that would bring impact. The research themes are emphatic on stakeholder involvement and consultations in research so as to developed relevant technologies. The working with beans and their marketing is a concrete example of how research orientation has changed.

NARO Bulindi embarked on bean production and commercialization as its main research and development challenges under the NARO/MAK/ICRA learning initiative. The bean work has two components: (i) working with conventional partners (extension and farmers) and non-traditional actors (Action Aid, Community Based Organizations, Makerere University, regional networks such as AHI, micro-credit providers and traders) in the innovations around beans (ii) integrated bean commodity value chains to track production-consumption process. The team reflected on their experiences on bean work and come up with better ways of working in an innovation systems. For example, the teams noted that the first stakeholder meeting used to plan and implement bean work actually formed a kind of ‘platform’: Actors shared experiences that the researchers used to develop research proposals. Secondly, the researchers have come to realize that the bean chain involves many actors, starting at production site on the farm up to the consumers in and outside the zone in Kampala. Thirdly, actors along the production and consumption chain operated in ad-hoc manner, but got organized once a clear market for beans was evident and guranteed.

The research team members have now experienced themselves what it means when it is said that local people’s perspectives need to be at the centre of research efforts to create ownership and effective collaboration with outsiders in order to have impact (Hagmann and Chuma, 2002).

A researcher with the team added, “we still develop our normal annual workplans, but we do not stick to it as we used to do. We change the planned activities according new farmer priorities or as issues emerge. Currently, the zone is affected by Banana Bacteria Wilt (BBW) which we did not anticipate. We are responding by creating awareness on how to manage it. There was the outbreak of poultry disease in mid this year and we responded by meeting farmers and discussing better poultry management option. These are topics we now work on, but were not planned. But they also are topics we are not prepared for. When the farmers ask us questions on topics where we do not have answers we take up the queries with us, we make consultations with experts and give feedback in subsequent meetings. Before we were not doing this, we were only concerned with our own crop or disciplines and considered ourselves the experts. Now, we feel more open and do not play the expert anymore. The kind of new questions we are now dealing with are related to new high-value crops such as vanilla; market outlets for mushroom, and alovera. Some of these technologies have not introduced by us but by NGOs. Nor are some of the technologies within the mandate of Bulindi, ZARDI, but we go beyond our mandate to provide farmers with answers to retain our partnership with them and our desire to see impact and improved livelihoods”.

On what is driving the change in research approach, the teams said that the need to demonstrate impact is key driving force in their work. Other driving forces mentioned are reduction in funding, demand led research, market integration and business entrepreneurship, customization of research, teaming with non- R&D actors for complementarity of different organizational styles, results based research, fusing basic with applied research, marketability in evaluation, and the need to have open communication between researchers and all the

relevant stakeholders. However, while being confident, they also know it will be difficult to put all these ideas in practice and be able to show the impact.

## **Challenges to the Research Teams**

### *Values and norms*

The new ways of working call for new skills, value systems and professionalism. The researchers and managers argued that new skills for forging partnerships, linking research outputs with policies and markets are needed as they are new expectations that are not traditionally handled by researchers and managers at the respective research stations. The IAR4D workshops that addressed these topics and provided the opportunities for teams to get introduced to the new concepts and skills. It should allow them to broaden their research and development agenda so as to be able to demonstrate development impacts. The discussions with the research teams show that the workshops have had an impact on the attitude and mindset of the researchers and team managers. There is gradual appreciation of new research approaches. However, they also show that the skills to work in line with the attitude and mindset and put in practice these new concepts and approaches is still limited.

### *Inter-institutional partnerships*

The ZARDI teams organized stakeholder workshops to strengthen partnerships in line with the innovation system approach and engage in the promotion of production and commercialization of enterprises. From this they gathered that partnerships with other stakeholders ( non-research organizations) are essential and that this needs multiple exposure and exchange between the partners to come at grip with the differences between the partners and overcome hindrances in working together (see box 3). A issue that the researchers are still struggling with is to see the 'science' or research element in these multiple-actor activities.

### *Capacity to enable articulate demand-led processes*

#### **Box 3:Challenges in forging and sustaining partnerships**

*ZARDI teams concurred through small group discussion and plenary debates that forging and sustaining partnerships and multi-institutional partnership is key in enabling an innovation system approach and its application. The teams noted that weak partnerships exist because of incompatibility of partner's vision and ways of conducting business (approaches to working with communities, time 'activity schedules) and long bureaucracy and approval procedures when ideas come from the bottom of the hierarchy within. For example, some NGOS that worked with ZARDI teams were asking for clear products and value addition to enable them to engage better in the innovations systems approach. Out of AHI regional assessment of partnerships in Phase 2, partnerships need; a) stronger focus on shared objectives / outcomes / impacts (relative to process) and facilitation to build this consensus and understanding for the next points; b) joint work plan with clear roles, responsibilities, mutual expectations, credit sharing; c) buy-in from top leadership is needed for staff time and cost-sharing among the actors involved; d) need facilitation / champions/ some empowerment and training of staff in positions where they can make and operate partnerships.*

From these discussions it become apparent that the research managers and researchers still feel they have limited capacity in a number of new skill areas that are required to successfully work with the new concepts such as team and partnership management, facilitation skills,

general management skills, feedback culture, action research, processes documentation, facilitation, communication and negotiation. The understanding of key concepts such as innovation systems; IAR4D, INRM and market led- research and integration in the design of research protocols therefore also has little opportunity to grow since one's own experiences are crucial in such increased understanding of complex concepts. These are not concepts and skills that one can come fully at grip with by reading books only or attending workshops intermittently.

### *Market orientation*

All the research stations in NARO are striving to have their technologies find their ways to the market so as to generate income to farmers. However, the researchers especially the biological scientists do not have adequate skills for market orientation by the nature of their professional training. They received training in market analysis and integration in the learning workshops. The researchers felt that one time training on marketing and market chain analysis in the workshops was not adequate. Similarly, researchers and managers in the training workshops felt that market orientation policy is biased towards promotion of export crops at the expense of subsistence production. The dilemma and questions being asked by researchers and stakeholders (farmers and extension) was what will happen to the food crops? How to get quick fix technologies to keep farmers interest in research process? And the difficulty to integrate indigenous knowledge and practices in market led research? To most of these challenges, and questions, research can only contribute, it cannot deal with the entire development dimensions (Probst and Hagmann, 2003).

## **DISCUSSIONS ON RESULTS**

Probst and Hagmann, (2003) differentiated three prototypical approaches to innovation development: the 'transfer of technology' approach, farmer first, and participatory learning and action research. The research teams are cognizant of the need to change the ways they have worked and interacted with farmers and development partners. The change from conventional to innovation systems approach and participatory learning and action research is a complex web of actors who get involved in generation of research agenda. The innovation systems approach principles are further applied to commodity value chains to foster the understanding of the actors and their roles in commodity value chains . The value chains perspective in research brings in fore actors and commodities that are geared to the market once production is increased.

With innovation systems approach, none of the research and development organisations act in isolation; each is embedded in a web of interrelationships. Furthermore, each operates according to a set of 'rules of the game' as agreed in stakeholder meetings. The rules of the game are formal policies, regulations and laws (Dantas, 2005) ; alternatively they may be informal rules, norms and procedures (Hall and Dijkman, 2006). Douthwaite ( 2002) noted that sustainable innovations are the ones developed in a systems that can be characterised as ' bazaar approach'. This implies that the users and manufactures of technologies are always interacting as equal partners. In the innovation systems (fig 2, above), each organisation performs at least one of the complementary functions that are required by a well-functioning system of innovation. The team noted that some of the function were....NARO- technology development; MAK university - data analysis on soils for NRM; MoA extension- training and follow-up on farmers groups; NGOS/CBOs linking farmer groups with stockists, input providers, extension and research organizations; private sector such as World Food Program (WFP) gurantee markets for beans for farmers in that are organized in marketing groups.

Thinking in terms of innovation systems approach changes the focus of analysis from the internal working of an economic system (where inputs lead to fixed outputs), to the way that the system interacts with the outside world. Partnership arrangements catalyse the flow of information based a shared vision (Lewis, 1998). Sources of knowledge and some times the technologies, for example, are often located outside the ZARDI research. For example CBOS such as VURUDI was engaging farmer in organic farming, while NAADS was contracting service provider to introduce high value crops such as alovera, vanilla and upland rice. Hall, et al, 2001 observed in that in India the horticulture section had the private and public sectors working together for the benefit of actors along the production chain. Given the forgoing, Probst and Hagmann, (2003) observed that an analysis of the innovation system within a given context needs to be conducted to verify whether there is a functioning 'research-development continuum', and to review the roles and mandates of research, extension, development agencies accordingly.

The teams with stakeholders periodically met and reflected on progress with regards to production and commercialization of enterprises e.g., beans in Bulindi. The innovation systems approach was used to reflect on the ingredients necessary for the actors in the systems and value chain. Dantas (2005), observed that as an analytical tool, the approach can also identify obstacles to the formation of a well-functioning system of innovation. As a tool, ZARDI and NARO secretariat could use it assess progress and integration of components across the new research themes. Sources of innovations are multiple and socially determined ( Biggs, 1990; Douthwaite, 2002; Hagmann, 1999; Probst and Hagmann, 2003).

The implication of the approach is that it as a new way of looking at research, it touches on espoused culture and values of organizations. From focused group discussions in workshops, researchers and managers noted that innovation systems approach is relevant to their work. Literature shows that technology transfer model is overtly linear, technology driven and includes mainly three actors: researcher who develop technologies and innovations, extensionist who transfer the standardized messages developed by researcher to the third actor, farmer who simply have the role of adopters or rejectors of technologies developed by others ( Haverkort, et al, 1991; Roling, 1994d:10; Hagmann, 1999; Probst and Hagmann, 2003).

Now embedded in the innovation systems approach is a processes of learning and acquiring knowledge are interactive, and often requiring extensive links among different sources of knowledge and reforms in policies and procedures for conducting research. The implication is that capacity development is needed to focus not just on enhancing the ability to produce knowledge, sustain partnerships, but also the ability to put the knowledge and technologies into productive use. Partnership strengthening as a way of developing the capacity of agricultural innovation systems, institutional change, particularly in public research organisations is important. However, forging successful partnerships needs a much more holistic understanding of the process of technology development and the institutional policy arrangements necessary to achieve it (Hall and Dijkman, 2006). Mytelka, (2000), noted that habits and practices interact with polices: so to design effective policies it is necessary to take into account the habits and practices of the people affected (Mytelka, 2000). For example, the introduction of more participatory approaches to research is often ineffective unless the habits and practices of scientists are also changed (Hall and Dijkman, 2006). We noted in the teams discussion that conventional research features still persists as they are rooted in the mental modes through socialization in the national research organization and institutes of higher learning with regard to how research gets designed.

## CONCLUSIONS

This paper shed light on the emerging paradigm in research and development discourse. All the NARS in the region are undergoing transformations towards new research approaches that would contribute to attainment of development impacts. Despite the benefits envisioned with the new approaches, institutional cultures, imbued science procedures and mindsets are major stumbling blocks at the level of research organization. We noted in the market chain analysis that farmers are used to the supply mode of working. For example, the farming communities still ‘thinks’ in supply - driven mode despite the calls for them to demand for research and development services in a decentralized research and extension context. The farmers still expect researchers to come up with technologies and associated inputs. Although experimentation is an activity that may pay off in the long run, farmers need short-term and more tangible benefits. The competencies of farmers to articulate their priority needs, change their own mindsets, as well as capacity for R&D actors to forge partners and manage an innovation system need strengthening.

The central issue that this paper brings forward is that uptake of new concepts, approaches and skills – such as those associated with innovation system approaches require not only training, but also continued stimulation of putting these concepts and skills in practice in order to learn and further increase the skills and co-learning for institutional change.

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