

Developing an agricultural innovation system to meet the needs of smallholder farmers in developing countries

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Abstract. Smallholder farmers in developing countries will be critical to meeting the growing demand for food in the next 40 years. However, current agricultural innovation systems (AIS), rural advisory services (RAS) and the enabling environment for smallholder agriculture do not adequately address their needs. Incorporating smallholder farmers into the AIS requires us to develop new systems that integrate research, development and extension so that it can quickly develop relevant solutions to meet the needs of farmers and their associated supply and value chains. This paper proposes some ideas about what this framework might include. It expands the framework of extension models proposed by Coutts et al. (2005) to show the role of RAS in capacity building, into a broader model for how RAS can play a pivotal role in an AIS designed for smallholder farmers. Key elements will be a focus on smallholders accessing value chains and participatory methodologies.

Keywords: agribusiness, development, cooperatives, clusters, value chains, AIS

Introduction

Changes in the environment for agriculture, particularly in developing countries has led to the conclusion by the UN Department of Economic and Social Affairs that ‘business as usual’ is not an option’ (DESA 2011, p. v). They call for a transformation in the models of economic growth and development and that economic progress is required to overcome poverty in many developing countries. Many of the key multilateral organisations such as the World Bank (WB), the Food and Agriculture Organization (FAO), the Organisation for Economic Co-operation and Development (OECD) and non-government organisations (NGOs) such as OXFAM and the International Food Policy Research Institute (IFPRI) have acknowledged that, in many countries, investment in agricultural development and innovation has declined relative to the rising demand for food (Murray-Prior et al. 2013). Increases in investment in agricultural innovation and development will be necessary to meet the growing demand for food in the next 40 years. However, equally important will be changes and improvements in the paradigms and institutional arrangements for developing the agricultural innovations necessary to meet the demand for food in an environment of declining available resources and increasing pace of change.

The subdiscipline of agricultural innovation systems (AIS) is an emerging approach to thinking about the changes required in the approaches used to identify, design and implement investments and in the institutional arrangements, relationships and processes (Rajalahti 2012) that will help us meet the challenges outlined by DESA. The World Bank (2012) has recently published *Agricultural innovations: an investment sourcebook* with the aim of helping development agencies and governments to ‘strengthen innovation systems and promote agricultural innovation and equitable growth’ (Rajalahti 2012, p. 1). While the World Bank uses examples from all types of countries, the focus of this paper will be on developing agricultural innovation systems to meet the needs of smallholder farmers in developing countries.

These changes will take place in an environment where growth in agricultural productivity is expected to slow from 2% in recent decades to 1.7% in the next decade (OECD/FAO 2012). Although many of the recent increases in productivity have occurred in developed countries, productivity growth has begun to slow in both developed and developing countries (OECD/FAO 2012), partly due to pressure on resources, but also because many of the easier options have been adopted (Hazell et al. 2006). Consequently, smallholder farmers, who are the main source of food in the developing world, will be one of the key sectors where increases in productivity are possible due to greater availability of land and potential to increase productivity (Murray-Prior et al. 2013). Therefore, they will be critical to meeting the growing demand for food in the next 40 years.

Factors that affect the ability of smallholder farmers to meet this demand include the changing demands of modern markets, the effects of climate change and deficiencies in their enabling environment, resources, capacities and institutional models for change and development. These deficiencies have implications for development of the smallholder sector and for designing and implementing improvements to AIS that improve the relevance of agricultural innovations including relevant innovations in smallholder supply chains and government policies to improve the enabling environment for smallholder farmers.

Ekboir and Rajalahti (2012) call for new directions in organisational design and investment of AIS including:

- Improving governance to enhance dialogue at different levels and facilitate development of actor's capabilities and organisations so that they can contribute to the alignment of resource allocation to key innovation issues.
- Organising around value chains because of benefits to local economies and the opportunities for farmers to gain more stable incomes and potentially higher profits.
- Supporting farmer organisations and self-help groups because they can be more effective in coordinating AIS actors, influencing research and extension priorities and in diffusing innovations.
- Building capabilities for coordination among individuals and organisations so that they can participate in development of policies and influence their outcomes.

These improvements will require policies that are more inclusive and contribute to better interaction, coordination and participation and thus faster diffusion of innovations. This is particularly relevant if the AIS is to incorporate innovations for smallholder farmers, because they have the least power and opportunity to benefit from current RD&E approaches. However, incorporating farmers into the AIS, in particular smallholder farmers in developing countries, requires us to develop new frameworks or systems that integrate research, development and extension (RD&E) so that it can quickly develop relevant solutions that meet the needs of farmers and their associated supply and value chains.

This paper proposes some ideas about what this framework might include by expanding the framework of extension models developed by Coutts et al. (2005), which show the role of RAS in capacity building into a broader model for how Rural Advisory Services (RAS) can play a pivotal role in integrating the RD&E systems for smallholder farmers. It draws on ideas outlined by Murray-Prior et al. (2013) in which a dualistic agribusiness systems framework is proposed to help with analysis of the interactions in food chains and to identify the range of issues and solutions required to enable smallholder farmers to participate effectively in the emerging food value chains. A key issue is how to link smallholder farmers to these markets and to improve their human and social capacities so that they can improve their productivity and continue to supply these markets. Cluster marketing arrangements are suggested as one method that can be used both to link smallholder farmers to food value chains as well as for identifying research priorities, developing appropriate innovations at the farm and chain level, identifying policy improvements in the enabling environment and to test and scale innovations up and out.

Five key functions of RAS in an AIS

Coutts et al. (2005, p. vii) define RAS or extension in terms of capacity building through 'processes of engaging with individuals, groups and communities so that people are more able to deal with issues affecting them and opportunities open to them'. Their review of projects in Australia found that RAS activities could be categorised into five models - I prefer to think of them as functions - that are necessary for the capacity building process. They include group facilitation/empowerment, technology development, programmed learning, information access and individual consultation/mentoring. I intend to take this model and show how it can be expanded to outline a role for RAS in enhancing any AIS, either in a developing or developed country's agribusiness system, although my focus is on developing countries.

The group facilitation-empowerment function

The group facilitation-empowerment function is about encouraging farmers and their communities to work together, thus enhancing their social capital and to develop their problem solving, planning and reflection skills, thereby enhancing their human capital (Coutts et al. 2005). It is at the core of participatory models of extension, because it develops human and social capital, which are fundamental to all development activity.

Key outcomes of the Landcare movements in Australia and the Philippines are that the empowered groups that arose from these activities have developed partnerships with government, industry, community and other groups that, subsequently, have enhanced outcomes from other non-Landcare activities. Former Landcare groups in Australia have combined and expanded their activities to take on research, development and extension activities through partnerships with funding bodies, government departments, universities, agribusiness companies and private consultants (Gianatti and Carmody 2005). Similarly, Landcare groups in the Philippines have expanded their activities to include collaborative marketing and microfinance (Murray-Prior et al. 2011). In turn, these activities have not only led to improved profitability for their members, but have been at the forefront of developing relevant technological and management solutions to key issues facing farming communities.

When groups of farmers (and other actors along the supply chain) participate in all elements of applied and adaptive research, development and extension, the innovations will be relevant to them and can lead to faster adoption as suggested by Ekboir and Rajalahti (2012) in their call for new directions in organisational design and investment. Researchers and funding bodies also benefit by learning to incorporate farmer knowledge into their research programs and through improving their capacity to conduct research on needs identified by farmers. Consequently, they are also in a better position to identify relevant research priorities for basic research to support the applied and adaptive research needs.

Group facilitation is a core role for RAS, though to be most effective the institutions involved with R,D&E activities need to have a philosophy and practice that incorporates participation. However, participation can mean many different things and to have a real impact the quality of participation needs to be at the higher levels, rather than the lower levels of participation in the Arnstein (1969) model. Participation at the higher levels allows smallholders to have an influence over what is important to them, whereas manipulation or consultation does not. RAS staff also must accept this philosophy and be given the training, funding and culture to conduct these activities.

The technology development function

The technology development function involves working with individuals and groups, using participatory approaches, to develop relevant 'technologies, management practices or decision support systems which will then be available to the rest of industry' though programmed learning projects or ongoing information access (Coutts et al. 2005, p. 19). It can complement the group facilitation function, because many solutions to agricultural problems are complex and require participation in multidisciplinary and transdisciplinary teams of farmers, researchers, RAS and actors in the supply and value chains. In Murray-Prior (2011) and Murray-Prior et al. (2013), we argued that for many industries in developing countries what is required is the development of an agribusiness innovation system built around improving the competitiveness of smallholder supply chains, using collaborative marketing groups of farmers where appropriate. This needs to take account of the agribusiness system, which incorporates the supply or value chains, but also takes account of the surrounding context and environment, including the enabling environment.

Davis and Goldberg (1957, p. 2) defined agribusiness as:

the sum total of all operations involved in the manufacture and distribution of farm supplies; production operations on the farm; and the storage, processing and distribution of farm commodities and items made from them.

In other words, the approach involves considering the set of interacting organisations that jointly provide food and fibre products for consumers and does not just focus on farmers. This approach is consistent with the plea by Davis and Heemskerk (2012) for a paradigm shift so that change occurs in the whole system rather than research knowledge alone driving the change. Similarly, it aligns with the view by Lynam (2012, p. 268) that such a framework 'usually focuses on applied research, expands the specification of the problem and usually integrates technical innovation with institutional innovations in farmer organisation and marketing to ensure that results are used throughout the value chain. It also acknowledges the need for changes in the policy and enabling environments (Roseboom 2012) that are necessary to overcome the particular constraints faced by smallholder farmers in developing countries.

Murray-Prior et al. (2013) argue that it will often be necessary to focus on 'bottom up' and partnership approaches, particularly by facilitating the establishment of cluster marketing groups to enable smallholder farmers to participate in value chains. Alternatives such as contract farming and cooperatives are also possible, but cluster marketing is particularly appropriate to the human, social and produced economic capital constraints of smallholder farmers.

Focusing an important part of the AIS in developing countries around smallholder marketing groups could be achieved through an approach that incorporates a pluralistic and participatory action research process to provide relevant solutions to stakeholders and a dualistic agribusiness systems framework to guide the analysis of the systems involved. Sulaiman et al. (2010) suggest a slightly different approach to innovation management, but also found that technology development needs to be imbedded in a range of activities that support the adoption of innovations and make them relevant to the context of the adopters. Murray-Prior et al. (2013) argue that these cluster groups can help identify the binding constraints to development and because the research would be focused on relevant needs, incorporate chain actor's knowledge and potential solutions, the results would be relevant and in a form that could be

readily adopted. Such an approach could also identify and respond more quickly to emerging issues as will be required as the social, economic and physical environments change more quickly in the future.

King (2012) identified the role and importance of collaboration facilitators within projects to the ongoing search for more efficient ways to conduct agricultural RD&E to meet the rapidly changing economic, social and natural conditions of the future. Collaboration facilitators are specialists who coordinate and mediate 'responsibility across all contributing disciplines and practices within a project social network' (p. 216). In fact, I believe collaboration facilitators could well become the project leaders of many multidisciplinary and transdisciplinary projects in the future and many staff from RAS have the skills to take this role. However, RAS staff who undertake this role must be able to think and act outside their immediate extension role and be systems thinkers as well as facilitators. This function can also be integrated with the group facilitation and empowerment function.

Klerkx and Gildemacher (2012) also suggest a role, at albeit at a more macro and preliminary level, for innovation brokers (either organisations of persons), who facilitate interaction between actors in the innovation system to catalyse innovations. They also suggest that this is an expansion of the role for agricultural extension to an intermediary role that focuses on facilitating the interactions in a broad systems perspective, involving a range of actors apart from farmers and researchers. This is similar to the findings of Sulaiman et al. (2010) who found that intermediary organisations were important to the success of R&D projects in South Asia. As Klerkx and Gidemacher (2012) point out, one of the problems is how to attract funding for such a role since it does not involve publishing results of its activities and tends to work behind the scenes. In my experience an additional issue is that traditional R&D projects have been funded, developed and managed by disciplinary researchers, who often do not have a good understanding of agribusiness systems or 'soft systems' and participatory or facilitation methods and can perceive them as non-science and/or as competition for resources and power. However, if we are to have AIS in developing (and other countries) that have improved governance that allows a range of actors throughout an agribusiness system to participate so that 'change occurs in the whole system' then innovation brokers and collaboration facilitators must have a greater role than they do currently.

The programmed learning function

The programmed learning function is about developing and delivering specific knowledge and skills to actors and groups in agricultural value chains. It is not economically possible to work with all farmers or chain actors through means of groups, while some farmers and chain actors will not join groups, so it is important to provide them with packaged learning opportunities that meet their needs. These programs will also be relevant to members of groups who are being facilitated through the technology development and group facilitation functions.

There is always a danger that such programs may not be relevant to participants, since in a sense the process is top down, but if they are based on needs and solutions identified and tested through the technology development and group facilitation functions, or market research, this will be less likely. When learning needs are identified through other processes, such as when a government decides to implement a new drought policy, it is particularly important that the program begin with a pilot phase that incorporates a rigorous monitoring, evaluation and adaptation process. The learning activities should be based on adult learning principles and piloted through a Continuous Improvement process (Timms and Clarke 2002) in which the content, delivery mechanisms and the trainers are assessed, leading to improvements so that the learning activities deliver relevant content, in a relevant manner using competent trainers.

Our experience with the Farm Business Planning Program developed as part of the Australian Government's Drought Reform Measures which Curtin University piloted in Western Australia (Noonan et al. 2012; Storer et al. 2012) is that such programs need to be flexible to adapt to the needs of different groups and communities. While the core of the content can remain essentially the same, other features such as locally relevant materials and case studies, length, timing and location of the sessions and knowledge, cultural and language skills of presenters will need to change. They require high quality facilitation and an emphasis on providing a learning environment where participants develop trust and have confidence to talk about the real issues affecting their businesses. Once again, a facilitated, multidisciplinary and holistic approach is required for effective programmed learning projects. Farmers and chain actors can have an important role as presenters in such programs, because they increase the perceived and tangible relevance and practicality of the program. Another advantage is that these programs can improve social capital and consequently resilience by improving the networks of actors and creating a learning community for particular topics.

The information access function

The information access function acknowledges the need to provide information to a wider audience than is possible through all the other extension functions for reasons that include: resources are insufficient, populations too large, or that many do not participate in the other extension approaches. Large farmer to rural advisor ratios are a particular problem in developing countries, so alternatives to individual or group delivery are essential. Another factor is that many rural advisors are themselves undertrained and lack knowledge and skills across all the areas they are required to service. My personal experience as a rural advisor was that I had to have quick access to a range of information, because often I either had limited knowledge of or could not remember all the necessary information accurately. It also acknowledges that the information farmers require will differ depending upon other factors such as their stage of adoption of an innovation, or the context of their various management decisions.

The information has to be accessible both in terms of the communication media used, but also the form of the information so that it meets the needs of the various clients for the information, with particularly attention being paid to intermediaries or next users as well as end users. This function has elements of a technology transfer approach to extension and consequently success requires the planning and implementation of effective communication strategies.

Communication activities will include a range of media and formats including: field days, newsletters, tweets and text messages, web or dvd videos, fact sheets, ute guides, phone apps, radio and TV interviews and newspaper or magazine articles. The choice of media and format will depend on the audience, the on-ground conditions, the funding available, the particular skill set of the communicators and the type of information. However, relevance can still be an issue unless the information is relevant to the characteristics of the audience including their needs, learning abilities and access to communication forms. Once again the information and the combination communication activities should be based on needs and solutions developed through the participatory processes of the other functions. Van de Fleirt et al. (2010) outline a participatory methodology for developing relevant technologies for smallholder farmers and suggest how this can be combined with a communication strategy that will lead to the scaling up and scaling out of the technologies.

Individual consultant/mentor function

This function includes the provision of one-on-one support that provides specific advice or assistance to farmers or other actors, such as processors in the food chains. Changes in economic philosophy, policy and reduced funding - in developed and developing countries - have led to governments moving away from this function and it is being left to the private sector. However, at critical stages towards the end of the adoption process, or for complex decisions, managers require some form of individual support if a change is to be successful (Crisp 2010). In making this decision, research has shown farmers will rely on people they perceive as having practical expertise in the topic, often relatives, friends or well-respected farmers, while innovative farmers will often contact leading researchers, both local and distant. In developed countries, such as Australia and New Zealand, private consultants are taking over much of the role of individual consultants from government, particularly for larger farmers.

Consequently, the government RAS need to support activities that enable next and end users of information to network and access information, even if they do not directly fund much individual one-on-one extension activity. This activity can be facilitated through the other four functions which enable the private sector (including agribusiness input and marketing companies and consultants), farmer production and marketing groups and leading farmers to provide individual consulting and mentoring support.

Conclusions

For an Agricultural Innovation System to be effective in an increasingly complex and rapidly changing world, in both developing and developed countries, it has to incorporate institutions and processes that emphasise multidisciplinary and transdisciplinary approaches that facilitate collaboration. Government RAS can have a key role in such systems, which will involve them undertaking four key functions (group facilitation/empowerment, technology development, programmed learning and information access), while supporting and incorporating the individual consultation/mentoring function, where this is necessary and possible. Their role would be to facilitate and fund the participatory processes involved with such a system where the private and NGO sector are not or cannot undertake these functions. Building human and social capital is fundamental. However, for RAS to assume such a role will require a change in philosophy for many government research, development and extension institutions and a commitment to build

the capacity of RAS staff and private sector or NGO staff to undertake the various functions required.

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