

FACING THE CHALLENGES OF CLIMATE CHANGE AND FOOD SECURITY: THE ROLE OF RESEARCH, EXTENSION AND COMMUNICATION INSTITUTIONS

Assignment commissioned by the 'Research and Extension Branch' at FAO, Rome

Final Report October 2010

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LIST OF ACRONYMS

CC	-	Climate Change
CGIAR`	-	Consultative Group for International Agricultural Research
DANIDA	-	Danish International Development Agency
DFID	-	The UK's Department for International Development
FAO	-	Food and Agriculture Organization of the United Nations
FARA	-	Forum for Agricultural research in Africa
FFS	-	Farmer Field Schools
GFAR	-	Global Forum on Agricultural Research
GFRAS	-	Global Forum for Rural Advisory Services
IBRD	-	International Bank for Reconstruction and Development
ICT	-	Information and Communication Technologies
IDA	-	International Development Association
IFAD	-	International Fund for Agricultural Development
IFC	-	International Finance Corporation
IFPRI	-	International Food Policy Research Institute
ILAC	-	Institutional Learning and Change Initiative
IPG	-	International Public Goods
ISNAR	-	International Service for National Agricultural Research of IFPRI (now Knowledge, Capacity and Innovation Division)
LINK	-	Learning Innovation and Knowledge network
NGO	-	Non-Governmental Organisation
NI	-	Neuchâtel Initiative
NRM	-	Natural Resource Management
NRR	-	(Previously) Research and Extension Division of the FAO under the NRM Department
OEK	-	Office of Knowledge Exchange, Research and Extension (FAO)
OEK-C	-	Knowledge and Capacity for Development Branch, OEK, FAO

OEK-M	-	Knowledge Management and Library Services Branch, OEK, FAO
OEKR	-	Research and Extension Branch, OEK, FAO
T&V	-	Training and Visit extension approach
UN	-	United Nations
UNEP	-	United Nations Environment Programme
UNU-MERIT	-	United Nations University Maastricht Economic and social Research and training centre on Innovation and Technology
WAU	-	Wageningen Agricultural University

1. INTRODUCTION

This report presents the findings of an assignment in which the consultants were asked to assist the Research and Extension Branch in FAO (including the communication for development specialists) to position itself strategically in meeting needs and demands that arise as a consequence of climate change. When the study commenced this unit was placed under the NRM division of FAO. In the meantime, the unit (now called OEKR) has become part of the Office of Knowledge Exchange, Research and Extension (OEK), which will take on a cross-cutting and support role for several divisions, including NRM and Agriculture.

The analysis of the way a group of research, extension and communication professionals should position themselves to better contribute to climate change-related intervention and support started with an exploratory visit to FAO in which numerous people inside and outside the Research and Extension Branch were interviewed about their views and needs regarding the unit and its role in the context of climate change-related interventions. This visit resulted in a preliminary analysis of the Research and Extension Branch and its environment (see Annex 2), and led to the development of a conceptual framework that would assist the unit to think about its role, and would serve simultaneously to give direction to country case-studies. This framework (see Annex 1) redefines the role of extension, communication and research based on contemporary thinking in innovation studies. In essence, the argument is (a) that climate change adaptation requires coherent technical and institutional innovations and responses across multiple societal levels, and (b) that bringing about such coherent responses requires the performance of a range of new intermediary roles in addition to classical extension, research and communication for development.

Four country case studies (Annexes 4, 5, 6 and 7) were carried out with the purpose of assessing which needs and gaps exist in actual practice with regard to the provision of innovation support services for climate change adaptation. The studies were guided by a common set of questions (see Annex 3). In addition, an international landscape review (Annex 8) was carried out to get a better view of what other international agencies do in the sphere of innovation intermediation.

In this report we analyse the outcomes of our discussions within FAO, the case studies and the international landscape review, and translate this into suggestions for re-positioning the OEKR unit in FAO as a unit that delivers 'agricultural innovation capacity support services'.

This report first discusses the context of climate change adaptation and its linkages with food security and then summarises key elements of the conceptual framework that served as a lens for our analysis. Subsequently, it provides an analysis of the current OEKR branch in the context of its wider environment. This is followed by an analysis of country case studies and an international landscape study. Finally, we sketch possible contours for a new-style OEKR. The detailed reports and frameworks can be found in the Annexes.

2. CLIMATE CHANGE ADAPTATION AS A METAPHOR FOR THE FUTURE

It is increasingly clear that climate change will have a profound influence on the agro-ecological conditions under which farmers and rural populations need to develop their livelihood strategies, manage their natural resources and achieve food security and other ends. Numerous publications by FAO and others point to this (see e.g. www.fao.org/clim). In most contexts, climate change can be regarded as part of a ‘complex’ problem situation in several senses: (a) there is often considerable uncertainty about specific climatic and ecological dynamics at play; (b) climatic and ecological change have (initially unknown) consequences for several interrelated societal realms (e.g. agriculture, forestry, fisheries, health, energy, economy, migration, etc.), and (c) it is likely that there are different and competing human interests and values at stake (e.g. between rich and poor, farmers and pastoralists, ‘food’ and ‘fuel’, economy and ecology, etc.). It is amidst this complexity that appropriate human responses will have to be developed. We will label such responses as ‘adaptation’, and take this to include ‘mitigation’. Working towards adaptation, then, poses specific challenges for research, extension and communication institutions. These challenges, however, are not unique to the context of climate change. From a wider perspective we can see that the world we live in is (and has been) characterised by continuous change, of which the pace seems to be accelerated by globalisation — a phenomenon underpinned by international trade patterns and regulatory regimes, Information and Communication Technologies (ICTs), enhanced transport facilities, and population growth. Hence, we can argue that enhancing the capacity to adapt to newly-emerging realities is going to require permanent attention from research, extension and communication institutions, and is critical for realising a range of millennium development goals.

From the literature on climate change it is clear that adaptation may involve an array of both technical and institutional responses, which may be inspired by both local or outside knowledge and experience. New technologies and technical practices may, for example, include new crop varieties, adapted cropping (including agro-forestry) systems, more efficient irrigation techniques, new forms of water harvesting, alternative ways of preserving soil fertility, novel forms of pest and disease control and alternative coastal protection infrastructures as well as improved technologies for early warning. Such technical responses need to be combined with — and embedded in — new institutional solutions, whereby the term ‘institutions’ refers to the formal and informal rules and organisational forms and policies through which society is ordered. Examples of possibly relevant institutional responses include the installment of new market mechanisms for carbon trade, the development of credit and payment mechanisms for ecosystem services, adapted land tenure arrangements and contracts, new organisational forms and laws for the management of water catchments, the introduction of alternative chains and certification schemes for ‘climate proof’ agricultural products, the re-organisation of input supply and marketing arrangements for new cropping systems, and, last but not least, the use of alternative procedures and methodologies in (public and private) research and extension systems to enhance collective adaptive capacity in communities, regions and countries.

3. SUMMARY OF THE CONCEPTUAL FRAMEWORK: THE ROLE OF EXTENSION, COMMUNICATION AND RESEARCH IN CLIMATE CHANGE ADAPTATION

The essence of the discussion presented in Annex 1 is presented in the following section. Climate change adds urgency to the need for adaptation in its widest sense in the natural resources sphere (agriculture, forestry, NRM, livestock, fisheries). This does not just mean technical change for farm-level adaptation and mitigation. It also means adaptation of the policy and institutional regimes that govern agricultural production, value chains and natural resource management.

Two critical features of this emerging adaptation agenda are: (1) the importance of negotiating new rules or institutional arrangements, often in a landscape of diverse stakeholders; and (2) the importance of reconfiguring networks of activity to bring about change (where the process of reconfiguration also relies heavily on negotiation). What is very apparent is that these two roles — negotiating new institutional arrangements and facilitating network reconfiguration — are both roles of intermediation. While extension has been traditionally viewed as intermediation between farmers and technology suppliers, adaptation to climate change also demands intermediation, but in a much wider sphere of activity and between different actors. The implication here is that the role of intermediation for adaptation for climate change is a niche role that extension professionals could feasibly fill, given their long-standing mandate of playing intermediary roles.

From a theoretical point of view, we can say that any innovation support infrastructure should be able to support three essential processes: network building; social learning; and conflict management (see Annex 1). Such support may certainly include well-known communication strategies and services such as:

- Advisory communication
- Horizontal knowledge sharing in support of innovation
- Awareness raising
- Training
- Persuasive mass media campaigns
- Information provision

However, in order to make innovation happen in a network-like configuration, such classical activities need to be accompanied by (and embedded in) other communicative strategies and services (see Leeuwis, 2004; Klerkx & Leeuwis, 2009), such as:

- Network brokerage
- Demand articulation and knowledge brokerage
- Visioning
- Process facilitation
- Interactive design and experimentation
- Learning-oriented monitoring
- Exploration of opportunities and constraints
- Lobby and advocacy communication
- Conflict management
- Organising interaction and participation

It is in the context of such ‘new’ communicative tasks and strategies in an innovation trajectory that ‘old’ strategies can become meaningful and appropriate, usually at later stages of an innovation trajectory. Moreover, it is important to realise that both ‘old’ and ‘new’ strategies may usefully involve a range of communication media (interpersonal, mass media, hybrid ICT). In innovation studies, any actor or organisation that carries out the tasks mentioned above is called an ‘innovation intermediary’, that is:

“an organization or body that acts as an agent or broker in any aspect of the innovation process between two or more parties. Such intermediary activities include: helping to provide information about potential collaborators; brokering a transaction between two or more parties; acting as a mediator, or go-between, bodies or organizations that are already collaborating; and helping find advice, funding and support for the innovation outcomes of such collaborations.” (Howells, 2006:720)

As transpires from this definition, innovation intermediation involves a much broader set of activities and processes (i.e. a broader set of innovation support services) than those performed by classical extension (which was originally casted as an intermediary function between science and practice only). Responding to climate change demands not only new modes of operating for communication and extension professionals, but also from researchers and scientists (see Annex 1). In order to ensure that research contributes to the development of balanced technical and institutional innovations, interdisciplinary teams of scientists need to become more involved in collaborative research and experimentation with societal stakeholders. Their prime role is to develop insights in connection with questions and uncertainties that emerge in the multi-stakeholder adaptation process, and thus improve the quality of social learning.

In sum, playing new intermediary roles in climate change adaptation processes would require a number of shifts:

1. **Expand from a focus on technology change to a focus on institutional change.** Climate change adaptation requires a coherent package of technical and institutional responses, which together form a socio-institutional innovation.
2. **Expand from rural space to national space intermediation.** Climate change adaptation is about reconfiguring roles and networks between interdependent players at different levels, all the way from the national level to the rural space with farmers.
3. **Expand from public agencies to multiple agencies.** Reconfiguration of support services for climate change adaptation not only involves public research and extension services but others from sub-national public agencies, civil society and the private sector.
4. **Expand from a tactical to a strategic role.** Intermediation is no longer just a tool to deliver technology, but a tool to reconfigure systems architectures and strengthen system capacities.
5. **Expand from practice development to policy development.** Intermediation is no longer just about field methods and practice with farmers, but also about strengthening the enabling environment for adaptation through policy change.
6. **Expand from communication for information diffusion to communication for network-based development and innovation.** Communication becomes integrated in ‘innovation intermediation’ activities aimed at enhancing network formation, learning,

negotiation and the building of relationships in new configurations of support and services for climate change adaptation.

7. **Expand core expertise from service delivery to facilitation.** The brokerage function between other agencies and organisations becomes much more important than that of actually providing services.

4. ANALYSIS OF OEKR

The current OEKR group has two broad areas of expertise that stem from different traditions and disciplines. First, there is a lot of strategic and operational expertise on research and extension systems. This expertise has roots in adoption and diffusion of innovation studies (Rogers, 1962) and has been institutionalised in agricultural research and education institutes under the banner of ‘agricultural extension’. Second, there is considerable expertise in ‘communication for development’. This expertise has its roots in the communication sciences, where many scholars became interested in the potential of media (initially mass media) as a vehicle or catalyst for development. Despite their different traditions, we see that the two bodies of expertise have converged considerably in the last decades. In both traditions the original ‘top down’ connotations (for the first the focus is on researcher-led innovation; for the second the emphasis is on centralised mass-media) have been replaced by a far greater attention to participatory processes, facilitation, indigenous knowledge, locally-specific conditions, etc. In fact, the communication for development group within OEKR has emerged as a response to such ‘top down’ tendencies in the international arena, and has been at the forefront of developing and advocating more participatory approaches.

In terms of available expertise it is relevant to note that OEKR is now part of OEK, and that within OEK there are several other units that have complementary expertise. Most notably, these are the Knowledge and Capacity for Development Branch (OEKC) with considerable expertise in capacity building through e-learning and web-based applications, and the Knowledge Management and Library Services Branch (OEKM) with considerable expertise in the accessibility of research databases. While this new setting may certainly offer opportunities with regard to playing new innovation support roles, these are not elaborated in this report since a broader analysis of OEK was not part of the assignment.

The work of the OEKR Branch spans “normative work” (advising national governments on research, extension, and communication for development best practice) and technical work (development projects, often externally-funded and addressing a specific problem or developing and/or testing new institutional development approaches). Discussions with staff in the group suggest that the vision of research, extension, and communication for development with OEKR has largely migrated from assisting with research and technology transfer to a more broadly-defined intermediation role within innovation systems and rural development policies. This migration is, however, not complete — both because of visions and perspectives within FAO as well as because of visions and perspectives of member governments and the demands these place on the OEKR group. There are a number of these tensions that arise from this partial migration.

Extension Services vs. Innovation Support

In many ways this is the crucible of all tensions. It stems from rethinking about research and extension activities with the development and spread of innovation systems ideas. These ideas recognise that innovation, as a process of using ideas and technologies for productive purposes, is not the preserve of research projects and public services. In this perspective promoting innovation goes way beyond promoting technology from research and involves enabling a wide range of processes, players and capacities. This idea is no longer contentious. But it does leave open the question about who should broker the relationships in these systems of innovation.

There are those who argue that since extension has always been about innovation support this is a function extension could very well play, albeit with a redefined mandate and scope. But there are others who argue that the primary role of extension is to provide technology and information services to farmers. These positions are not mutually exclusive and can co-exist; in some contexts emphasis will need to be placed on different roles. Nevertheless, the tension between the two can be seen playing out within FAO. Part of this tension relates to the history of FAO as an international source of information and expertise on agricultural topics. Traditionally it was a subject matter specialist-type of organisation rather than a research organisation or a policy advice organisation. And it still, visibly, has a very strong tradition of producing publications with an advisory-type orientation. As a result there remains a degree of schizophrenia about whether OEKR should be providing information or expanding the envelope of what might be deemed “best” practice.

Tensions between New Vision and Member Country Demands

Since FAO is a membership-based organisation the OEKR team is obliged to respond to requests for support from member countries. Frequently, requests take the form of ways to strengthen public research and extension services; in other words, how can the function of generating and extending information be strengthened. This presents a difficult dilemma. On the one hand extension and communication for development professionals in OEKR have a much expanded vision of extension and the need to strengthen capacities for innovation support that go beyond classical extension services. This would require engagement with issues of institutional and policy reform towards playing the broader ‘innovation intermediation’ roles and services outlined in section 3. On the other hand, relatively few member governments are requesting assistance for such kinds of reform in innovation systems, while the majority of governments tend to request assistance with capacity strengthening in the existing framework and conception of their public research and extension services.

Training vs. Capacity Development vs. Capacity for Capacity Development

FAO has traditionally played a very strong training role. However, the new extension agenda implied by innovation systems is one of capacity development in a total systems sense. In other words it is about adaptation and reconfiguration of roles and architectures of supports services, resources and partnerships. This perspective clearly has implications for the OEKR group’s normative role, as it suggests that the best way to help member countries is to build their capacity to support the institutional and policy change that is required for the continuous adaptive process. Staff in the group have this vision and have relevant experiences with, for example, platform-based capacity development strategies. However, they expressed doubts that an emphasis on institutional and policy change would sit comfortably in their normative work because of its demand-led nature.

Rural Image vs. Role in Institutional Arena

While OEKR as a group has a good vision of its potentially strategic role in a new extension agenda, for historical reasons much of its work is very strongly branded as farmer-centric, located in the rural space. Illustrations on the front of its publications feature farmers and rural scenes even though actual topics might have more of a policy orientation. Titles can be equally misleading. This is not a trivial issue. While the vision of the group has clearly started to migrate to a more strategic one of enabling adaptation in the policy and institutional arena, the message sent out by its publications is about a tactical role of developing and disseminating extension tools and methods. One of the outcomes of this rural branding is that even others within FAO are unclear about the professional skills that the group has to offer,

particularly those skills associated with the group's migration into a wider range of intermediation functions.

Communication vs. Communication for Innovation and other Language Tensions

This is a tension that relates to how the term 'communication' is understood. The traditional core of extension has, of course, been about communication. However, over time it has been recognised that communication isn't just a tool for diffusing information. Instead communication is also (increasingly) seen as a process of intermediation or brokering relationships. Building partnerships is often about finding ways of communicating; conflict management is about facilitating constructive dialogue and supporting learning through enhanced communication; change in organisations is often about helping communicate agendas and concerns among different people; and participation and knowledge sharing too depend on high quality communicative processes. During the review we witnessed a classic communication for intermediation tool used to discuss the impact of climate change — an open space event.

Professionals working with communication for intermediation have coined different terms to describe this function; for example, development communication. This, however, has not prevented the term 'communication' being understood in the old sense by most people even in allied professional fields. The work of OEKR suffers from this lack of clarity of meaning. This is particularly unfortunate because staff in the group have a vision of communication as a process of intermediation. In many senses the tensions over the term communication are symptomatic of the tension that arises from much of the language around this topic. Extension as a term is a prime example of this problem. While the concept of what this terms means to the OEKR group has migrated significantly, the terminology of extension has remained and along with it the baggage that this term brings. Much of this baggage, while not necessarily negative, gives the impression of a set of expertises and outlooks which is seen as less relevant in the contemporary agricultural development setting. One could argue that the name ought not to matter. Interviews with other FAO divisions, however, suggest that it does.

It is important to stress that this report is not arguing against the relevance of professional expertise on research, extension practice, planning and communication for development. These skill sets remain relevant. Our argument is, however, that these skill sets are no longer relevant ways of organising OEKR's work. The subsequent sections of this report discuss how these skill sets could be used within an activity framework that would concern championing and supporting innovation support services. As outlined in Sections 1 and 2, such services are needed to assist societal stakeholders in diagnosing ever changing environments (including climate change) and developing coherent and concerted responses to these.

5. CASE STUDY ANALYSIS

Four country case studies were carried out for the report with the purpose of assessing which needs and gaps exist in actual practice with regard to the provision of innovation support services for climate change adaptation. This was in order to help FAO's Research and Extension Branch position itself strategically in meeting needs and demands in this area. Country studies were carried out in Bolivia, Bangladesh, Ghana and Congo. They took the form of desk-studies complemented with key informant interviews, guided by a set of questions (see Annex 3) that were based on the conceptual lens outlined in Section 3 (and elaborated in Annex 1).

Below we identify a number of similarities and differences that emerge from the individual studies.

(a) There is a need for adaptation

It transpires from all cases that climate change indeed poses a number of issues and challenges to all four countries. The nature of these challenges changes from country to country, and also between regions in a country. This means there is indeed a need for combined technical and institutional innovation (see Section 2).

(b) Projects and programmes are organised around climate change

In all countries we see that there are a number of programmes and projects organised around the issue of climate change. Along with internal concern about climate change, international donors seem to be influential in putting the issue on the agenda.

(c) Other Ministries than Agriculture seem to be taking the lead

In all four countries, the impression is that other Ministries than those mandated with agriculture seem to be taking the lead. In Ghana, Bangladesh and Congo this is the Ministry of Environment; in Bolivia it was initially the Development Planning Ministry, but the Ministry of Environment (and Water) took over at a later stage. In all countries, however, there exist projects and programmes that do have an agricultural component or focus.

(d) The emphasis is on technological adaptation and the local level

The agricultural projects seem to be mainly focused on developing and/or disseminating new technologies for farmers (e.g., new varieties, water harvesting, changing cropping systems, etc.). Moreover, most extension and development communication projects seem to be oriented towards innovation at a local level. There is relatively little attention to changing higher level framework conditions (i.e., institutional innovation, see Section 2), which may be needed in order to create conducive conditions for technological change and adaptation.

(e) Research and extension architectures are dynamic and stable at the same time

The case studies suggest that research and extension architectures undergo regular change. In most cases, however, these changes do not seem to be driven by a wish to improve the adaptive capacity of research and extension, or an explicit wish to establish more effective agricultural innovation systems. Instead, systems undergo reforms when donor-funded projects and programmes end and new programmes and donors come in, or — in the case of Bolivia — when political landscapes change radically. Bolivia is also a bit of an exception in the sense that the reform is based on an explicit philosophy of 'participatory innovation', with reference to innovation systems thinking. However, in the Bolivia case it must be mentioned

that the system still operates in a rather centralised and linear manner, despite the change in rhetoric. Moreover, in Bolivia ‘participatory innovation’ seems to be highly grassroots-focussed, thus ignoring required institutional and technical innovations at the above local level. The other case studies also suggest that conventional ‘technology transfer’ thinking is still very much alive.

(f) Interventions seem to be problem driven — not opportunity-led

Perhaps, not surprisingly, climate change projects and programmes seem to be primarily oriented towards solving problems that are associated with climate change. However, from an innovation systems perspective this (i.e., ‘problems’) may not be the ideal entry point, especially in situations where poverty alleviation and development are of prime importance. From a development and innovation perspective, one could argue that one would first and foremost have to identify new opportunities (e.g., producing soybean for the Chinese market; producing value-added food for idealistic consumers, etc.) and then take climate change and other constraints and barriers into consideration when developing adequate institutional and technical innovations and responses. We do acknowledge that our line of questioning may have resulted in a ‘problem-oriented’ bias; on the other hand this observation is in line with broader experiences in the agricultural development sector.

(g) A widespread need for orchestrating integration/ innovation intermediation

All case studies signal significant problems that have to do with lack of coordination between interdependent actors — for example, between research and extension, between different ministries and sectors (water, environment, agriculture), between public and private spheres, between academic disciplines, between different projects and programmes and/or between interventions at different societal levels. While we do not believe that innovation trajectories can or should be ‘coordinated’ in the classical sense of ‘central steering’, it is essential that interdependent actors somehow come to align their activities and plans in a synergistic manner. In this light there is certainly a need for the new communicative ‘innovation intermediation’ roles and functions outlined in Section 3.

(h) There exists an institutional vacuum for innovation intermediation at the country level

Despite the explicit attention to identifying new intermediary actors none of the case studies reports the emergence of new innovation intermediaries as a response to the integration and coordination problems signalled above. While there may be developments ‘below the radar’ (e.g. existing organisations, projects or NGOs taking on new roles) it is fairly safe to say that a vacuum seems to exist in this respect. The absence of such innovation intermediaries (i.e. the non-provision of a broader array of innovation support services) is likely to hamper the emergence of effective innovation systems around climate change induced challenges, along with sub-optimal performance of classical research and extension organisations. Given the diversity in country contexts, histories and opportunities for innovation — as well as earlier experiences with introducing recipe-like models — it is likely that each country will have to find its own contextually-adapted solutions to this challenge.

(i) There exists an institutional vacuum for innovation intermediation at the level of international development organisations

The ‘international landscape review’ suggests that no international organisation is currently taking the lead in supporting capacity development for innovation intermediation. We do see quite a number of agencies with overlapping mandates and unclear task division. However, even though some agencies adopt the language of ‘innovations systems’ and ‘institutional

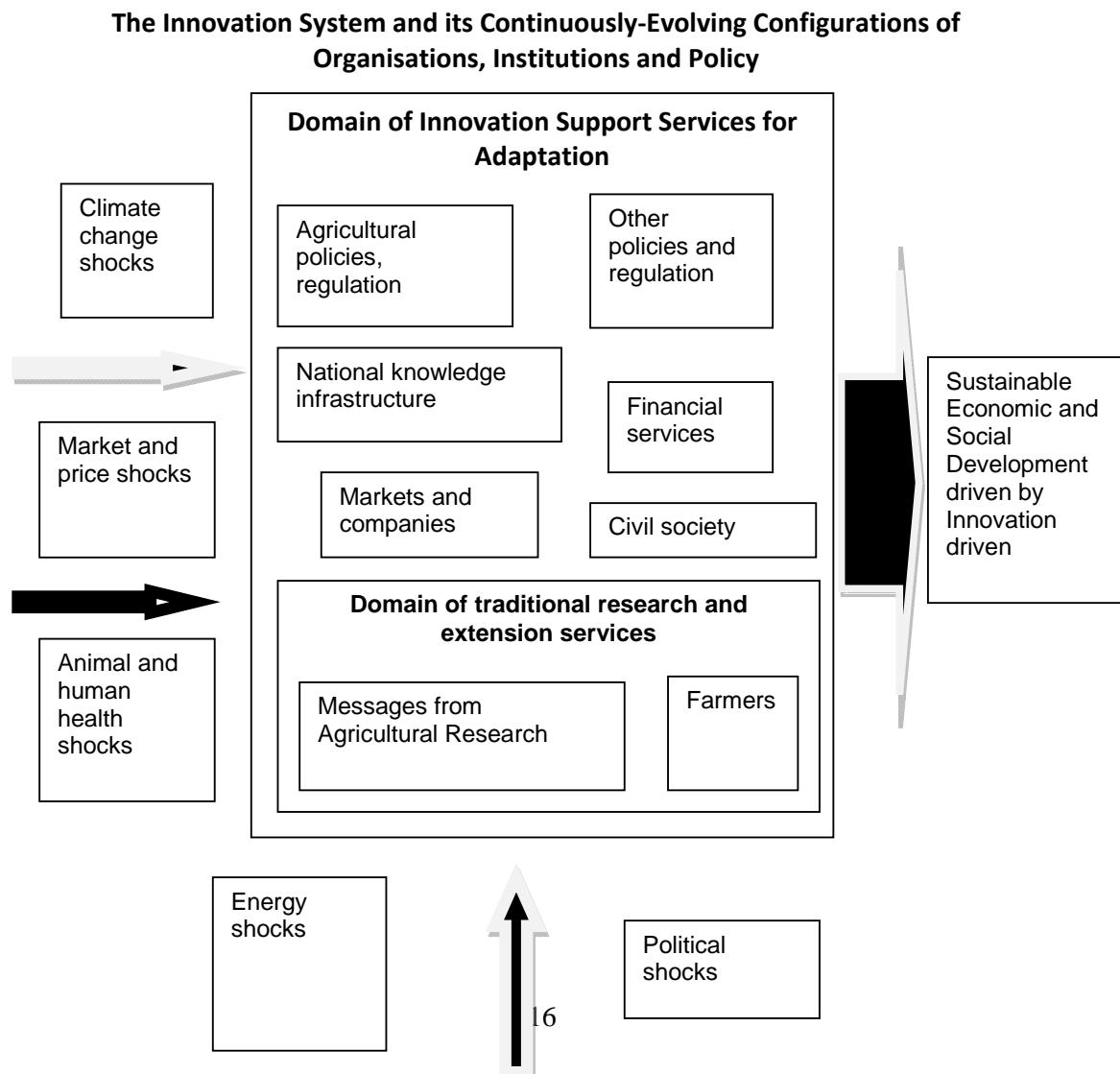
change' the overall picture is that most organisations focus on research or advisory services and not on supporting innovation intermediation. Many people are interested in the theme, but in view of their existing mandates, constituencies and funding mechanisms they find it difficult to adapt their organisations in this direction. The FAO's Research and Extension Branch (including the Communication for Development group) within the new OEK (Office for Knowledge Exchange, Research and Extension) is likely to face similar problems.

6. CONTOURS FOR A NEW POSITIONING OF OEKR IN FAO

Gap analysis

The preceding analysis of case-studies and relevant literature has made clear that climate change adaptation is not only an issue of technological adaptation, but also one of institutional adaptation within and beyond the agricultural knowledge architecture, including wider policy, regulatory and market regimes. It is argued that not only has institutional adaptation largely been overlooked in debates about technological responses to climate change, but that institutional adaptation needs to take place at all levels. The national case-studies indicate that there is a vacuum regarding the provision of the broader innovation support services that are needed to enhance adaptive capacity. At the same time we see that international development organisations do not take the lead in developing capacity for such new forms of innovation intermediation. Figure 1 below summarises the expanded domain of innovation services in a dynamic, global environment. The figure indicates that adaptation is not only about realigning and adapting rural processes, but also of adaptation at higher levels of the national system of innovation. The final element of this argument is that institutional adaptation requires innovation intermediaries that provide a range of innovation support services.

Figure 1. The Expanded Domain of Innovation Services in a Dynamic, Global Environment.



Intermediation is a task that extension professionals have traditionally played in communicative roles associated with technology promotion. The need now is to expand the focus of this intermediation role to the wider innovation system so as to allow multi-level institutional adaptation, which is a precondition for realising effective technological responses to climate change.

Innovation intermediaries can play a number of roles; i.e. they can provide a range of innovation support services (see Section 3). These include:

- Network brokerage
- Demand articulation and knowledge brokerage
- Visioning
- Process facilitation
- Interactive design and experimentation
- Learning-oriented monitoring
- Exploration of opportunities and constraints
- Lobby and advocacy communication
- Conflict management
- Organising interaction and participation

An analysis of the landscape of international agencies and country case studies reveals that (1) intermediation functions are often being fulfilled at a rural level, but there is currently no agency or function that plays the wider systems intermediation role; and (2) in the international landscape there is currently no agency that has an explicit role in providing support and advice on multi-level techno-institutional adaptation in the networks that eventually shape agricultural production, rural livelihoods and the ability to adapt to climate change and other emergent challenges and shocks.

Strategic and Operational Options for Agricultural Innovation Capacity Support Services

The above suggests that there is a gap for an international agricultural innovation capacity support service and that FAO's Research and Extension group under OEK could provide these services. Note that the term capacity is used here in the sense of the ability of the techno-institutional regime to adapt to the challenges and opportunities associated with climate change and a range of other such phenomena. This notion of capacity recognises that an ability to adapt includes, but goes beyond, processes and organisations in the rural space and agricultural research and extension organisations. It transcends traditional organisational and bureaucratic boundaries and, because of the nature of the value chain, national borders. This capacity is primarily a function of the system's ability to reconfigure groups of organisations, resources, technologies and policies around emerging themes, which may be challenges, but may very often be opportunities.

The role of the proposed agricultural innovation capacity support service would be to assist national partners to strengthen their ability to undertake a continuous reconfiguration process in response to climate change as well as a range of emerging issues. The core of this support would be in strengthening and backstopping the innovation intermediation tasks outlined above as part of an agenda of techno-institutional adaptation. It is only when these tasks are performed that research and classical extension can become meaningful (see Section 3). This

support could be oriented toward climate change-related challenges and opportunities, but it could also equally be direction towards adaptation related to a range of emerging themes.

How could support for the intermediation tasks outlined above be bundled into a group of support services appropriate to an international agency? An operational programme could contain the following broad elements:

a) Diagnosis and Visioning Support

This would involve supporting national partners to assess the intermediation priorities associated with specific themes and development opportunities. For example, this might be to help focus on disconnects between organisations relevant to an emerging theme, such as sustainable energy sources for agro-processing, and the identification of specific intermediation tasks needed to address these disconnects (in this case, connecting agricultural, industrial and energy pricing, policy and technical support). It may be about helping with a more general institutional analysis to identify areas where new ways of approaching problems may be needed. Finally it may be about helping develop different visions for agricultural sector development and exploring different patterns of reconfiguration under different development scenarios.

b) Establish and Support Newly-Introduced National Agricultural Innovation Capacity Support Units

This would involve working with national partners to establish and backstop specialised units to undertake intermediation tasks, with a specific focus on higher level institutional adaptation. The location of such a unit could be in an extension department, research institute or ministry of agriculture, although it may be more appropriate to locate it outside existing structures. Specific national and historical conditions need to be considered when defining the location of such units.

c) Change Management Support

While intermediation is by definition a form of change management support, reorientation of working practices in large public organisations and bureaucracies brings with it special challenges. Change management is a well-developed professional field and is a specialised type of expertise that could be used to help national partners in cases where reconfiguration of architectures and institutional adaptation requires major changes.

d) Reflective Learning Support

This would have two roles. The first would be in helping national partners systematically learn lessons about the effectiveness of programmes and initiatives and help usher in incremental institutional adaptation around emerging themes. Secondly it would be an internal function within FAO, helping develop generic lessons about techno-institutional adaptation from projects dealing with climate change and other topics.

e) Support to Institutional Learning for Technical Change Experiments

This would involve assisting national partners to establish and learn from experiments that explore how institutional learning for technical change could be achieved. It might involve establishing a series of pilot initiatives and assisting with reflective learning and undertaking systematic research on change processes. Alternatively it could involve establishing a challenge fund to create opportunities for new modes of collaborative initiatives on selected themes with specific requirements for systematic learning from these experiments. A

challenge fund may be an option that is attractive to donors who have been championing this idea. The role of the FAO unit might also be, therefore, to help broker the funding of such initiatives.

f) Professional Development Support

This would involve helping strengthen the professional skills of national partners so that they could reorient their role towards intermediation for higher level institutional adaptation. This may involve a range of options, including developing short courses for professionals and policymakers, secondments, support to curriculum development in universities and even M.Sc. and Ph.D level training.

Operational Options and Considerations

Adopting the six support service areas outlined above would represent a bold step toward reinvigorating the role and orientation of the research, extension and communication for development group within FAO. It would bring with it a number of benefits:

- It would strengthen the group's strategic relevance in agricultural development processes by aiming at the policy and institutional domain and this, in turn, would increase the scope of the group's activities for impact. This is an important consideration for a Rome-based international organisation in a sector where the field-level intervention space is already crowded by local and regional organisations.
- It would realign the group's role and underpinning "theories of change" in line with innovation systems ideas. These ideas are gaining ground as a policy framework in international agricultural development. Member countries are likely to increasingly look for support within this new policy framework; this is partially of their own accord and partially because this perspective has been adopted by major donors and is increasingly part of the common development narrative.
- It would accelerate the migration of the professional identity of the group, which has, in any case, already moved on considerably from its traditional research, extension and communication origins. This new focus could be used as a way of formalising that new professional identity and capitalise upon the unique circumstance of diverse and broad expertise on intermediation (rooted in extension and development communication) that is available in the unit.

There are also reasons why this new direction is opportune:

- The service orientation of the new direction, with both internal and external learning orientation, seems to be in line with the OEKR's new location with the Office of Knowledge Exchange, Research and Extension (OEK).
- It has already been argued that climate change as a topic is giving urgency to the need to adopt this interlinked techno-institutional adaptation agenda. Climate change could, therefore, be a vehicle to introduce this more broad-based perspective to agricultural development services.
- As a topic agricultural extension seems to be once again moving up the international development agenda with indications that large-scale investments are likely in a range of extension-like activities. The establishment of GFRAS is but one indication of this. While this brings with it the danger that this will push thinking back to strengthening technical advisory services, there are also a number of opportunities. Firstly, while there is much agreement that what went on before in extension planning and practice was inadequate, a new strategic direction has yet to solidify. Piloting a conceptually

well-informed new approach might be attractive to investors interested in taking the agenda forward. The companion opportunity is that it is likely that renewed funding will emerge in this area..

Operationalisation of this new direction is, however, not without its challenges.

Within FAO there is a danger that the new direction and role will not get recognised as a legitimate area of professional expertise and service provision and/or will not help in raising the profile of OEKR in FAO. Similarly it may simply further cloud the identity of the group.

Probably most challenging is how best to introduce this into support programmes with national partners, especially national research and extension organisations. This is particularly so because the new direction implies a role for extension services not just in helping farmers, but a service that helps the wider innovation system reconfigure and adapt. This may be too great a step for many national partners, who are primarily interested in their traditional role. Table 1 analyses the strengths and weaknesses of different operational options.

Through the use of these options FAO's OEKR unit could position itself at the forefront of efforts to pursue a technical and institutional adaptation agenda, which is as relevant to climate change as well as to a range of other emerging challenges and opportunities within the sector.

Table 1 An Analysis of the Strengths and Weaknesses of Different Operational Options

Options	Logic	Strengths	Weaknesses	Observations
Work with traditional extension service partners	Work with traditional extension partners and gradually try to help traditional partners evolve their role through experimentation and learning	Allowing the role and necessary expertise to grow organically over time in a way adapted to the local context. It's well within development bank investment traditions and would ease funding of the new approach	Moving the intermediation focus above field level activities may be difficult Lack of critical mass of appropriately skilled professionals to engage in higher level intermediation. Extension services may not have the political standing to help usher in wider institutional changes in the innovation system	Establishing and supporting special high-level institutional adaptation support units might be a useful way of providing space for experimentation and learning
Work with a different public agency partner, e.g. Ministry of Environment	Work with partner ministries with broader cross-cutting mandate and no traditional allegiances to technical advisory service vision of extension	Avoids the dangers of business as usual extension services support. Brings in new stakeholders needed for wider process of institutional adaptation.	Alienation of existing extension services. May confuse development investors who have their own traditional partners	Undertaking activities and support as a collaboration between extension services and other agencies may be more useful
Establish and support	New role needs new organisation with	Avoids the dangers of business as	No constituency of stakeholders.	Could affiliate the organisation to

autonomous intermediation agency	fresh mandate	usual extension services support. Sidesteps contested role within existing organisational and bureaucratic set-ups. No need to migrate expertise profile as will be recruited specifically for the new role	Lacks political support to work at higher level institutional adaptation. Would require substantial funding and political will to establish	existing extension departments. Strengthen the role of its governing board
Thematic or mission mode programmes	Emerging challenges and opportunities are transient and therefore alliances to address them can be done in a time-bound way	Provides space and legitimacy for new alliances to work on specific issues. Many countries are familiar with this mode of funding and working	Sustainability of innovation capacity support is limited to life of the mission	Could be used as a tool by existing extension agencies to experiment with new consortia to deal with unfamiliar challenges and opportunities
Establish and support a challenge fund	Provides funding and space to experiment with new ways of working on selected themes	Encourages experimentation with new ways of working	Non-traditional partners don't have the skills and networks to access these type of funds without handholding assistance	Could be used as a tool by existing extension agencies to experiment with new consortia to deal with unfamiliar challenges and opportunities

Expertise Needed

If OEKR wanted to position its role as one of strengthening the ‘agricultural innovation capacity support services’ of member countries in order to enhance their capacity to adapt to climate change (and other challenges), what implications would this have for the kinds of expertise the unit would employ? The first thing to mention here is that the current expertise in OEKR (and OEK more broadly) remains highly relevant. The current expertise in ‘research management’, ‘agricultural extension’ and ‘communication for development’ is clearly relevant to offering support services for ‘diagnosis and visioning’, ‘reflective learning’, ‘institutional learning’, ‘experimentation’, ‘change management’, etc. In fact, the currently available staff is already involved in playing and supporting the new intermediary roles that we are referring to (see Annex 2). To a considerable degree, our proposal is not to radically change expertise in the unit, but rather to re-brand the expertise that is available. This re-branding is needed for two reasons. The first reason is conceptual: when we look at climate change adaptation as an innovation challenge then terms like ‘extension’ and ‘communication for development’ do not clearly capture the kinds of communicative intermediary services that are required from a theoretical point of view (see Annex 1). Sticking to old terminology and labels reinforces the risk of reproducing outdated insights and theories of change. The second reason is that the outside world (including neighboring departments within FAO) hardly recognises the significance of the OEKR unit to contribute to climate change adaptation. They know that there is a group dealing with ‘extension’ and ‘communication for development’, but when it comes to supporting dynamics in multi-stakeholder innovation networks they prefer to hire or employ expertise from elsewhere (see Annex 2). This may at times serve the strategic and/or financial interests of other FAO groups, but it is also

connected to the images that go with terms like ‘extension’ and ‘communication for development’.

In the long term, a re-branding of the unit, and/or the services it provides, will have implications for the staff and expertise it will (want to) hire. The history of the former Extension Science group at Wageningen University is perhaps indicative of this: the group changed its name to Communication and Innovation Studies more than 20 years ago. Since then it became part of (and was invited into) new networks, discovered new issues, and developed new areas of expertise. This also led to the employment of staff (e.g., with a background in social psychology or innovation studies) who would probably not even have applied for a job in ‘extension science’. Despite these changes, and perhaps because of them, the group continues to generate relevant ideas on agricultural innovation support, including extension.

Options for Conventional Extension Organisations

As outlined in our discussion of operational options and considerations (see above) our proposal to reposition the OEKR group in the face of climate change and other adaptation challenges may well lead to working with new strategic partners, and less attention for classical extension establishments. As mentioned, it is not likely that the latter will develop into innovation intermediary organisations that work at multiple levels and in multiple arenas. But even within their current set-up classical extension organisations might improve considerably. A number of small but meaningful changes are possible:

- Provide extension organisations with up-to-date insights from innovation studies to make clear that all technical innovation requires re-organisation of local institutions and social relationships
- Change job descriptions of above field-level extension staff, and make senior extension officers responsible for facilitating the local institutional change process (for a successful case see Dormon, 2006)
- Enhance diagnostic and visioning skills at regional extension offices to facilitate future and opportunity-oriented extension programming (instead of problem-based programming)
- Conduct experiments with organising interaction among relevant players in local level ‘innovation systems’ (e.g., local farmers, traders, processors, money lenders, chiefs, etc.,) in order to identify social and technical problems and opportunities

Concluding Comments

This report argues that climate change is merely one of a set of macro-scale drivers of rural change that demand techno-institutional adaptation at all levels of society. The report goes on to argue that the role of intermediation, traditionally used in mediating research-farmer interactions, could be used in a much wider sphere of activity. This would involve intermediation for institutional and policy adaptation in national arenas and not just in the rural space. The main suggestion of the report is that research, extension and communication professionals could reorient their core expertise in intermediation toward these wider dimensions of the climate change adaptation task. The report makes suggestions on how these sorts of support services could be organised to help FAO member countries as well as FAO's own needs of institutional learning and adaptation. This is certainly a challenging agenda. However, what is also clear is that global shocks such as climate change are demanding fundamental changes in the way human society as a whole operates and organises itself. An international organisation like FAO should take this opportunity to place itself at the forefront of a new way of doing business.

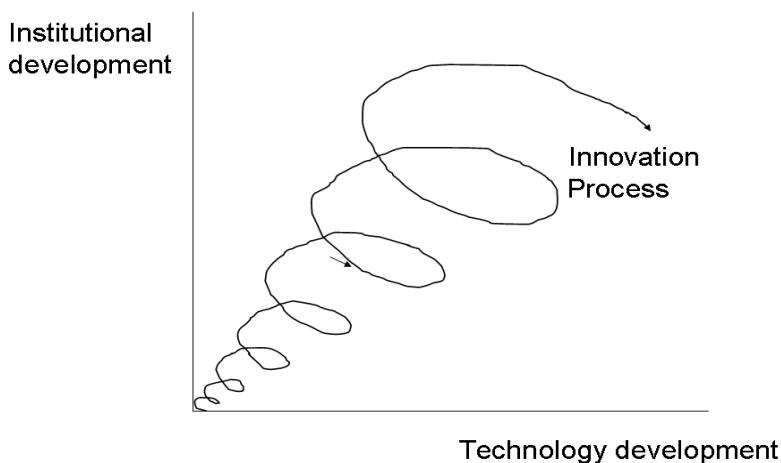
ANNEX 1

CONCEPTUAL FRAMEWORK: THE CHANGING ROLE OF EXTENSION, COMMUNICATION AND RESEARCH

1.1. Adaptation as combined technical and institutional innovation

From the literature on climate change it is clear that adaptation may involve an array of both technical and institutional responses. The idea that effective adaptation involves the use of a coherent set of technical and institutional responses and solutions is congruent with contemporary thinking in innovation studies. Nowadays innovation is no longer associated with technology only, but is looked at as a successful combination of 'hardware' (i.e., new technical devices and practices), 'software' (i.e., new knowledge and modes of thinking) and 'orgware' (i.e., new social institutions and forms of organisation) (adapted from Smits, 2000, 2002; see also Leeuwis, 2004). Thus, climate change adaptation can be usefully regarded as a process of innovation.

Figure 2: Innovation as an iterative process in which novel connections are forged between technology and institutional arrangements (source: Convergence of Sciences)



It is important to recognise that coherent technical and institutional changes will be needed simultaneously across societal levels and arenas.

1.2. Innovation for adaptation as a process

It has become clear that adapting to climate change requires coherent responses from actors that operate at various levels (national, regional, local), in different sectors (agriculture, forestry, environment, industry) and of several kinds (e.g. public, private). In response to climate change (or other challenges) these parties are not in a position to realise change on their own. Whether they like it or not, therefore, actors (need to) interact with each other, and can be seen to be part of a network of interdependent actors. Although policy matters, it has become clear that change in networks cannot be engineered and steered in a centralised and top-down fashion (Scharpf, 1978; Dryzek, 1990; Rhodes, 1997; Healey 1997; Pierre, 2000).

Hence, we witness increasing attention on more interactive ways of fostering change, including ‘network approaches’ (Engel, 1995; Kickert et al., 1997; Rhodes, 2000), ‘collaborative problem solving’ (Gray, 1989), ‘social learning’ (Leeuwis and Pyburn, 2002, Wals, 2007) and ‘consensual approaches’ (Susskind and Cruikshank, 1987). In the context of (agricultural and non-agricultural) innovation studies, similar insights have been elaborated in the idea of fostering effective innovation systems (Edquist, 1997; Metcalfe, 1995; Hall et al., 2001; Smits, 2002; Spielman, Ekboir, Davis, & Ochieng, 2008; Lenné, 2008). In innovation systems, networks of different players are transient and emerge around specific challenges and tasks at particular points in time. Public research and extension are among these players, but their value is as responsive elements of a network or system, rather than in their own right (Sumberg, 2005; Kristjanson et al., 2009). Other players such as the private sector or civil society organisations have a prominent role, not just as passive knowledge users or transmitters, but as pro-active agents who are interdependent in working towards effective socio-technical innovations (Hall et al., 2001; Leeuwis, 2004; Biggs, 2007).

Experience has taught us that it is a mistake to think in terms of an optimal ‘one-size-fits-all’ model for organising research and extension in support of agricultural innovation and/or climate change adaptation (Sulaiman & Hall, 2008; Hartwich, Gottret et al., 2007). However, at a more abstract innovation theoretical level, we can say that any innovation support infrastructure should be able to support three essential processes. The first process is that of *network building*. We have seen that innovation inherently implies a re-configuration of relationships within and between networks, and possibly the formation of new networks and/or the demise of existing ones (Engel, 1995; Callon et al, 1986; Latour, 1987). A second key process is of *supporting social learning*. In different strands of thinking about innovation, learning is considered a critical process for developing a conducive fit between innovations and their environment (Geels, 2002; Rotmans, 2003; Smits & Kuhlmann, 2004; Hommels et al, 2007). Moreover, the development of congruent storylines and discourses (Hajer & Laws, 2006; Grin & Van de Graaf, 1996) requires that the parties involved slowly develop overlapping — or at least complementary — perspectives on relevant models of reality, problems, goals and boundaries as a basis for identifying desirable, feasible and acceptable options for change. Dialectical debate and joint learning are proposed as the main route towards achieving this (Checkland, 1988). Several scholars have labelled this process ‘social learning’ (Dunn, 1971, Friedmann, 1984, Röling, 2002, Woodhill, 2002; Leeuwis, 2002). The third key process that needs to be supported is *dealing with dynamics of power and conflict*. The existence of competing human values and interests in complex problem settings implies that efforts to change the status quo are likely to lead to tensions and conflicts of various kinds. Moreover, the realisation of change in one way or another involves the mobilisation of power resources to overcome resistance. Our point here is not that dynamics and power and conflict must be prevented. Instead we argue that they are always at play, and that there are more and less productive ways of dealing with them.

1.3. The role of extension and communication in innovation processes: Multiple modes of intermediation

Theoretical and practical literature on learning, negotiation, participation and communication provide numerous insights and suggestions on how the three basic processes indicated in the previous section could (depending on a specific context) be facilitated and enhanced through communicative strategies. In Table 2 (derived from Leeuwis & Aarts, 2010) we list such strategies.

Table 2: Examples of possibly relevant communicative strategies for enhancing the basic processes relevant to innovation support.

Network building	Supporting social learning	Dealing with dynamics of power and conflict
<ul style="list-style-type: none"> - Make an inventory of existing initiatives, complemented with stakeholder analysis - Build on existing initiatives for change and the networks around these - Arrange contact between disconnected networks that may have compatible interests (e.g., Chinese consumers and African farmers) - Work towards 'coalitions of the willing' and exclude actors who do not feel interdependent - Mobilise pressures from outside (carrots and sticks) to enhance feelings of interdependence - Forge contact with outsiders and outside expertise 	<ul style="list-style-type: none"> - Demonstrate and visualise interdependencies among stakeholder practices - Explore and exchange stakeholder perspectives (values, problems, aspirations, context, etc.) through discussion, role playing, dramatisation, visits, filmed interviews, informality, humour, fun etc. - Visualise invisible bio-physical processes with the help of discovery learning tools or simulation - Explore past and current trends and likely futures if nothing changes - Use visioning tools and scenario analysis to imagine (and find common ground on) possible futures - Discuss institutional and other influences that reinforce existing patterns/problems - Organise contact with others who have encountered and managed similar problems - Elicit uncertainties that hinder change, and design collaborative investigation and experimentation to develop common starting points - Use practical actions and experiments as a source of reflection and learning, rather than organising discussion and reflection only - Organise regular reflection on process dynamics and satisfaction with outcomes 	<ul style="list-style-type: none"> - Identify and propose process facilitators who are credible and trusted by the stakeholders involved - Work towards process agreements, including dealing with media, mandates, etc. - Probe to explicate the interests and fears that underlie mobilised arguments and counter-arguments - Steer collaborative research activities (see other column) to questions relevant to less resourceful stakeholders - Make stakeholders talk in terms of proposals and counter-proposals - Ensure regular communication with constituents to take them along in the process - Translate agreed-upon problems and solutions into storylines and symbols that are likely to resonate in society - Use media and lobby tactics to influence societal agendas and advocate solutions (with the help of storylines/symbols)

[sources: Pretty *et al*, 1995; Loorbach, 2007; Smits & Kuhlmann, 2004; Weisbord & Janoff, 1995; Aarts, 1998; Pruitt & Carnevale, 1993; Leeuwis, 2004]

When resorting to more conventional terminologies used in the sphere of extension and communication literature, the kinds of activities mentioned in Table 2 still include well-known strategies and services such as:

- Advisory Communication
- Organising horizontal exchange in support of diffusion
- Persuasive mass media campaigns
- Awareness raising
- Training
- Information provision

However, in order to make innovation happen in a network-like configuration, such classical activities need to be accompanied by (and embedded in) other communicative strategies and services (see Leeuwis, 2004; Klerkx & Leeuwis, 2009) such as:

- Network brokerage
- Demand articulation and knowledge brokerage
- Visioning
- Process facilitation
- Interactive design and experimentation
- Learning-oriented monitoring
- Exploration of opportunities and constraints
- Lobby advocacy communication
- Conflict management

It is in the context of such ‘new’ communicative tasks and strategies in an innovation trajectory that ‘old’ strategies can become meaningful and appropriate, usually at later stages of an innovation trajectory. Moreover, it is important to realise that both ‘old’ and ‘new’ strategies may usefully involve a range of communication media (interpersonal, mass media, hybrid ICT, etc.).

What we see, in essence, is a broadening of the role of extension and communication professionals in innovation trajectories. While in the linear ‘transfer of technology’ model communication was primarily seen as an intermediary function between science and practice, we now see a much broader range of intermediary roles. As indicated in Table 2, these include, for example, mediation in conflict situations; network and knowledge brokerage; facilitation of exchange, learning and vision building among diverse communities; matching of supply and demand of innovation support services (e.g., research); etc. Moreover, the intermediary roles that we are discussing now happen at a range of interfaces that are situated within (and between) networks of stakeholders operating in different societal spheres. In terms of substance, such intermediary processes do not mainly address the qualities of given technologies in connection with assumed or proposed problems (as in the linear model), but rather centre on a range of human aspects and attributes that bear relevance to the building of networks and reaching agreement and coherence (Röling, 2002; Grin & Van de Graaf, 1996) within and between them. Such attributes include, for example, stakeholder characteristics, interests, perspectives, motives, agendas, fears, visions, uncertainties, questions, etc. In practice, we see that such broader intermediaries have indeed emerged in present-day innovation systems (see Smits & Kuhlmann, 2004; Howells, 2006; Klerkx & Leeuwis, 2008; Klerkx, Hall & Leeuwis, 2009), and complement the activities of classical intermediaries that

focus on disseminating technology. At the same time a range of authors signal that there is still considerable scope for strengthening the quality and position of such intermediaries in innovation landscapes (Hall, 2005; Smits & Kuhlmann, 2004; Klerkx, 2008). An important question here is whether agricultural extension organisations are willing and able to play broader roles. These organisations have always had the mandate to play an intermediary role in innovation processes and could, in principle, expand their activities to include those mentioned in Table 2. However, this would have to go along with considerable change in terms of staffing and organisational capacities (see Leeuwis, 2004).

1.4. The role of research in innovation processes for climate change adaptation

In our introduction we have argued that climate change goes along with the emergence of complex problem situations. This has important implications for the role of scientists and research since different levels of complexity require different modes of operation by scientists (Funtowicz and Ravetz, 1993; Gibbons et al., 1994). In ‘low complexity’ situations where both uncertainty and decision stakes are low (i.e., goals are not contested), Funtowicz and Ravetz (1993) argue, scientists can suffice to act as *applied scientists* and engage in ‘puzzle solving’. If uncertainty and stakes are moderate, scientists can act as *consultants*; scientific knowledge is then combined with context-specific expertise and tacit judgements. In case of high uncertainty and decision-stakes, scientists need to engage in *post-normal science*. They have to become intensely involved in societal interactions and collaborative forms of research in order to contribute to the development of shared views and value commitments (Figure 2). Societal stakeholders (or: the actors in an innovation system), then, become part of an ‘extended peer community’ (Funtowicz and Ravetz, 1993).

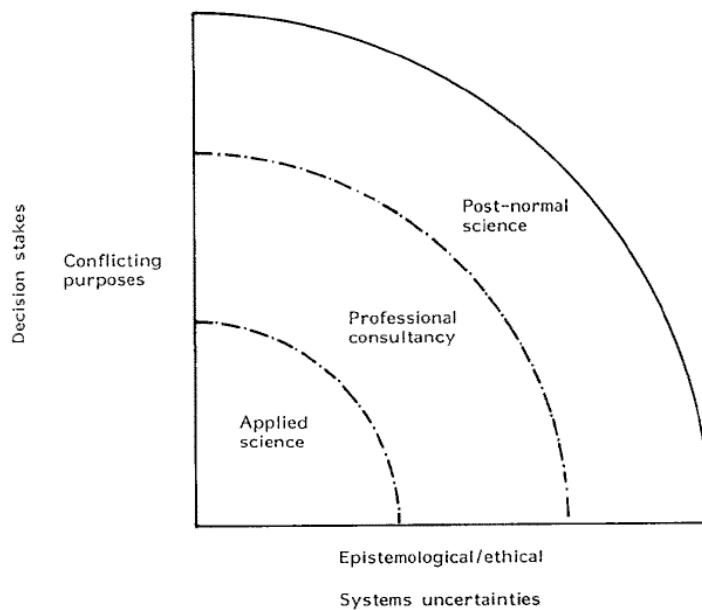


Figure 3: Different roles of science in relation to decision-stakes and uncertainties
(From Funtowicz and Ravetz, 1993)

‘Post-normal’ innovation trajectories and innovation systems are not likely to be successful if they are scientist-owned and/or initiated (Leeuwis, 1999; Broerse & Bunders, 1999). In a learning and negotiation process, knowledge generated in various locations (e.g., research

stations and farmers' fields) by different stakeholders (e.g., researchers and farmers), for dissimilar purposes (e.g., assessing the 'truth' and promoting stakeholder interests) and through different procedures of validation (e.g., scientific method and farmer experience) must be creatively articulated and integrated. In such innovation processes, then, scientists (in the broadest sense, so including consultants, technical experts, knowledge brokers, applied researchers, etc.) can be seen as *resource persons* who can play four basic roles during social learning and negotiation processes:

- *Help explicate implicit assumptions, knowledge claims and questions:* Discussions among stakeholders usually contain a range of implicit knowledge claims, assumptions and questions. Frequently, progress in social learning and negotiation processes is hampered when these remain implicit and do not become a point of explicit discussion and reflection. Such explication is far from easy and can never be complete. Nevertheless, not only process facilitators, but scientists from different disciplines can also play a useful role in this respect. From scientists one may expect a special sensitivity for the assumptions, knowledge claims and questions that are hidden in what stakeholders say or do not say about their specific field of expertise. Hence, dialogue between stakeholders and scientists may contribute toward making explicit what was implicit previously, and result simultaneously in a coherent set of relevant natural and social science questions.
- *Joint fact-finding and experimentation:* Research can play a role in joint fact-finding geared towards answering shared questions and reducing uncertainties that affect the innovation process. The purpose of this type of natural and/or social science-research is not only to provide answers, but also to build confidence, trust and shared perspectives among stakeholders by working together on an issue in the first place (Van Meegeren & Leeuwis, 1999). Depending on the questions addressed such research may involve on-farm research, laboratory research by scientists, computer simulations etc., as long as it remains part of a commonly agreed upon — and preferably iterative (see Vereijken, 1997) — procedure. In the context of such research, scientists also need 'free space' to follow their own intuitions (see Van Schoubroeck & Leeuwis, 1999).
- *Feedback:* Results from research can serve as more or less confrontational *feedback* in order to induce learning, i.e., through the creation of new problem definitions. Such *feedback* from natural and/or social scientists may be provided by research data on the existing situation, but may also arise from comparison with totally different situations (including laboratories) or computer-based projections about the future (Rossing et al., 1999; Röling, 1999). This can also include comparison with radically new technological and organisational solutions. These latter kinds of feedback may serve to enlarge the space within which solutions are searched for.
- *Process monitoring:* Research can play a role in monitoring the social dynamics of the learning and negotiation process itself, in order to inform its organisation and further facilitation. How are relations between stakeholders developing? Which new developments, questions, wishes and problems emerge? How do these affect progress, and what can be done about it?

It is important to realise here that playing a role as outlined above requires different modes of operation by researchers than are currently dominant. It requires, for example, (a) intensive

cooperation between stakeholders, change agents and researchers, (b) cross-disciplinary cooperation among scientists (as the solving of problems may well involve integration of insights from various disciplines), (c) greater emphasis on on-farm (or ‘in-society’) experimentation, (d) new procedures for setting research agendas, etc. (see also Bouma, 1999; Van Schoubroeck & Leeuwis, 1999; Vereijken, 1997; Klerkx & Leeuwis, 2008). Similarly, Gibbons et al (1994) argue that there is a need for scientists to shift from ‘Mode 1’ to ‘Mode 2’ science.

Table 3: Key differences between ‘Mode 1’ and ‘Mode 2’ science (Gibbons et al., 1994)

‘MODE 1’ Science	‘MODE 2’ Science
<i>Academic context</i>	<i>Application-oriented</i>
<i>Disciplinary</i>	<i>Trans-disciplinary</i>
<i>Homogeneous</i>	<i>Heterogeneous</i>
<i>Hierarchic and stable</i>	<i>Heterarchic and variable</i>
<i>Academic quality control</i>	<i>Quality measured on a wider set of criteria</i>
<i>Accountable to science</i>	<i>Accountable to science <u>and</u> society</i>

1.5. Newly emerging languages and professional landscapes

As can be noted from the above the roles that change agents (i.e. extension staff and communication professionals) and researchers may play in supporting climate change adaptation (and/or in dealing with other complex problem settings) are broad, and different from what we have been used to. Along with this, the terminology that is used to indicate these roles has evolved over time. Moreover, nowadays we see that there are many staff members within government bodies, private consultancies, civil society organisations, development NGOs, research organisations and private companies who use a variety of communication strategies in order to stimulate change and innovation. Many of these do not identify with (or may not even know) classic terms like ‘extension’ or ‘communication for development’. In addition to the terms already presented earlier, we present a few terms below that are currently being used inside and outside the agricultural arena to characterise important dimensions of this professional field:

- Innovation capacity development
- Innovation support services
- Innovation brokerage and intermediation
- Communication for innovation services
- Change management
- Governance of science and technology
- Institutional learning and change
- Facilitation of social learning
- Multi-organisational partnership development

Different terms have different origins and connotations. Several of these terms may better capture and convey what is needed for climate change adaptation than ‘research, extension and communication for development’.

ANNEX 2

PRELIMINARY ANALYSIS AFTER BRIEFING AT FAO

In this section we provide a preliminary analysis of the current research extension and communication role, its evolution and its possible future role with special reference to climate change-related activities. The analysis results from intensive interactions and interviews with FAO staff from several divisions during a 3-day visit in July 2009.

2.1 Recap

The starting point for an analysis of the way a group of research, extension and communication professionals should position themselves to better contribute to climate change is to restate what is understood by extension in the contemporary sense. As a short hand for this contemporary view of extension the term 'new extension' is used here (although recognising that this term covers a number of things and that it may not be the ideal name as it is too easily confused with the old extension). This analysis is presented to focus on what the implications are for the role of a group of extension-related professionals in the setting of an international organisation such as FAO. While this is an important starting point, this analysis also needs to be informed by organisational changes within FAO as well the larger international landscape of agriculture-related international organisations.

2.2 Climate change and the new extension

The essence of the discussion presented in Annex 1 is as follows. Climate change adds urgency to the need for adaptation in its widest sense in the natural resources sphere (agriculture, forestry, NRM, livestock, fisheries). This does not just mean technical change for farm-level adaptation and mitigation. It also means adaptation of the policy and institutional regimes associated with the whole of the natural resources sector. In practice this means policy and institutional adaptation ranging from new land tenure arrangements, new markets for environmental services, as well as adaptation of natural resources public bureaucracies (for example, ministries of food, forestry, environment and agriculture) and adaptation of the agricultural knowledge infrastructure — public research and extension services, but also a diversity of other knowledge-related services and functions.

Two critical features of this emerging adaptation agenda are: firstly, the importance of negotiating new rules or institutional arrangements, often in a landscape of diverse stakeholders; and secondly the importance of reconfiguring networks of activity to bring about change (where the process of reconfiguration also relies heavily on negotiation). What is instantly apparent is that these two roles — negotiating new institutional arrangements and facilitating network reconfiguration — are both roles of intermediation. While extension has traditionally been viewed as intermediation between farmers and technology suppliers, adaptation to climate change demands precisely this role of intermediation, but in a much wider sphere of activity and between different actors. The implication here is that the role of intermediation for adaptation for climate change is a niche role that extension professionals are ideally placed to fill.

Given then that extension has a potentially critical role in adaptation for climate change, what would be the key features of this new type of intermediation role? The following seem to be important:

1. **Expand from rural space to national space intermediation.** Climate change adaptation is about reconfiguring roles and networks between interdependent players at different levels, all the way from the national level to the rural space with farmers.
2. **Expand from public agencies to multiple agencies.** Reconfiguration of support services for climate change adaptation not only involves public research and extension services but others from civil society and the private sector.
3. **Expand from tactical to strategic role.** Intermediation no longer just a tool to deliver technology, but a tool to reconfigure systems architectures and strengthen system capacities.
4. **Expand from practice development to policy development.** Intermediation no longer just about field methods and practices with farmer, but also about strengthening the enabling environment for adaptation through policy change.
5. **Expand from communication for information diffusion to communication for for network-based development and innovation.** Communication becomes integrated in ‘innovation intermediation’ activities aimed at enhancing network formation, learning, negotiation and the building of relationships in new configurations of support and services for climate change adaptation.
6. **Expand core expertise from service delivery to facilitation.** Brokerage function between other agencies and organisations becomes much more important than actually providing services

What follows is an analysis of the way the role of extension professionals in FAO has migrated towards this vision of a wider-ranging intermediation role and a preliminary analysis of how it might develop this niche within the international research and extension arena.

2.3 Historical origins of the research and extension group and its implications

When this study commenced the Research and Extension (and communication) Division (formerly NRR) was placed under the NRM division of FAO. Since then the unit (now called OEKR) has become part of the Office of Knowledge Exchange, Research and Extension (OEK), which will take on a cross-cutting and support role for several divisions, including NRM and Agriculture.

The group was originally created by the merger of a research and extension group and a development communications groups. This earlier merger, while in line with a contemporary vision of agricultural extension as an intermediation task, left many artefacts of earlier professional designations and perspectives within the group: for example, the development communication professionals were misleadingly titled communication officers.

The work of the group spans so-called normative work (advising national governments on extension best practice) and technical work (small-scale development-type projects, often externally-funded and addressing a specific problem or developing and testing new extension approaches).

Discussions with staff in the group suggested that the vision of extension has largely migrated from assisting technology transfer to a more broadly-defined intermediation role within innovation systems (see first point below). This is a very promising development and suggests that extension professionals are well-placed to make a key contribution to climate change and adaptation because of the emergence of a critical role of intermediation. This migration is,

however, not complete both because of visions and perspectives within FAO as well as because of visions and perspectives of member governments and the demands this places on the OEKR group. The following section presents a number of these tensions that arise from this partial migration. The purpose is to highlight where further change in self-vision and role would be required if the OEKR group were to grow into a more strategic role of intermediation for climate change adaptation.

2.4 Extension services vs. innovation support

In many ways this is the crux of all tensions. It stems from rethinking about research and extension activities with the growing development of innovation systems ideas. These ideas simply recognise that innovation as a process of using ideas and technologies for productive purposes is not the preserve of research projects and public services. Instead it is a process that takes place throughout social and economic systems — sometimes with farmers leading, sometimes with the private sector leading and more usually involving agents forming transient networks to get hold of information and resources. At the same time the wider policy and institutional setting is an intrinsic element of this system and its capacity to innovate. In this world view promoting innovation goes way beyond promoting technology from research and involves enabling a wide range of processes, players and capacities.

This idea is no longer contentious. But it does leave open the question over who should broker the relationships in these systems of innovation. There are those who argue that since extension has always been about innovation support this is a function extension could very well play, albeit with a redefined mandate and scope. But there are others who argue that the primary role of extension is to provide technology and information services to farmers. These positions are not mutually exclusive and can co-exist, and in some context emphasis will need to be placed on different roles. Nevertheless the tension between the two can be seen playing out within FAO.

Part of this tension relates to the history of FAO as an international source of information and expertise on agricultural topics — traditionally it was a subject matter specialist-type organisation rather than a research organisation or a policy advice organisation. And it visibly still has a very strong tradition of producing publications with an advisory-type orientation. As a result there remains a degree of schizophrenia about whether OEKR should be providing information or expanding the envelope of what might be deemed “best” practice.

Nowhere is this more evident than in the so-called normative work that the OEKR team provides for member countries. As part of a membership-based organisation the OEKR team is obliged to respond to requests for support from member countries. Requests take the form of ways public extension services can be strengthened; in other words how the function of extending information can be strengthened. This presents a difficult dilemma. On the one hand extension professionals in OEKR have a much expanded vision of extension and the need to strengthen capacities for innovation support that go beyond extension services. This would require engagements with issues of institutional and policy reform. On the other hand member governments are generally not requesting assistance with the reform process, but instead request assistance with capacity strengthening in the existing framework and conception of their public extension services.

OEKR staff have commented that more recently, as part of their normative role, they have been doing diagnostic work on innovation systems. In reality, however, they conceded that

this diagnostic work focused on extension services. They also commented that discussion about new extension approaches that addressed the need for bottom-up processes had been given emphasis in advice on new best practice. At the same time it was recognised by staff that this over-reliance on bottom-up approaches and tools has been somewhat misguided in that it failed to address the overarching policy and institutional framework and architecture in which extension-like activities were being used to promote innovation.

2.5 Training vs. Capacity Development vs. Capacity for Capacity Development

This tension is really a sub-set of the point just discussed but focuses on the specifics of the tension between the old and new vision of extension. FAO has traditionally played a very strong training role. However, the new extension agenda implied by innovation systems is one of capacity development in a total systems sense. It is about adaptation and reconfiguration of roles and architectures of supports services, resources and partnerships. This perspective clearly has implications for the OEKR group's normative role as it suggests that the best way to help member countries is to build their capacity to support the institutional and policy change that is required for the continuous adaptive process. Staff in the group have this vision, but expressed doubts that this would sit comfortably in their normative work because of its demand-led nature.

2.6 Rural Image vs. Role in Institutional Arena

While OEKR as a group has a good vision of its potentially-strategic role in a new extension agenda, for historical reasons much of its work is very strongly branded as farmer-centric, located in the rural space. Illustrations on the front of its publications feature farmers and rural scenes even though the topics themselves might have more of a policy orientation. Titles can be equally misleading. This is not a trivial issue. While the vision of the group has clearly started to migrate to a more strategic one of enabling adaptation in the policy and institutional arena, the message sent out by publications is about a tactical role of developing and disseminating extension tools and methods.

Staff members recognise this issue. They explain it partly by the professional backgrounds of staff — many have a field-based background. Also one suspects that many grew up professionally in the 1980s and 1990s when the participatory and allied movements (rightly) drew attention to the need to put farmers at the centre of development. Many of the group's technical activities do still focus on field-based activities, developing and testing methods. (The group itself questions the prudence of a Rome-based international organisation with limited staff conducting such work). However, the rural branding goes beyond these activities. The other reasons that staff give for this rural branding is that this is what their organisation-wide peers and seniors expect of them.

One of the outcomes of this rural branding is that even others within FAO are unclear about the professional skills that the group has to offer, particularly those skills associated with the group's migration into a wider range of intermediation functions. For example, discussion with the technical leader of a project on range management in Azerbaijan was asked if they had consulted the OEKR group. It was a valid question since intermediation to negotiate agreements on land use is a central issue in range management and, therefore, firmly in new extension territory. The project leader's response was illuminating in two ways. Firstly, it was frankly stated that the expertise of the OEKR group had not been considered, mainly because it wasn't clear what that expertise was precisely or how it could help.

Secondly — and this was a point echoed by other technical divisions — what is usually required is a range land management specialist who has intermediation expertise rather a generalist. Ironically this tendency of the technical divisions to develop their own in-house expertise on intermediation (for example, the work on disaster management) means that many of the emerging good practice lessons on this topic are found outside the OEKR group. This has very important implications for the role of the group, which are discussed below.

2.7 Communication vs. Communication for Innovation and other Language Tensions.

This is a tension that relates to how the term ‘communication’ is understood. The traditional core of extension has, of course, been about communication. However, over time it has been recognised that communication isn’t just a tool for diffusing information. Instead communication is also (increasingly) seen as a tool for intermediation or brokering relationships. Building partnerships is often about finding ways of communicating; conflict resolution is about finding ways to communicate; change in organisations is often about helping communicate agendas and concerns among different people. During the review we witnessed a classic communication for intermediation tool used to discuss the impaction of climate change — an open space event.

Professionals working with communication for intermediation have coined different terms to describe this function; for example, development communication. This, however, has not prevented the term ‘communication’ being understood in the old sense by most people, even in allied professional fields. The work of OEKR suffers from this lack of clarity of meaning. This is particularly unfortunate because staff in the group have a vision of communication as a tool of intermediation. But professional backgrounds of others and mislabelling of positions (mentioned earlier) tend to cloud this vision both internally and for external audiences.

In many senses the tensions over the term ‘communication’ are symptomatic of the tensions that arise from much of the language around this topic. Extension as a term is a prime example of this problem. As already stated many times, while the concept of what this term means to the OEKR group has migrated significantly, the terminology of extension has remained and, along with it, the baggage that this term brings. Much of this baggage, while not necessarily negative, gives the impression of a set of expertises and outlooks that is seen as less relevant in a contemporary agricultural development setting.

One could argue that a name doesn’t matter. Interviews with the technical division suggest it does. There is a good reason why others in the fields of extension have renamed themselves — for example, Wageningen University in the Netherlands had a pioneering agricultural extension department that renamed itself the Communication and Innovation Studies Department for precisely these reasons.

2.8. What does this mean for OEKR’s Contribution to the Climate Change Agenda?

It is quite clear that the climate change agenda and the centrality of adaptation at all levels is a metaphor for the series of challenges that is affecting the agricultural sector — avian influenza, food price crisis, etc. — all of which require adaptation. It is also clear that the rate of change is increasing and there is an ever-increasing urgency to find ways to facilitate the flexible adaptation of countries’ and regions’ knowledge infrastructures to cope with this. Climate change certainly adds to that urgency. For FAO climate change is an important and

widely-accepted rallying point of such significance that it could be used to usher important new ways for working, which resonate with contemporary ideas about the flexible, networked capacities needed for adaptation and innovation.

There seems little doubt that climate change could, thus, be an important vehicle for redefining and reinvigorating the role of the research, extension and communication for development group within FAO. This is not a self-serving survival strategy. Rather, the role of new extension and the migration of professional skill around intermediation for adaptation and innovation means that this group is very well-placed to make a vital contribution to international efforts in this area. Clearly, the group can build on its already existing activities in the sphere of climate change adaptation, and expand these to higher level networks and different adaptation issues.

There are internal debates in FAO about whether the OEKR group should have a role as a clearing house for expertise and lessons on the newly-defined topic of extension (actually intermediation). There are merits to this. Technical divisions have built up their own expertise in these areas and on topics related to climate change and it would be valuable to have an overarching institutional learning function. This could also strengthen FAO's hand in normative work as it could draw from a wider skill base and experience.

The alternative is to place all the new extension-like expertise closer to climate change topics — such as NRM. In other words, concentrate on expertise. This also has its merits, but it could easily get lost in a service function rather than playing a more strategic role of building national capacities for policy and institutional change.

Both of these options will require additional professional skills. However, to be effective in either location and as part of the climate change agenda the OEKR group and its future reincarnation needs to make efforts to complete its migration to the new strategic intermediation role that the new extension vision suggests. Priorities include:

1. Finding a new language or new labels to better convey the role and expertise of the group.
2. More clearly position the group as having a strategic role in the institutional and policy arena rather than in the rural arena.
3. Reassess the demands of member governments in their own process of migrating to the new extension and its role in a more broad-based process of adaptation.
4. Redefine normative work as helping member governments in the process of migration, strengthening local capacities for institutional and policy change to underpin adaptation.
5. Identify FAO's niche in this area in the international landscape, given its relatively limited staff numbers and resources in this area, and communicate this more clearly to the outside world.

ANNEX 3

QUESTIONS FOR THE COUNTRY CASE STUDIES

To further understand the way in which FAO's research, extension and communication professionals could contribute to the climate change agenda two types of desk-based case studies were conducted.

The first focused on country case studies to explore how the role and vision of extension is migrating toward the intermediation emphasis of the new extension and the extent to which climate change is impinging on debates about policy and institutional reform. The priority here is to see how countries are coping with the wider adaptation agenda and how they could best be supported in that agenda. It is recognised that climate change may not be a priority for many countries. However, adaptation to other global phenomena, such as avian influenza or the food price crisis might be used as illustrative cases of adaptation. Country studies were carried out in Bolivia (Mario), Bangladesh (Andy), Ghana (Cees) and Congo (FAO-OEKR). Specific questions that guided these case studies are presented below.

The second kind of case study focused on developing an overview of the international landscape with a view to better identifying FAO's niche within it. A number of organisations in the international community are active in the area of innovation, institutional and policy change through normative work, through policy work and through research. While FAO has modest resources in this area it is well-respected and usefully co-located in Rome. This desk-based landscaping exercise meant to identify different niches that FAO could occupy and discussed the strengths and weakness of these options.

3.1. Themes and format for country studies

Based on the conceptual lens outlined in Annex 1, we proposed the following set of questions and attention points for the country (mini) case-studies. The main purpose of the country studies was to see which needs and gaps existed in actual practice with regard to the provision of innovation support services for climate change adaptation. This was done in order to help FAO's Research and Extension Unit position itself strategically in meeting needs and demands in this area.

A. Recent History of Knowledge Institutions

- How have extension landscapes evolved over time (organisation, payment, methodology)?
- How have research establishments evolved over time (organisation, payment, methodology)?
- What does the media landscape look like (organisation, payment, methodology)?
- How are research, extension and communication linked?
- What is the importance of public and private players?

B. What is happening at the grassroots level?

- Content: What is the focus: mitigation, adaptation, disaster preparedness? What is the entry point: NRM or Agriculture? CC or other themes?

- How much attention is paid to technical content, social-organisational change, capacity building?
- What level of integration do we see between different sectors (agriculture, NRM, water, forestry, health, disaster, rural development)?
- Are new networks being built at (and/or including) the local level? Who are included/excluded (NGOs, Public Extension, Research, Rural Development organizations, Local Administration, Farmer Organisations, Private Sector)? What strategies are used (see e.g. Table 1)?
- What strategies are used to support social learning (see e.g. Table 1)?
- What strategies are used to support conflict management (see e.g. Table 1)?
- What media & methodological approaches are followed (FFS, classical extension, radio, ICT, entertainment education, etc.)?
- Who is doing/initiating that (NGOs, Public Extension, Research, Rural Development organizations, Local Administration, Farmer Organisations, Private Sector)?
- Who is taking the lead? Who feels responsible for managing the process?
- Who is paying for it? Through what arrangements (e.g. tendering)?
- How broadly (spatially) is this all happening?
- How effective does it seem to be?
- How do Research and Extension organisations see their role at local level?
- What old and new intermediary roles are being performed (see section 1.4)? What other actors play such roles?
- What is NOT happening at local level? What gaps and vacuums exist in supporting climate change innovation?

C. *What is happening at the above grassroots level?*

- What efforts are made to make others adapt as well / along with farmers? (input supply, marketing, processing, credit, labour organization, WUAs, local/district governments?)
- What kinds of institutional changes are developing to alter framework conditions for farmers? To widen options?
- Are new networks being built above grassroots level? Who are included/excluded (NGOs, Public Extension, Research, Rural Development organizations, Local Administration, Farmer Organisations, Private Sector)? What strategies are used (see e.g. Table 1)?
- What strategies are used to support social learning (see e.g. Table 1)?
- What strategies are used to support conflict management (see e.g. Table 1)?
- Who is doing/initiating that (NGOs, Public Extension, Research, Rural Development organizations, Government bodies, Farmer Organisations, Private Sector)?
- Who is taking the lead? Who feels responsible for managing the process?
- Who is paying for it? Through what arrangements (e.g. tendering)?
- How broadly (spatially) is this all happening?
- How effective does it seem to be?
- How do Research and Extension organisations see their role at above grassroots level? What old and new intermediary roles are being performed (see section 1.4)? What other actors play such roles?
- What is NOT happening above grassroots level? What gaps and vacuums exist in supporting climate change innovation?

D. What are policies at national level?

- Is there a national policy for CC adaptation?
- Do Research and Extension organisations play a role in policy formation?
- How does CC policy translate into policy for research, extension, communication?
- What is the role that different international organisations play in offering support?
- What is NOT happening at national level? What gaps and vacuums exist in supporting climate change innovation?

ANNEX 4
BOLIVIA CASE-STUDY
INNOVATION SUPPORT SERVICES FOR CLIMATE CHANGE ADAPTATION

Gisela Ulloa

The existing needs and deficiencies with respect to the provision of innovation support services for adaptation to climate change in Bolivia were identified based on the following points:

1. Impacts of climate change in Bolivia
2. Evolution of research institutions and extension environments over time
3. What is happening at grassroots level?
4. What is happening at the above grassroots level?
5. What are policies at national level?

The study was carried out on the basis of expert bibliographic revision and interviews with key actors related to innovation systems and their relationship with adaptation and mitigation of climate change.

1. Impacts of climate change in Bolivia

In the Altiplano region of Bolivia, climate change is provoking the melting of the Andean glaciers, together with an increased concentration of precipitation, more storms, more hailstorms and an extended dry season, causing as a result a lack of water availability for human and agricultural consumption and problems in energy generation, due to the reliance on hydroelectricity in the Andean region. In the valleys, similar problems occur as well as an increased risk of landslides, erosion and desertification of soils and loss of biodiversity.

In the Chaco region, climate change is causing a decrease in the rainy period and more intense hot periods in summer, causing recurring, intense droughts as well as reduced river flows. As a result, the main impact in this region again is the lack of water, causing erosion and desertification of soils, competition for water use and greater pollution of water sources.

On the contrary, in the Amazon plains, in summer the quantity of water is greater increased by extreme climatic events, provoking frequent floods, which cause the loss of infrastructure, biodiversity and crops, as well as an increase in plagues and water-related infectious diseases, while in winter severe droughts are experienced.

<i>Water Supply</i>	<i>Glacial Retreat</i>
According to the PRAA (2008) the populations of the cities of La Paz and El Alto are supplied drinking water from water resources which receive contributions from the Tuni-Condoriri, West Huayna Potosi and Milluni basins, the resources of which originate mainly from the contributions of glaciers in winter. The surface area losses of the glaciers in the Tuni-Condoriri system are 55.4%, in the Zongo system 43.7%, and in the Milluni system 68.4% between 1984 and 2004.	As Vuille and Bradley (2003) showed, the temperature in the Andean tropical mountain range has increased between 0.10 and 0.11 degrees/decade since 1939 and the pace of warming has increased in the last 25 years (0.32 – 0.34 degrees/decade). In mountain ranges extensively covered in glaciers, like the Royal Mountain Range of Bolivia, the total surface area of the glaciers has reduced around 20%.

2. Evolution of research institutions and extension environments over time

Agricultural knowledge and the information system in Bolivia have experienced a specific discontinuous evolutionary process. Different institutional research and extension models have been tried, without successful results (Chiara, 2009).

The following table summarizes the evolution of extension services in the Bolivian Agricultural Information and Knowledge System, the ideologies and the changing patterns of rural development:

Rural Development Models	Extension models and advisory services
<p>1. <i>Nation State Model (1953-1985)</i> Crop diversification in order to substitute imports and assignation of lands to small rural producers.</p>	<p>a. <i>Classic extension models and advisory services (1950)</i> • Inter-American Agriculture Service (SAI)</p> <p>b. <i>Conventional Institutional Model (1975)</i> Led by the Bolivian Agricultural Technology Institute (IBTA) and the Tropical Agriculture Investigation Centre (CIAT)</p>
<p>2. <i>Neoliberal Model (1986-2005)</i> Privatization of public companies, support to the private sector, promotion of agribusiness for exportation.</p>	<p>a. <i>Focus on Technology by the World Bank(1990)</i> Promotion of research and entrepreneurial spirit amongst farmers.</p> <p>b. <i>Intermediary User Model by the CIAT (1990)</i> Information flows established between centers of research and producers.</p> <p>c. <i>Privatization of extension (2000).</i> Creation of the Bolivian Agricultural Technology System (SIBTA).</p>
<p>3. <i>Rural Revolution Model (current)</i> Diversification of the rural economy, planning and execution of centralized development, with emphasis on small producers, communities and indigenous people, and the direct transfer of funds to community organizations.</p>	<p>a. <i>Universal and free of charge extension and public advisory services (2009)</i> The National Agricultural and Forestry Innovation Institute (INIAF) was formed as a public system for research, technology transfer, technical advice, extension and communication for development.</p>

Source: Chiara (2009)

In the evolution of these institutional systems, climate change was not considered and only recently the INIAF has begun to consider it in its strategic planning framework.

The evolution over time of the research institutes is detailed below:

IBTA: Conventional model (State institute). The activities of the SAI ended in the 1960s due to budget limitations and the service was replaced in 1975 by the IBTA, in which the Bolivian state committed to provide extension and research services for the whole country except for the lowlands region in Santa Cruz, given that this region was the subject of independent agricultural research, carried out by the CIAT. (Chiara, 2009)

IBTA consolidated the traditional approach of vertical knowledge generation and technology transfer, based on the assumption that researchers would pass on their results to extension agents, who would then disseminate the results to farmers. The separation between research

and extension units responded to conventional models of existing national agricultural research systems in Latin America. As a result, the work methods were similar to those applied at the time of SAI: activities were mainly carried out by young researchers and agricultural extension agents situated in strategic areas. (Bojanic, quoted by Chiara, 2001)

The main weaknesses of the systems were the centralism and the strong government control, the attempt to impose a single extensive agricultural model for all (consistent with the Green Revolution) in diverse productive areas of Bolivia, the lack of participation of farmers and the low value given to traditional indigenous knowledge. (Chiara, 2009)

In the 1980s, political and budgetary pressures obliged both the IBTA and the CIAT to reduce their funds and reduce the number of extension agents, leaving the Santa Cruz region with no public extension services from 1987. (Thiele et al., 1998)

SIBTA: Privatized extension model driven by demand. In the year 2000, the SIBTA was created, operating via the Agricultural Technology for Development Fund (FDTA), in the main agro-ecological regions of the country. The project profiles proposed by farmers were standardized by foundations, and developed by both the public and private sectors. Service providers played an important role, and a significant relationship was achieved between the demand for agricultural technology (from the farmers' associations) and the supply (from private service providers). (Chiara, 2009)

According to the neoliberal model of the Bolivian governments, SIBTA was designed to include broad participation of the private sector, in order to encourage market-oriented agricultural innovation driven by demand: around 70% of SIBTA members were private entities, such as farmers' cooperatives and producers' organizations, while 30% were public institutions. (Jansen, 2006)

The structural and methodological limitations of the system were linked to the privatization of knowledge, most clearly demonstrated by subsistence agriculture: small scale farmers with little or no market orientation were excluded by their low financial capacity, lack of education and the high levels of technology required. With respect to methodology, there was a significant weakness in the top-down approach: the methodological approach required was focused on investing in acquiring technologies from other countries, instead of developing them locally, which reflected the lack of interaction between research centers and universities – they focused on transferring the complete package to producers, considering them passive receptors. (Chiara, 2009)

On the other hand, the SIBTA tendering process and its structure based on the externalization of independent functions, together with the increase in bureaucratic and transaction costs ended up hindering the efficiency of the system, mainly due to the dispersion of administrative efforts. (C. del sistema, Ayala 10, quoted by Chiara, 2009)

These limitations, together with the change of political strategy and the priorities approved by the government of Evo Morales, led to the disapproval of the management of the system and its substitution with a new institution: the INIAF.

INIAF: Decentralized public rural innovation model. According to the Supreme Decree No. 29611 of June 2009, the INIAF was created with the purpose of strengthening strategic public institutions and increasing and improving productivity in agriculture, cattle breeding

and forestry. Despite being a government institute, only a small part of the financial resources are public, while the rest are mainly related to international aid programs and integrated by internal funds. (Chiara, 2009)

Based on the principles of participative innovation – intercultural dialogue, knowledge, exchange and synergy – the vision of INIAF is to create effective links between these principles and become the main institution in the agricultural innovation system at national and local level. Therefore, its mission is to contribute to food security and national sovereignty, as well as to integrated sustainable rural development, through research and innovation, the recovery of indigenous and traditional knowledge and the incorporation of vegetable genetic resources for national wealth. (INIAF, 2009)

The institute has the mandate to coordinate and negotiate actions between all agents of the SAI, in order to provide applied, fundamental research, “free and universal” technology transfer and technical advice, through the coordination of rural extension, information, awareness raising and Communication for Development (ComDev) mechanisms. (MDRAyMA¹, 2007)

In contrast with previous experiences of privatization and liberalization of the market, INIAF works from a social policy, reaffirming the centrality of the State through the participation of the population and bringing back the idea of free, public extension and advisory services, which implies that rural information is a public good, which must be available in benefit to all individual farmers.

	IBTA (1975 – 1997)	SIBTA (2000 – 2007)	INIAF (2009)
Mission	Adaptation and technology transfer Technical assistance Increase productivity.	Innovation technology transfer Increase competitiveness	Development in rural areas based on innovation Ensure national food security and sovereignty.
Institutional structure	Centralized public institution	Decentralized private institution	Decentralized public institution
Methodology	Top down research	Technology transfer, (PITAs ²)	Participative model
Beneficiaries	Traders and farmers with high production levels.	Producers and actors involved in the highest potential link in the market chain.	Small and medium scale producers, subsistence producers and marginalized farmers.

Fuente: Chiara (2009)

Links between research, extension and communication

Communication services are fundamentally important in the facilitation of forming networks, social learning and conflict management, in a diverse rural context, where coordinated action and negotiation are the focus of sustainable development. (Chiara, 2009)

Communication within the INIAF represents a tool in rural innovation and is defined as “strategic” and “fundamental”; within its national institutional flowchart, the Communication for Development (ComDev) methodology is a sub-unit of the Information and Technical

¹ Ministry of Rural Development, Water and Environment

² Applied Technology and Innovation Plans

Assistance Division, which is responsible for planning communication as a transversal strategy. At regional level, the importance of ComDev is focused on building networks and conflict management. (Communication for Sustainable Development Initiative, 2009)

The importance of public and private actors

In Bolivia, 60% of the national budget originates from bilateral and multilateral aid, such that most implementation is done with aid resources via public projects; there are few private entities in the area of agricultural extension and innovation. The implementation of a new vision was begun but so far no concrete results have been seen; bilateral aid projects continue to lead in the sector.

With respect to climate change, it is the private sector and bilateral aid projects that are carrying out the most significant interventions in research and in application of adaptation measures, e.g. “camellones” (systems of canals and raised beds) as a more efficient agricultural technology, Tarwi (a type of bean found in the Andes) as a product adapted to new climatic conditions³ and bioindicators to determine the conditions of water sources⁴. The presence of extension activities in the field of adaptation is still limited, however there are entities with some experience, and a number of activities have been implemented in the field of food security and water resources which incorporate elements of adaptation to climate change.

3. What is happening at the grassroots level?

The focus of adaptation is changing, fundamentally due to the availability of financing for this issue, such as the Pilot Program for Climate Resilience (PPCR) of the World Bank and mitigation initiatives such as the reduction of deforestation and degradation of forests. However, the process is slow and the most common entry points continue to be water resources and agriculture, given that these are the areas which suffer the greatest number of problems. Most of the adaptation seen so far has been in the form of spontaneous reaction, in order to alleviate the impact, however the interventions do not represent the construction of a structural response. It is clear that there is no leadership at the level of the head institutions of the sector, and that the (technically) responsible entity does not have the technical abilities to take forward the process of “sectorialization” of policies.

In the short time that the INIAF has been operating, it has still not been possible to adequately integrate the necessary technical base to transversally incorporate the issue of climate change into its operations. It is necessary to develop capacities and qualified personnel additional to the current personnel, in both the national office and the regional offices, but especially in the latter.

The issue of climate change was initially dealt with by the Development Planning Ministry (MDP), which enabled the incursion of the issue into other ministries and relevant sectors, consistent with the National Development Plan (PND). However, since 2009, the issue has been confined to the then Ministry of Water and now Ministry of Environment and Water, which reduces the potential for political incidence in other sectors.

³ Small donations of the PNUD

⁴ Fundación Natura (Valles Crucenos)

A positive element has been the recent transfer of the forestry sector into the Ministry of Environment and Water, integrating at least water and forests into the same entity that manages the issue of climate change. However, the issue of agriculture, rural development and lands remains in a different ministry, the Ministry of Rural Development and Lands, which requires strong coordination mechanisms in order to operate adequately. Climate change coordination efforts have been carried out through the management of the PPCR and due to the creation of new legal frameworks in the issues of forestry and environment. However, the level of integration between the different sectors of the country is low, and there is no evident articulation of institutions which fulfill an important function in rural development and climate change; there are no formal mechanisms for coordination or articulation.

Strategies for supporting social learning

The FAO and the World Bank adopted the concept of AKIS⁵ for Rural Development (AKIS/RD) as an instrument for creating links between people and institutions to promote mutual learning and generate, share and use technology related to agriculture, knowledge and information. The dynamic of AKIS is developed and applied within a framework more widely known as AIS⁶, which covers actors, practices, activities, etc. that constitute innovation processes, learning cycles, networks, structures and rules that orientate actions and relations at national or sectorial level. (Marzia Pafumi, 2009)

In this context, the FAO created a method called Communication for Development (ComDev), focused on Latin America, which consists of an education methodology, based on interventions of farmers, with the aim of collecting their knowledge and experiences and integrating them into modern scientific knowledge. This approach implies planned and systematized used of communication, through inter-personal, audiovisual channels and both traditional and conventional means of communication, in order to encourage consistent participation and collective decision-making. (Marzia Pafumi, 2009)

In Bolivia, the FAO is currently carrying out a new initiative in communication for rural innovation and development, through a component of its global program called Communication for Sustainable Development Initiative (ICDE), the objective of which is to develop and execute plans, strategies and services in communication for development, as well as to strengthen the capacities of ComDev within the INIAF. In this context the Communication for Development Unit was created, with the purpose of integrating all the activities within a national system of communication for rural development, based on action research, participation mechanisms and constructive dialogue. (Marzia Pafumi, 2009)

Now in the second year of execution of the ICDE, results are being achieved in the positioning of ComDev within rural knowledge (pilot projects in Yacuiba and Yapacaní). Also, within the ComDev methodology and based on a virtual consultation between indigenous organizations, the Indigenous Peoples' Communication Platform was created, with the purpose of covering issues related to ComDev, climate change and natural resource management (see www.plataformaindigena.org).

Projects related to ComDev exist in various parts of the country, focused on: supporting the Integrated Natural Resource Management System in the Cochabamba Tropics and the Yungas (Proyecto Jatun Sach'a) and creating capacities and strengthening processes of ComDev

⁵ Agricultural Communication and Information System

⁶ Agricultural Information System

(Project FIT “To win, you have to know how to negotiate”); amongst other experiences are the Yasserekomo Study (2004), developed with guaraní indigenous communicators, the studies of Paredes (2003) and Troilo (2003), focused on technological innovation, food security and Information and Communication Systems for Rural Development.

Gaps at grassroots level in supporting climate change innovation

There are considerations which are not being taken into account, and that reflect the competency differences between users and producers of technology, which can make innovation processes unsatisfactory and cause slow uptake. Within the framework of wider innovation, it is necessary to define and evaluate knowledge networks, information flows, interactions between interested parties and critical points and both national and local levels.

A strategy of technical capacity development is necessary in support institutions, in order to be able to adequately fulfill the demands of the communities associated with climatic impacts, but above all to be able to create measures to reduce vulnerability and increase the resilience of local productive systems.

It is also necessary to a) systematize existing successful experiences in rural areas and create a communication and information transfer scheme appropriate to local realities; and b) systematize the impacts associated with climate change including information from grassroots levels in order to correlate it with existing scientific information, to enable the refinement of the adaptation strategies which are being considered at national level.

4. What is happening at the above grassroots level?

The climate change adaptation projects that are being carried out are: a) the Project Bol 60130 PNUD (2009-2010), oriented towards strengthening national capacities through the systematization and management of knowledge and the dissemination of information about climate change in Bolivia, which puts emphasis on achieving an installed capacity in the country for the creation of climate change scenarios for the development of adaptation measures; b) The Friends of Nature Foundation (FAN), through its Climate Change Adaptation Unit, is developing and promoting climate change adaptation strategies, guaranteeing food security, biodiversity conservation and the stability of the water cycle of the country, through the following projects: establishment of climate change adaptation alliances at local and regional level and the Departmental Climate Change Adaptation Program. (FAN, 2009)

The Regional Climate Change Adaptation Project (PRAA) of the National Climate Change Program (PNCC), supported by the Ministry of Development Planning and the Global Environment Fund (2006-2009), is oriented towards supporting efforts of the Andean countries in the implementation of programs and pilot measures of adaptation to climate change impacts in the high Andes and their river basins, and dealing with sector-specific problems caused by climate change impacts on glaciers and the consequent repercussions on the water cycle, high mountain ecosystems, the water supply and energy generation. (REDESMA, 2009)

In order to improve and broaden the options available to farmers, there is a desire to plan, through the law, the creation of Agricultural Insurance, which would demand the creation of

policies and instruments which enable the sector to have adequate infrastructure and risk reduction in production. Agricultural Insurance is considered a tool which aims to improve competitiveness, achieve stability in the incomes of producers and avoid their decapitalization. (Inter-American Cooperation for Agriculture Institute, 2007)

5. What are policies at national level?

Within the framework of climate change adaptation policies, the PND, through the strategic sector “Environmental Resources”, refers to the policy: Environmental and Risk Management “Balance between development needs and conserving the environment”. The National Climate Change Adaptation Mechanism (MNACC) essentially responds to the PND as a long term strategy oriented towards reducing vulnerability to climate change, promoting adaptation planned in the framework of different sectorial programs and reducing risks due to climate change impacts. The MNACC is also perceived within the PND as a tool for the formulation of a structural response to climate change through adaptation.

The structure of the MNACC includes five sectorial programs: a) Adaptation of water resources to climate change; b) Adaptation of food security and sovereignty to climate change; c) Sanitary adaptation to climate change; d) Adaptation of human settlements and risk management; and e) Adaptation of ecosystems to climate change. These programs are accompanied by three transversal programs: a) scientific research; b) education, dissemination, training; and c) anthropologic aspects and ancestral knowledge.

With respect to policy formulation, the INIAF organizes its structural function through the SBI and is constituted as the National Agricultural and Forestry Innovation System (SNIAS), which has two fundamental elements: the innovative process and the political-institutional process, which facilitate articulation between technical aspects, policies and the institutional framework of Bolivia.

In this way, the Directive Entity of the SNIAS represents the regulatory entity, which guarantees the agreement of the actions of the INIAF with respect to State policies and Development Plans. Similarly, it defines policies for the achievement of its strategic plans. The presidency is assumed by the Ministry of Rural Development and Lands. (MDRT, 2009)

The support role that international organizations such as the PPCR of the World Bank play is fundamental given that they aim towards the multisectorial integration of climatic risks in development and planning policies. The objectives of the PPCR are aligned with the framework of the MNACC and represent a unique opportunity to strengthen adaptation efforts in Bolivia, which will enable the use of funds in a coherent way, directing them towards investment for climate change adaptation.

Amongst the international organizations which play an important role in the consolidation of the INIAF are: the FAO, which is supporting the strengthening of the Area of ComDev, within the Financial Strategy of the Plan for the Transition of the Germplasm Bank to the INIAF; it has a common fund formed by DANIDA, Holland and COSUDE, through an agreement between the donors. After this common fund, the incorporation of funds from the World Bank is planned under new conditions of the established strategic plan. Also, other international organizations will be turned to in order to strengthen the common fund (Accompanying Committee for the Strengthening of the INIAF). (INIAF, 2009)

In general terms, the support role played by the different international organizations is the creation of financial funds oriented towards the consolidation of the processes that are being carried out within the INIAF.

However, there are gaps at the national level, in terms of supporting innovation with respect to climate change, e.g. mechanisms for early evaluation of climate change impacts are not being created in the technology innovation projects; there are no rigorous baselines which enable the comparison of the advances achieved by the processes implemented; nor are there minimum conditions of institutional stability to guarantee monitoring of processes in the medium or long term; tools for monitoring and evaluation of climate change impacts are not being incorporated in the agricultural sector; the administrative pressure on budgetary execution sometimes distorts the identification of demands and the interaction between suppliers and demanders of research services and technical assistance; the lack of articulated multidisciplinary strategies with institutions related to development and climate change, amongst others. A fruitful relationship between research and policy formulation should ensure that research offers scientific inputs to decision makers, and should define the research agenda on the basis of national development priorities related to climate change. (Montaño et al., 2007)

Other Aspects

Within the World People's Summit on Climate Change which took place in April this year in Cochabamba, the conclusions of the working group "Agriculture and Food Security" were: the need to promote and ensure the financing of policies and public, participative, social control mechanisms for agricultural production systems in order to avoid damaging the Mother Earth, which must include research, extension and public investment to eliminate the use of agricultural inputs based on petrochemicals, improve the organic content of soils, reduce post-harvest losses, strengthen local markets, promote urban agriculture, protect the sources and bodies of water and support native indigenous peasant agriculture and food sovereignty.

The group also ratified the defense, revalorization and dissemination of the sustainable model of indigenous/native peasant agricultural production, and other models and ecological ancestral practices which contribute to solving the problem of climate change and ensure food sovereignty.

5. Conclusions

Due to the fact that the INIAF has not been functioning for long, what has been achieved so far is not entirely coherent with its vision for reasons associated with its inheritance from previous institutions with different approaches which currently affect the AKIS. Amongst these reasons, the following stand out: the lack of work with an interdisciplinary approach, the lack of mechanisms to achieve good communication of research results, the absence of synergies and coordination between the public, productive, research and innovation sectors and extension providers, the low levels of investment in human resources education and training, and the persistence of the legacy of the conventional model orientated towards the

market and technology transfer. However, there is also an increasing awareness of the need for more participative and inclusive approaches.

In this context, the incorporation of the ComDev approach in the agenda of government, institutions, organizations and development entities is important, mainly with the purpose of promoting communication and information actions which take into account the culture and identity of indigenous peoples, in order to incentivize the formation of their own organizations and to be able to ensure and guarantee their participation in the formulation of communication policies and programs which are aligned with their strategies and needs.

Within the institutional framework of the national AIS, in which the INIAF is found, it appears that a centralized innovation model is followed, in spite of its mandate, given that the need for coordination and feedback by the rest of the actors involved in the AKIS still persists. This makes increased local autonomy necessary, mainly with respect to financial management and the approval of operative plans. (Communication for Sustainable Development Initiative, 2009)

With respect to climate change in rural development and technological innovation, there is a lack of a national database and mapping of actors and organizations interested in these issues. Considering this, there is an evident need for greater investment in the planning of communication activities as a key way of positioning and consolidating the INIAF as a coordinating entity. There is also a need to strengthen the INIAF as a technical organization with the aim of neutralizing the political bias and improving inter-institutional relations, above all in regions with strong social and political conflict.

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ANNEX 5
GHANA CASE-STUDY
INNOVATION SUPPORT SERVICES FOR CLIMATE CHANGE ADAPTATION

Samuel Adjei-Nsiah and Emanuel Dormon

The Term of Reference Required the Consultants to identify needs and gaps existing in actual practice with regards to the provision of innovation support services for climate change adaptation in Ghana.

Key questions arising from the TOR are:

1. How have knowledge institutions evolved over time?
2. What is happening at the grass root level?
3. What is happening at the above grass root level?
4. What are policies at the National Level?

The team met once and also communicated through e-mail on regular basis to plan and discuss the work. The study was mainly a desk study but key informants working on climate change related activities including the National Focal Person on Climate change were contacted.

1. Expected impact of climate change in Ghana

Expected impacts of climate change as identified in the National Communication to the United Nation Framework Convention on Climate Change (UNFCCC) focus on three resource sectors namely water, coastal and agriculture (EPA, 2007). Historical data observed by the Ghana Meteorological Agency across the country from the year 1960-2000, (a forty year period), shows a progressive and discernible rise in temperature and a concomitant decrease in rainfall in all agro-ecological zones in the country. Future climate change scenarios developed, based on the forty-year observed data, also indicate that temperature will continue to rise on average of about 0.6°C, 2.0°C and 3.9°C by the year 2020, 2050 and 2080 respectively, in all agro-ecological zones in Ghana. Rainfall is also predicted to decrease on average by 2.8%, 10.9% and 18.6% by 2020, 2050 and 2080 respectively in all agro-ecological zones.

Scenarios of sea level changes with respect to 1990 mean predicts an average rise of 5.8 cm, 16.5 cm and 34.5 cm by 2020, 2050 and 2080 respectively. Already, at the current sea level, the east coast of Ghana, in particular the Keta area, is experiencing an annual coastal erosion rate of 3 metres. It is estimated that if nothing is done to protect the east coast, a total of about 1100 km² of land along the east coast will be lost by the year 2020.

With the rising increase in temperature and concomitant decrease in rainfall, agriculture is seriously going to be affected. It is projected that if the present trends continue, the yield of maize will be decrease by 6.9% by the year 2020. Other crops of national importance that will be affected by climate change include root and tuber crops and cocoa (Agyeman Bonsu et al., 2008).

Climate change is actually not a new phenomenon. It has been with us for a while. It only attracted worldwide publicity with recent awareness creation of its adverse consequences on the environment. Farmers in Africa and Ghana in particular have for a very long time been

developing strategies to cope with its adverse effects (see Mapfumo et al., 2008; Gyampoh et al., 2008).

2. Evolution of knowledge institutions

Evolution of extension services

The delivery of agricultural extension services in Ghana was started in the nineteenth century by the missionaries and some foreign companies involved in the production and export of cash crops like cocoa, coffee and rubber (MoFA, 2005). Over the years, the extension service in Ghana has been dominated by the government with pockets of private providers who focus mainly on high value commercial crops like pineapple, oil palm and rubber. Although the extension system has gone through many phases, it shows little signs of transformation and remains largely a transfer of technology model.

In the last decade, the Ministry of Food and Agriculture (MoFA) has been considering mechanisms to privatise the extension services, at least partially. However, the furthest this has gone is a one year pilot that was implemented in 2006. In this pilot, the principle that was explored was for government to pay private service providers to deliver extension services as a public good. Experience from the pilot showed that private service providers were more effective but generally cost more than twice the under-funded public sector.

A number of different approaches have been tried in the last two decades: training and visit (T&V) in the 90s, participatory approaches like farmer field schools (FFS) also from the 90s and still ongoing and participatory technology development and extension (PTD&E). Most extension programs are donor funded and therefore approaches that are adopted are largely influenced by the donor's interest

Evolution of agricultural research system

The structure of research institutions and their organisation has remained very much the same over the years with researchers setting their own agenda without always ensuring that the clientele's interest is adequately catered for. Like the extension service, research is managed and financed almost exclusively by government directly or through donor funded projects. With the exception of the Cocoa Research Institute of Ghana (CRIG) which is under the Ghana Cocoa Board, all other research institutions belong to the Ministry of Environment and Science (MES) and therefore operate quite separately from the Ministry of Food and Agriculture. Both private and public Universities also carry out research with funding from both the government and donors.

Media landscape

In Ghana, there is a vibrant media controlled mainly by private operators with government providing mainly regulatory functions. Frequency Modulated (FM) stations can be found in every regional capital and many district capitals as well with coverage reaching most rural communities. Some attempts have been made to use this media resource to disseminate agricultural information. However this is limited to mostly donor-funded project areas. A few private companies, mainly agricultural input companies, sponsor prime time adverts promoting the use of their products and passing on some good agricultural practices along with the promotion. Where the public extension system has tried to tap into this resource through the stations' corporate social responsibility arrangements, slots made available, in most cases, do not attract wide listenership because they are non-prime periods. To have a program aired at prime time will be too expensive for the public sector extension system to

afford. The situation described has limited the impact of the media in disseminating agricultural information.

For newsprint, there are few agricultural related publications but these are irregular and are not marketed in any organised way, therefore their reach is limited to persons who have close contacts with the organisations that publish them. Again the impact is minimal on the majority of both agricultural professionals, farmers and other stakeholders.

Research-extension-communication linkage

Most agricultural projects have research components and hence their planning and implementation is done in collaboration with research. The last two major agricultural projects, the National Agricultural Extension Project (NAEP) implemented from 1992 to 1999 and the Agricultural Services Sub-sector Investment Project (AgSSIP) implemented from 2001 until 2007 linked research, extension and farmers through the Research, Extension Liaison Committees (RELCs). These committees functioned quite effectively during project implementation and farmers were able to bring their needs directly to researchers. However, these links always broke down as soon as the projects ended because of funding issues.

Importance of public and private players in extension

Extension is generally treated as a public good and financed by the government. In a few exceptional cases like pineapple, rubber and oil palm where out-grower schemes have developed, farmers pay indirectly for the extension services through service charges for the technical assistance they receive from the plantation estates. However, the total coverage of private extension is no more than 10-15% of the total number of farmers receiving extension services (MoFA, 2006).

3. Climate change activities at the grassroots level.

At the grass root level a lot of emphasis has been placed on adaptation with Natural Resources Management and Agriculture as entry points although few projects have health as the entry point. About five climate change related projects are currently on-going in various parts of the country at the grass root level. These include Sustainable Land Management for Mitigating Land Degradation, Enhancing Agricultural Biodiversity and Reducing Poverty (SLAM) (Gyasi, 2008); Climate Change Learning and Observatory Network (CCLONG) (<http://www.epa.gov.gh>); Anticipatory Learning for Climate Change Adaptation and Resilience (ALCCAR) (<http://www.geog.psu.edu>); Lack of Resilience in African Smallholder Agriculture: Exploring Measures to Enhance the Adaptive Capacity of Farmers (Mapfumo *et al.*, 2008) and Advancing capacity to support climate change adaptation (ACCCA) project (Unitar, 2008).

With the exception of the “Lack of Resilience in African Smallholder Agriculture: Exploring measures to enhance the Adaptive Capacity of Farmers” project which is being coordinated by the Soil Research Institute of Ghana, the activities of all the projects are carried out under the supervision of Ghana’s Environmental Protection Agency (EPA). Some of these projects build on existing initiatives and the networks around these and use Participatory Action Research to build the capacity of smallholder farmers to be able to make flexible decisions in the face of uncertainties (e.g. see Mapfumo, 2008). Some of these projects also use drama and role play to explore and exchange stakeholders’ perspectives (e.g. see Unitar, 2008).

These projects -which actually focus on agriculture- create awareness among stakeholders, particularly among farmers of the adverse impacts of climate change on livelihoods. Some

projects also do technical training while others such as “lack of resilience in African smallholder farming: Exploring measures to pressures of climate change” facilitate resource constrained farmers to manage their production resources, particularly soils through collective action to increase their resilience to climate change and variability. Very little attention is however paid to social-organizational change such as marketing, land tenure and labour.

The level of integration between different sectors (agriculture, NRM, water, forestry, health, disaster, rural development) is low. Even within one sector very little coordination exists among departments and agencies. For instance within the Ministry of Land and Natural Resources, coordination between the Forestry Commission and Land Commission has been found to be weak (Gyasi *et al.*, 2008).

Friends of the Earth-Ghana (FoE), an environmental NGO organises workshops and working sessions for rural communities in coastal areas as well as desert-prone inland areas, to encourage exchanges on adaptation and coping strategies (FoE, 2007). They also use leaflets and other materials to raise awareness in communities about climate change. This and other related work allowed FoE Ghana to build up a network of community development organisations (CDOs) and civil society organisations (CSOs), as well as NGOs, rural community groups, women’s groups, churches, mosques, youth groups, and traditional leaders. For example, a workshop and field work on control of desertification allowed FoE Ghana to make links with civil society groups in three northern regions. This network built up the capacity of these stakeholders to share ideas, techniques and strategies for reducing their vulnerability to environmental change, and adapting to unavoidable impacts.

Climate change awareness creation is done mainly through the mass media with about 34% getting climate change information through the radio (Dontwi *et al.*, 2008). In Ghana, most districts and all the regional capitals have Frequency Modulated (FM) stations which are used to create climate change awareness among the populace.

Gaps and vacuums at the grassroots levels

Research and Extension still see themselves as technology generators and disseminators. No new roles are being played by Research and Extension. Most of the Climate change related projects are donor driven, financed largely through bilateral and multilateral arrangements and supervised by EPA with very little role being played by Agricultural Research and Extension. The strategies that are being used by most of these donor-funded projects are not being mainstreamed into the national agricultural extension systems. Besides organizations such as Friends of the Earth and the Ghana Wild Life Society, no other actors are taking on any new role directly related to climate change. With regard to extension, almost every project being implemented by various organizations have adopted the value chain approach as the new way to innovate. The value chain approach is very much another way of looking at agriculture as a system which is composed of many sub-systems like input supply, production, processing, right up to consumption and with support services like research, extension, financial services, policy framework etc. The Ministry of Food and Agriculture has also officially adopted the value chain approach as new way to do business. However, many of the organizations are talking more about the approach without necessarily implementing it innovatively. There are links between a value chain approach and innovation system thinking. However, inadequate operationalization of innovation systems thinking at the field level leaves the value chain approach with a relatively weak theoretical underpinning.

4. Climate change activities at the above grassroots level

Several climate change project activities are being carried out at the above grass root level. These include; The Netherlands Climate Assistance Programme (NCAP) which focused on climate change impacts, vulnerability and adaptation assessment in Ghana on water resources, human health, land management and agriculture (Agyeman Bonsu *et al.*, 2008); United Nation Development Programme (UNDP)/Global Environment Facility (GEF) funded climate change enabling activities projects which focused on preparation of Ghana's Initial National Communication (MEST, 2001) and climate change Technology Needs and Assessment (MEST, 2003) and the World Bank sponsored 'Reducing Emissions from Deforestation and Degradation' (REDD) project (Bamfo, 2008). Several other donor funded climate change activities are on-going at the health sector (GEF, 2009) and they include the following;

- UNDP/GEF: Integrating Climate Change into the management of Priority Health Risk in Ghana;
- World Bank/GFDRR: Support for development and implementation of a Country Disaster Risk Management Plan
- UNDP Ghana: Mainstreaming DRR and CCA mainly for capacity building
- UNDP BCPR: Recovery Program for Northern Ghana
- UNDP GEF: Impacts of Climate Change on Health
- UNDP UNEP: CC-DARE to help finalize preparations of the National Climate Change Adaptation strategies
- UNDP Africa Adaptation Program (AAP): support for CRM/CCA
- CB2: Targeting coordination of environmental conventions

Most of these projects are donor driven, with financial support from development partners mainly Dutch and Danish governments and UNDP. These projects are largely policy based often aimed at satisfying some of Ghana commitments to international obligations (i.e. United Nation Framework on climate change (UNFCCC) and Inter-Governmental Panel on Climate Change (IPCC). The Netherlands Climate Change Assistance Programme (NCAP), for example, conducts studies on the impacts of climate change on different sectors of the economy such as Agriculture, Fisheries, Health and Coastal zone management. Other programmes develop and implement strategies for reducing Green House Gas emissions such as reduction of emissions from energy and enhancement of sink capacity through forest protection and regeneration. Other activities of these programmes include dissemination of reports-including holding of national stakeholders' forum, radio and TV discussions and development of policy advice brochures, mainstreaming climate change into national development processes. The rest include consultation and development of national adaptation strategies, training of national experts to conduct research into climate change, sensitization of policy makers on issues of climate change, preparation of national adaptation programme of action, preparation of technology needs assessment to enable Ghana to fulfill her commitments under UNFCCC and also to demonstrate Ghana's preparedness to join efforts with the global community in addressing the ever increasing threat of climate change.

As a signatory to the UNFCCC Ghana government has taken measures towards meeting the UNFCCC objectives (Gyasi *et al.*, 2008). These include the following:

- The preparation of an agenda to phase out the use of ozone depleting substances
- The establishment of a National Climate Change Committee to conduct studies into climate change

- The Biomass Energy Project to develop a national wood-fuel policy to, among other things regulate production and use of wood-fuel policy to among other things regulate production and use of wood-fuel
- A solar energy program to promote solar energy use
- A national LPG program to promote the use of LPG as a substitute for charcoal and firewood
- Tax exemptions for importation of technologies that minimize ozone depletion.

Friends of the Earth-Ghana has been playing advocacy role for a legislation to implement the Montreal protocol to phase out the use of ozone depleting substances.

At the above grass root level, the only programme focused on agriculture is vulnerability assessment of the impact of climate change on agriculture with particular reference to cereals, root and tubers and cocoa. As at now no comprehensive programmes have been put in place to strengthen the adaptive capacities of farmers to adapt to climate change and climate change is not yet streamlined in the national agricultural research and extension system.

Existing Gaps at the above grassroots level

At the above grass root level, very little support is offered to agricultural research and extension to play a major role in adaptation. No effort is being made to make others adapt with farmers. No institutional changes are taking place to change framework conditions for farmers. No new networks are being built at above the grass root level. At the above grass root level Agricultural Research and Extension are playing no new roles. No other organization is currently taking up these new roles. Thus there is a vacuum.

5. Climate change adaptation policies at national level

Until now, Ghana does not yet come out with a clear policy on climate change. There is still an ongoing process to prepare a national climate change adaptation and mitigation strategies as part of the development of a national climate change policy. The environmental protection agency (EPA) is the institution that hosts the national focal point on climate change issues and has carried out numerous environmental impact assessment studies and proposed mitigation actions to minimise degradation.

Research and Extensions play a role in policy formulation but do not make a decision. Crucial and final decisions rest with policy makers (who in this case are politicians). However, Research and Extension organizations may influence policies through lobbying, negotiations and sensitization through the use of policy briefs, newspaper articles and policy seminars. Extension and Research can lobby policy makers to formulate and implement policies that will favour farmers or in the case of climate change, policies that will enhance farmers' capacities to adapt to the changes and also to minimise the impact of their farming practices on climate change.

An important factor in adaptation development is availability of funds. International organizations have been assisting in supporting adaptation programs by providing funds for capacity development of national staff involved in climate change activities and also supporting research (Agyeman Bonsu, 2008).

6. Gaps in supporting climate change innovation

The overall picture that emerges from this study is that there are serious gaps in supporting climate change innovation:

- Climate change is not mainstreamed in the activities of National Research and Extension Organizations
- Climate change is not integrated in the national sustainable development strategies
- Absence of climate change adaptation policy.

There are agricultural policies in place and National adaptation policies are now being prepared but as at now no comprehensive policies are in place to strengthen farmers' adaptive capacities. Recently, a National Committee on Climate Change was formed and tasked to formulate National Policy on Climate Change Adaptation.

The national agricultural policy document recognises the importance of protecting the environment and also makes it mandatory to take measures to remedy any negative impacts. It is also a requirement that every project must conduct an initial environmental assessment and report to the EPA before commencement. Therefore, there are some systems in place to check, monitor and evaluate environmental changes; however, this is not yet well articulated in a single climate change policy document.

According to EPA (2007), there are many sectors of the Ghanaian economy where current policies, plans, programmes and practices do not integrate climate change, even though climate change currently represents a major source of risk for the poor. Examples include land-use policies and incentives, which force the poor to live on flood prone areas and water, agriculture and/or forestry policies which reduce the access of the poor to these resources, especially in times of climate-induced stresses.

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ANNEX 6
BANGLADESH CASE-STUDY
INNOVATION SUPPORT SERVICES FOR CLIMATE CHANGE ADAPTATION

Rasheed Sulaiman V.

1. Introduction

Bangladesh has made commendable progress in several development areas, including reducing population growth, achieving national self-sufficiency in food-grains and coping with natural disasters. However, over 40% of the country's 143 million people are poor. Furthermore, one-fifth of the population is *ultra*-poor and remains seriously underfed due to inadequate purchasing power. Agriculture contributes about 22% of Bangladesh's GDP. Another 33% of its GDP comes from the rural non-farm economy, which is largely linked to agriculture. Growth of agriculture and the rural non-farm sector is therefore critical to poverty reduction in Bangladesh. The dominant food crop of Bangladesh is rice, accounting for about 75 percent of agricultural land use. Small farms dominate the agriculture sector.

The overall objective of the Government's National Agricultural Policy (NAP, 1999) is "to make the nation self-sufficient in food through increasing production of all crops, including cereals, and ensure a dependable food security system for all". NAP emphasises that these goals could be achieved only through efficient delivery of inputs and support services. To meet the increasing demand for food, the country needs to focus its efforts on increasing productivity of crops, livestock and fisheries and promoting diversification to high value crops/commodities. The detailed strategies and actions on food security enhancement and climate change adaptation in Bangladesh are provided in two major documents of the government- the National Food Policy Plan of Action (2007-2015) and the Bangladesh Climate Change Strategy and Action Plan 2008

2. Overview of knowledge institutions

The Ministry of Agriculture (MoA) is responsible for policy formulation, planning, monitoring and administration. Eighteen agencies operate under MoA, dealing with implementation of different projects and plans. These include: the Department of Agricultural Extension (DAE) and the Bangladesh Agricultural Research Council (BARC). DAE is the largest public sector extension service provider in Bangladesh and it has large country wide network and operational staff. The largest wing of DAE is the field service wing which provides field level extension services to the farmers. The DAE focus primarily on food grains, pulses, oilseeds, fruits and vegetables. Livestock, sugarcane, tea, cotton, sericulture have their own organizations.

The Training and Visit (T&V) Approach, which was established in the late seventies, had formed the backbone of DAE's extension practices. Though the DAE introduced the Revised Extension Approach (REA) by late 90s to improve the efficiency of the T&V approach, it retained the primary elements of the T&V approach. The REA approach consists of five principles-decentralisation, targeting, responsiveness to farmer needs, the use of a range of extension methods and working with groups. As part of decentralization, the responsibilities for planning, budgeting, implementation, monitoring and evaluation of extension

programmes is given to staff at block, upzilla, district and regional levels. The upzilla is the basic unit for planning, implementing, monitoring and evaluating local extension programs. The major modes of extension method involved group extension, individual methods, use of mass media and audio-visual aids. DAE also operates few farmer field schools (FFS).

The Danish funded Agricultural Sector Programme Support (ASPS) Phase II (2007- 2012) currently under implementation address some of the issues such as capacity development of farmers and Union Parishads; promoting farmer organizations and FFS approach; and supporting Planning Commission and line ministries for institutional and policy development. The Agricultural Extension Component (AEC) under this project envisages developing improved, demand-driven, integrated and decentralized extension systems to support poor marginal and small farmer households and enhancing the capacity of the associated agricultural agencies of MoA.

Public sector actors, notably BARC (and the 10 research institutes under it) and two agricultural universities — Bangladesh Agricultural University and Bangabandhu Sheikh Mujibur Rahman Agricultural University — are the sole providers of agricultural research services. The Bangladesh Agricultural Research Council (BARC) is the apex organisation of the national agricultural research system (NARS). Its main responsibility is to strengthen national agricultural research capability through planning and integration of resources. BARC is responsible for coordinating research and fostering inter-institute collaboration, monitoring and reviewing the research programmes of NARS institutes, assisting institutes in strengthening research capacities and establishing system-wide operational policies and standard management procedures and assuring that each institute is optimally governed.

BARC has not been able to perform these roles adequately and therefore its constitution and functions are expected to be amended shortly as part of the reforms envisaged under the National Agricultural Technology Project (NATP). The project has a major policy reform agenda, which includes amendment of the BARC Act 1996; establishment of an autonomous agricultural research foundation (the *Krishi Gobeshona Foundation*) mainly to manage the competitive grant funds; the decentralisation of agricultural extension (funding, planning and services) to the *upzilla* level; supply chain development and strengthening national organisations involved in agricultural research and extension

BARC partners with most CGIAR centres and is also a member of regional organisations such as SAARC Agriculture Centre (SAC) and APAARI. The World Bank-funded Agricultural Research Management Project (ARMP) which ran between 1996-2001 helped several BARC scientists in acquiring PhD degrees. Similarly the IRRI-BRRI collaboration, which ended in the mid-1990s, also supported human resource development of the country's agricultural scientists. The Bangladesh Agricultural Research Institute (BARI) and Bangladesh Rice Research Institute (BRRI) are the two main public sector research centres. BARI, the most important agricultural research centre in Bangladesh, conducts research on a wide range of crops. BRRI focuses on all aspects of rice development. Bangladesh Agricultural University (BAU) is the main agricultural university in the country and is mainly engaged in post-graduate research and teaching. Private sector agricultural research is minimal in Bangladesh. Livestock and fisheries research have not got adequate attention, so far.

About 400 NGOs are directly involved in agricultural activities and thereby extension services. Initially NGOs were associated with the agricultural extension and small farm

management with especially small scale vegetable crops poultry, fisheries, agro-forestry/social forestry. In recent years, NGO are moving towards extension and farm advisory activities on some of the major crops like hybrid rice, maize etc. However, most of these NGOs are not involved in agricultural research. The major NGO, Bangladesh Rural Advancement Committee (BRAC), has recently initiated research programmes that deal with seed improvement. BRAC is emerging as a main supplier of seeds in Bangladesh. It is currently involved in importing seeds of hybrid rice, hybrid maize and vegetables.

The Horticultural Export Development Foundation (Hortex Foundation), established in 1993 as a not-for-profit organisation, deals with the development, promotion and marketing of exportable horticultural produces. The foundation is led by a governing body, consisted of seven members representing two from the public sector and five from private sector organisations including one NGO. It provides technical assistance to private companies and NGOs entering the market to procure, process and export horticulture crops. After 1993, the private sector was allowed entry into agriculture sector by giving permission for carrying on business of agricultural inputs and irrigation equipment. The private companies in agri-business include seed companies, fertilizer dealers, pesticide dealers and companies involved in contract farming. Besides, there are small plant nurseries run by individuals.

Radio and Television are also used for communicating farm information. The national radio channel of Bangladesh broadcast 25 minute programme on agriculture daily. Similarly in the state Television, there is a special 25 minute programme on agriculture telecasted four times a week. DAE also publishes two bimonthly magazines and it also publishes leaflets, booklets, folders, posters etc occasionally on contemporary agricultural issues. In Bangladesh private sector operators are the main providers of ICTs (mobile phones, computer and internet). The NGOs are promoting community information centres to facilitate information transmittal to rural people. BRAC and Grameenphone has set up knowledge centres in all upzillas. The Department of Agricultural Marketing (DAM) with support from FAO has been working together to make agricultural market information available. Mobiles are increasingly being used in rural areas. There are presently 122000 village cell phone women who have the potential to connect poor farmers to a market price information system (Haque, 2009).

The Centre for Policy Dialogue (CPD) and the Bangladesh Institute of Development Studies (BIDS) are two policy think tanks in Bangladesh that deal with agriculture-related issues. Both do policy research on agriculture, poverty and trade and are well connected with different stakeholders, including the government. The Bangladesh Krishok Federation (BKF) is the leading national agricultural organizations representing farmers in Bangladesh. It maintains several advocacy programmes and a number of social development programmes.

Donors, especially the World Bank, FAO, USAID, have played a very important role in building Bangladesh's research capacity. IRRI has also played a very important role in building the capacity of Bangladesh for rice research. After the end of the ARMP, donor support has declined and this has adversely affected the research capacity of BARC and its affiliated centres. Many qualified and experienced researchers left the country during the last decade in search of greener pastures.

"The Bangladesh Government's long term strategy is to transform the agricultural extension services from state domination to a partnership between government, the private sector and NGOs. And as part of this strategy the government requires support to gradually withdraw

from direct extension and to focus on regulatory, monitoring and technical back-up roles, as well as to provide an enabling environment for the private sector to develop" (ASPS, 2006).

3. Ground level situation

The lowest operating area of DAE is called block which is supervised by a block supervisor. The DAE has 12,832 extension workers and 2000 extension personnel throughout the country. This is only half of the staff strengthened envisaged during the T&V period. The block supervisors are supposed to visit each block which consists of 1000-1200 farmers. Considering the work load and lack of adequate transportation facilities, the extension workers visit farmers only on a need basis. There is not sufficient information within DAE on how many farmers are actually reached and serviced by it. "DAE offer a blanket public good service and the producers are expected to avail themselves of the services. Large scale farmers perceive DAE as generally not competent enough to provide advisory services. On the other hand, adoption of available technologies has not reached expected levels within the small holdings" (Haque, 2009).

Though several efforts were made to link research and extension services since the T&V days, the progress has been very limited (Quayyum, 2006). Unfortunately the linkage between extension and research and extension and farmers in Bangladesh over the years has been very weak (Haque, 2009). Though extension should ideally be linked to different types of organizations dealing with wider set of rural services, only its linkage with research was emphasized. But even this hasn't witnessed any improvement so far. The DAE and other extension agencies including NGOs also lack linkages with agricultural universities and colleges.

"One of the serious problems to conduct agricultural extension work in Bangladesh is the presence of several ministries who are directly involved to assist the farmers without much co-operation with the Ministry of Agriculture. The absence of functional and active participation of local government is also a big problem in the extension system of the country" (Uddin, 2008). The Government of Bangladesh has identified weak governance as one of the major bottlenecks in increasing agricultural productivity and reducing poverty (GoB, 2006).

Natural disasters and climate change

Being subjected to periodic floods and cyclones, the country has been trying to improve its ability to manage disasters better. Several donors have been supporting the Government of Bangladesh in providing relief and rebuilding livelihoods after every such natural calamity. "Over the last 35 years, Bangladesh, with the support of development partners, has invested over \$10 billion to make the country less vulnerable to natural disasters. These investments include flood management schemes, coastal polders, cyclone and flood shelters, and the raising of roads and highways above flood level. In addition, the Government of Bangladesh has developed state-of-the-art warning systems for floods, cyclones and storm surges, and is expanding community-based disaster preparedness. Climate resilient varieties of rice and other crops have also been developed" (MoEF, 2008)".

One of the recent initiatives (2005-06) by FAO and the Asian Disaster Preparedness Centre is about assessment of livelihood Adaptation to Climate Variability and Change in Drought

Prone Areas and this was implemented in close collaboration with the DAE. This was about characterization of livelihood systems and profiling of vulnerable groups and understanding local coping capacities and adaptation strategies. The approaches followed initially for this purpose are limited to the following:

Demonstrations: Monitoring the benefits of adaptation in cooperation with agricultural extension staff involving the local community, especially the farmers.

Farmer-friendly extension tools: Orientation meetings, demonstrations, rallies, and farmers' field schools being adapted to disseminate information on adaptation practices. There are also plans to adopt other extension methods in the future.

Awareness-raising strategies: Printed materials will be developed to describe the salient features of each adaptation practice selected for demonstration. Local-level training programmes will discuss the advantages of the adaptation options identified for drought-prone areas.

Though addressing issues related to climate change requires a series of technical and institutional responses at various levels, it appears that in Bangladesh it is considered more as building the capacity of farmers to adapt to climate change. Initiatives on climate change therefore focuses on awareness building (distribution of posters or leaflets and organizing discussions); identification of diversified livelihoods; and development of stress-tolerant breeding lines. Capacity building is mainly understood as training farmers and extension staff.

The Bangladesh Climate Change Strategy and Action Plan (2008) sets out six key areas of action. And this included, food security, social protection and health; disaster management, infrastructure; research and knowledge management, mitigation and low-carbon development; and capacity building and institutional strengthening (of government, civil society and private sector). To ensure food security and health, the plan calls for research to develop crop varieties that are tolerant to flooding and salinity, and to implement surveillance systems for existing and emerging diseases. It has also recommended establishment of a centre for research and knowledge management on climate change, enabling the country to have access to the latest science and technological developments. It also calls for strengthening its cyclone, storm surge and early-warning systems to enable more accurate short-, medium- and long-term forecasts. The Ministry of Environment and Forests will be the nodal organizations for implementing the Action Plan.

As discussed earlier, the response to increasing challenge on food security and climate change in Bangladesh is clearly perceived and planned as follows:

- More and better extension through the public sector (more demonstrations, media use, farmer field schools, farmer meetings)
- Development of stress tolerant crop varieties
- Strengthening infrastructure- high ways, roads and shelters
- Upgrade early warning systems (forecasting and surveillance)
- Improving the capacity of the field staff, especially at the Upzilla level to take forward climate change adaptation

As linkages are weak, different departments of the government and the NGOs are pursuing the above strategies independently without any co-ordination at the local level. Moreover the

challenges are perceived as either technological (weakness in availability of technology or its transfer) or infrastructural.

Need for a new paradigm

There has not been any debate on the need for a different paradigm to deal with these issues and therefore the other intermediation mechanisms such as network building, social learning or dealing with power and conflict issues haven't got enough attention. The major strategy adopted by the public sector is technology transfer and this is the yardstick used by the Government in evaluating their performance. The DAE therefore focuses only on farm visits and farmer trainings apart from implementation of different schemes. Climate change initiatives of the NGOs also follow a similar pattern. For instance, the climate change initiatives of "Practical Action" focus on awareness raising and community based adaptation that could provide diversified livelihoods and better infrastructure. Climate change is emerging as a priority for big NGOs such as BRAC, which has always been involved with livelihood restoration and emergency relief operations after every natural disaster. However they also view climate change as something that needs to be addressed by way of designing and implementing better adaptation strategies at the community level.

Broader perspectives outside public sector

While public sector extension has been focusing on crops and transferring technical knowledge, the NGOs in Bangladesh has displayed a more broader approach to rural development. For instance, BRAC's Economic Development Program covers microfinance, institution building, income generating activities and program support enterprises. It operates through village organizations (VOs)- an association of poor and landless with particular emphasis on women's participation. BRAC has identified six sectors in which large numbers of low-income women can be productively engaged at or near their homes: poultry, fishery, livestock, sericulture, agriculture, and agro forestry. For each of these sectors, BRAC has developed an integrated set of services, including training in improved techniques, provision of improved breeds and technologies, on-going supply of technical assistance and inputs, monitoring and problem solving as needed, and marketing of finished goods.

Grameen Foundation helps the world's poorest, especially women, improve their lives and escape poverty through access to microfinance and technology. The Grameen Krishi Foundation (GKF) provides inputs (such as irrigation, seeds and fertiliser) and services (such as agricultural extension and a credit program for agricultural activities) to farmers in return for a fixed quantity or share of the harvest. NGOs have thus been doing a much broader intermediation than the public sector line departments and agencies and hopefully there is a lot that could be learnt from some of these experiences. PROSHIKA, Rangpur-Dinajpur Rural Services (RDRS), CARE-Bangladesh are some of the other important NGOs in Bangladesh.

4. Concluding remarks

To effectively deal with the twin challenges of food security and climate change, Bangladesh has to revisit its existing knowledge infrastructure, in the light of past performance, new challenges and new insights from innovation studies. Narrow mandates, inadequate resources (human and financial) and weak patterns of interaction among the various agencies dealing with rural development have effectively constrained Bangladesh from making rapid advances in reducing poverty and dealing with climate change related challenges.

The tendency has been to view the situation from a technological angle and this has resulted in continuation of policies, institutions and networks and this is precisely that constraints Bangladesh in moving forward. Bangladesh needs a new paradigm to deal with the new challenges which would help it to learn, foresee and adapt to new situations better. Though extension, especially the DAE could play a very important intermediation role to facilitate this transition, it is unable to do so as it is organized in an older and out-dated paradigm focusing on technology transfer. Bringing about a paradigm shift within extension and related rural development infrastructure should therefore be the focus of reforms in Bangladesh. This would need long term support and hand-holding and especially reforms within the donor community.

Ways forward

Currently no single agency in Bangladesh articulates the need for institutional and policy adaptation to deal with the climate change and food security challenges. While identifying and promoting technological adaptation is important, this is not enough to deal with emerging challenges related to climate change. The focus of interventions therefore should shift towards institutional and policy adaptation to climate change. This would probably support the much needed reconfiguration of actors (inclusion of new actors and nature of interaction among the various actors) that are also critical to deal with these challenges. Organisations like FAO can play an important role in facilitating this transition in extension organisations, the national government and the private and civil society actors in Bangladesh.

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ANNEX 7
DEMOCRATIC REPUBLIC CONGO CASE-STUDY
INNOVATION SUPPORT SERVICES FOR CLIMATE CHANGE ADAPTATION

Abdoulaye Mbaye

1. Introduction

Rural and Agricultural sector in the developing countries is changing rapidly and is driven by a number of external and global factors. The challenges the sector is facing are ever increasing and becoming more complex. Climate change is having a profound influence on the agroecological conditions under which farmers and rural populations need to develop their livelihood strategies and manage their natural resources. It is increasingly obvious that appropriate human responses developed through adaptation strategies including mitigation will be the most sustainable way to deal with. There is no gainsaying the crucial role of rural knowledge institutions in facing climate change impacts. Hence enhancing the capacity of population to adapt to the emerging reality of climate change is one of the new main challenges of Agricultural research, extension and communications institutions.

To further understand to the way in which FAO's research, extension and communication professionals could contribute to the climate change agenda, it is suggested that this case study be conducted in democratic republic of Congo

2. Context

DRC is a country of Central Africa coming out of nearly 10 years of civil war. Despite its abundant natural resources, it is one of the poorest countries of Africa. DRC is ranked at 167th position among 177 countries according to human development indicators (HDI). The vast majority of its population lacks access to basic social services. About 70% of its population are living below the poverty line .

DRC hosts, on its territory, the second largest rainforest in the world. Its vast forest reserves are not only a vital source of food, income, medicine, fuel and housing, but also an environment that allows millions of poor living in rural areas, to satisfy their cultural needs. It has a unique biodiversity that provides storage of large quantities of carbon, thus fulfilling a mission environmentally helpful.

As a country emerging from conflict, DRC also faced institutional constraints and governance which have hampered agricultural development. Many agricultural policies and programs adopted earlier were abandoned or partially implemented due to lack of resources, low involvement of local populations, and weak institutional capacity (human resources). Although ongoing decentralization is a long term solution to many of these underlying institutional weaknesses, the frequent changes in the public sector have affected this decentralization policy until 2007.

The process of United Nations Framework -Convention on Climate Change (UNFCCC) highlighted the particular situation of a group of 50 countries including the Democratic

Republic of Congo (DRC) identified among the Least Developed Countries (PMA) . These countries face serious difficulties in economic and social development. They are particularly vulnerable and exhibit extreme sensitivity to external economic shocks, natural disasters or catastrophes and epidemics. They are characterized by limited access to education, health and other social services, poor management of natural resources, inadequate infrastructure and, finally, poor access to information technology and communication.

3. How are the climate change impacts felt in DRC?

In DRC, the impact of climate change is experienced differently depending on climatic zones of the country. From 1990 to 2009, total annual precipitation has increased in many parts of the country, while extreme weather events have increased in intensity and frequency. Increases in rainfall occur in most regions (Ntombiet al, 2004, Ally, 2005). Less rainfall was recorded mainly in the southern part of the country, especially in the tropical savannah belt where more than 70% of the population lives in rural areas. There are uncertainties in the distribution (temporal) of rainfall with increased likelihood of intra-seasonal drought (Tshibayi, 2003, Kamenga, 2003). Climate change (CC) affects the seasonal cycles and directly threatens the agricultural production of basic food in rural communities. CC has potentially serious implications for the precarious food security of the country.

The survey carried out across the country, under the National Plan of Action on Climate Change (NAPA) which have interviewed nearly 2,800 people (32 social categories) of which 82% have at least 30 years, have noted that 96% of opinion agree that climate changes occur and are characterized by increasing temperature, shortening of the rainy season and increased occurrence of heavy rains or hurricanes / tornadoes. According to the order of decreasing impact, the five major climate risks threatening the daily lives of people in DRC (NAPA, 2006) are respectively: heavy rainfall, coastal erosion, floods, heat wave crisis, and seasonal droughts. Torrential rains have a clear tendency to increase, causing casualties, destroying infrastructure and habitats particularly those in poor urban areas and generating erosion. The increasing heat waves kill young children and old people especially in urban areas, causes dehydration and disorders related to heat stress, various cardiovascular diseases, and increase vulnerability related to waterborne diseases, malaria and trypanosomiasis. Seasonal droughts generate serious disruption of agricultural calendars within a rainy agricultural system.

The most vulnerable population to the adverse effects of climate change are the rural poor (about 70% in DRC). This group is followed by small farmers (NAPA, 2006). Crops and water resources are the two forms of capital most affected by the climate crisis which generates decrease in capacity of production and consequently leads to return to hunting and gathering practice as a means of livelihood of the poor.

How people perceive climate change?

Finally, rural population have a very low awareness of the potential impacts of climate change and adaptation options available to them. The survey conducted during the preparation of NAPA has revealed that although over 90% of the population can attest to have a perception of climate change, few of them understand how changing weather patterns can affect their livelihoods in the long term, and how to adapt their practices to take advantage of new opportunities and reduce their vulnerability. Advice to farmers including information on climate change is so far unavailable.

What are the adaptive capacities of populations to climate change?

The adaptability of farmers and agricultural services are limited because the root causes of vulnerability of farmers depend mainly to many non-climatic factors. Among the most serious are:

- The high level of poverty and food insecurity among rural populations: an estimated 52% of the population lives in extreme poverty, and 38% suffer from chronic malnutrition (with important disparities among regions). Levels of health and education are similarly low in rural areas. This situation creates a condition of high vulnerability to any change in food productivity resulting from climate variability or climate change. In addition, rural populations rely excessively on staple crops, with little means of diversifying livelihoods, which increases their vulnerability to climate shocks.
- A low level of mechanization: despite its high agricultural potential, DRC experiences a continuous agricultural deficit of 30 to 40%. Labour intensive agriculture, combined with low yields due to inadequate land management practice and the depletion of agro-genetic potential, limits the coping mechanisms of rural populations. Most small producers lack access to the basic tools and agricultural inputs. In addition, many farmers rely on depleted (used) agricultural genetic material, which not only provides low yields, but is also not adapted to predicted climate changes. Agricultural extension services have been rendered ineffective in most areas due to conflict, depletion of materials and a chronic lack of human and financial resources.
- Poor management of water and soil resources: conflict (including land tenure issues), as well as low technical capacity and a lack of resources among agricultural institutions have prevented the effective dissemination of appropriate techniques for water and soil management. Slash-and-burn agriculture and the fragmentation of land plots (on average 0.7 ha per landholder) have led to deforestation and land degradation. Unsuitable or degraded lands are abandoned, leaving many with little choice but migration, thereby further limiting their access to development services.
- Low levels of technical and financial capacities among farmers: low levels of education, as well as severe gaps in the institutional means for agricultural support (extension services, agricultural research) continue to maintain farmers in a state of poverty, limiting production to low yields of basic staple foods (rice, cassava, maize), with only basic means.
- Insufficiency in structures to expand and support production: the degradation of infrastructures due to past conflict or lack of investment is a major limiting factor to agricultural development, with access to markets and very limited in certain regions (lack of roads, absence of conservation and commercialization facilities). Remoteness, insecurity in some parts, and population movements also continue to be a challenge to development.

4. Recent history of knowledge institutions

Evolution of the landscape of rural extension services

In DRC, the National Extension Service (NES) , a public institution, is the most important extension system since the independence of the country. It has, in Kinshasa, a National Coordination backed by six divisions (programming, training/research, technology, personnel management, finance, and monitoring and evaluation) each of which comprises two to three

bureaux. At the regional level, there are six provincial coordinations with district bureaux and units. The units ensure direct contact with producers through grassroots development workers each of whom is responsible for 300 farmers on average.

The NES operates on the ground with other stakeholders (INERA, SENASEM, NGOs and projects) within the framework of specific collaboration protocols. With the support of UNDP, FAO and the World Bank, the NES has been given a new lease of life and has started harmonizing its intervention approaches and methods. It generally uses the farmer field schools (FFS) approach developed by FAO and based on training under real farming conditions. However, with the completion of the above-mentioned support and the widespread looting during the war, the extension workers do not have enough means to properly perform their duties. These include: (i) lack of means of transport and teaching aids; (ii) state of complete decay of office buildings; (iii) non-existence of material and moral motivation; and (iv) absence of training and retraining programmes. Extension activities, which can still be seen on the ground, are backed by emergency programmes which take care of the logistics and other operating costs of extension.

This situation forces the NES's field staff to become contractual workers of NGOs and projects they would rather supervise. NES is facing a major human resource problem: in the 11 provinces of DRC, only 5% of agents are high-level executives, 23% are senior technicians, 27% are implementation technical staff. The largest proportion (45%) is administrative staff support. There is a sclerosis of the field technical staff confined in routine and inactivity and the aging of many of them (many of them having reached retirement age are still in office). There is no longer an in-service capacity building and performance evaluation for the NES staff. In addition to NES, projects and agricultural centers (10), which no longer worked for almost ten years for the same reasons, theoretically, participate to extension system.

In NES extension system, at ground level, the agricultural agent called monitor is the only one staff in constant contact with farmers. In addition to his extension role, he is charged with implementing the other tasks of Ministry of agriculture at field level. So, the same monitor has to train farmers, gives them advice for appropriate inputs, sells inputs, controls the quality of inputs, collects agricultural statistical data and retrieves taxes from farmers.

In the current situation, because of the lethargy of public services, NGOs, (many of them are religious associations), and some projects are the main actors which provide advisory services to farmers .

The Ministry of Agriculture has just started implementing new decentralized framework at local level (territoire). These frameworks, called Council for Agricultural and Rural Management (CARG) have, among their duties, to provide advisory services, to disseminate technical innovations and information on agriculture and draw training plans for farmers' organizations. The CARG include representatives of technical and administrative public institutions, provincial assembly, farmers' associations, private individuals and unions, universities and research centers and religious congregations.

Evolution of the landscape of agricultural research

Agricultural research is conducted mainly within INERA. Other bodies such as the Faculty of Agricultural Sciences and the Faculty of Veterinary Sciences also intervene in this area but their actions are limited, specific and short-term depending on financing possibilities. INERA has five research centres (Nioka, Yangambi, Mulungu, Gandajika and M'vuazi) and seven

research stations (Bambesa, Kiyaka, Luki, Boketa, Kipopo, Gimbi and Bongabo) covering the entire country. At present, only M'vuazi station in Bas-Congo carries out research activities per se. The other stations are idle, because they are almost completely isolated due to lack of resources. All the stations have virtually no agricultural inputs and research equipment. With regard to human resources, INERA has 63 researchers, 117 technicians and 94 research workers. Lack of financial and material resources has reduced its capacity to generate technology and accelerated the departure of researchers towards other occupations.

INERA's research programme includes various themes covering the following areas: (i) food production; (ii) industrial products; (iii) livestock production; and (iv) management and conservation of natural resources. However, implementation of most of these programmes is slow, due to their precarious human and financial resources situation. The few ongoing activities concern mainly the maintaining of the germplasm and basic strains of already developed varieties, and improvement of staples (cassava, maize, rice, legumes and banana). These activities are receiving some external support within the framework of networks of sub-regional research organizations and emergency programmes initiated by FAO and other donors. In spite of the modest resources put at its disposal, INERA has achieved worthwhile results in the improvement of yields and resistance to diseases of some foodstuffs notably cassava and banana. However, these achievements are not being disseminated in the rural areas due to lack of financing. To remedy this deficiency, on the one hand, and ensure synergy between the various interventions in this area, on the other hand, it is necessary to strengthen INERA's human resources and logistics particularly in the area of plant material multiplication and dissemination, especially the material that has proved its worth.

Research work has slowed down considerably, the few ongoing activities being geared essentially towards maintaining the germplasm and basic strains of already developed varieties and producing improved varieties of staple food items (cassava, maize, rice, pulse plants and bananas). These activities are receiving some external support, especially from the network of regional research institutions such as the International Institute for Agricultural Research (IITA), the South-East Consortium for International Development (SECID), and the International Network for Improved Banana Species (INIBAP), as well as from emergency programmes initiated by FAO and other donors (USAID, EU, Belgium, France, etc.

In addition to INERA, a number of institutions are involved in agricultural research: Regional Center of Nuclear Studies of Kinshasa (CREN-K), Center for Food Research (CRAA) of Lubumbashi, Research Center on Maize (CRM), Agricultural Sciences Faculties of Kinshasa, Lubumbashi and Kisangani Universities and Veterinary Medicine Faculty of Lubumbashi University. The International Institute of Tropical Agriculture (IITA) has a long history of cooperation with DRC. During the eighties IITA performed its largest project of cooperation with that country. Since the end of this project, special links were maintained with the DRC research institutions mainly with INERA. In recent years, a fruitful collaboration has been established to address the degradation caused by cassava mosaic.

The evaluation done with the support of Center for International Forestry Research (CIFOR) pointed out that forest research in the DRC is affected by more than ten years of lethargy, looting and non-renewal of human resources (lack of qualified researchers). Besides INERA which is mandated of forestry research at the station Yangambi and related stations, most institutions involved in forest research no longer work. These include: Center for Research in Natural Sciences (NSRF) Lwiro which focused on basic and applied research on animals,

plants, soil and water (1954), Center for Research in Ecology and Forestry (CREF) (1947) which works on the ecology of primates, “Institut Congolais pour la Conservation de la Nature (ICCN)” which is responsible for research on protected areas. The National Reforestation Service (SNR) and the Permanent Service of Inventory and Forest Management (SPIAF) are involved in forestry research. The country lacks a coherent framework of formal scientific coordination between multiple disseminated institutions.

A program to revitalize the agricultural and forestry research (REAFOR) was signed in March 2006 between the EC and the Congolese government. This program and the Belgian cooperation enable eight INERA stations to benefit from rehabilitation, equipment and a large part of strengthening and retraining of human resources. It helps improve the national research system and is working to the successful reintegration of Congolese research in international research network.

Evolution of the landscape of communication in rural areas

The media landscape is very diverse in DRC and is, currently, one of the most effective ways to reach rural populations in terms of dissemination of technical messages. Democratic Republic of Congo has, overall, more than 450 radio stations of all types and which include community radio stations, public radio stations and association radio stations. GRET Institution, which conducted a comprehensive study counted 114 community radio stations with a religious connotation for some of them while the Association of Community and Associative Radio (ARCO,) reported 119 radio stations spread across all the country.

The rural stations in DRC are popular tools addressing community development issues in local languages through broadcasting programs that, often, meet the aspirations of rural populations. They have a huge impact on changing attitudes of the population and they fill the void not covered by public radio stations. The rural stations are scattered in several provinces and considered as local instruments. Although, not yet fully covering the whole country, their contributions are significant in their areas of coverage that may affect at least 30,000 to 40,000 people and sometimes a whole province. The most important include: FM Radio Bandundu, Katanga Jedidja Radio, Community Radio at Nava Isiro Pweto Community Radio in northern Katanga, community radio Nioki in Bandundu, Kigandu Community Radio, Radio 4 LikassaTV, Radio Rural Munku Radio Rural Mutanga, Radio Sankuru Standing in Kasai Oriental, Kilimanjaro Radio TV Contact TsikapaRadio of Community Muanda Vuvu Kieto radio and community radio Ntemo Mbanza Ngungu Lendisa Radio Ecuador. The National Service of Rural Information (SNIR), a department of the Ministry of Rural Development which is responsible for rural communication policy and strategy strategies, is not operational due to deficiency in all sorts of resources.

Many of the rural radio stations are facing organizational and technical constraints including: (i) lack of cohesive and rational organization, (ii) lack of legal governing texts (statutes, rules, specifications), (iii) low technical capacity of technical staff (employment of non-professionals trained in radio production, processing, handling equipment and audio equipment), (iv) lack of partnership with other institutions such as extension and research.

FAO is a major international institution which supports implementation of rural radios in DRC and which hosts technical expertise usable by all other partners (government, financial partners, United Nations system). In DR Congo, *Communication for Sustainable Development Initiative* (CSDI), is supporting the Project on Rehabilitation of the National Agricultural and Forestry Research System of the Democratic Republic of Congo

(GCP/DRC/036/EC) through ComDev methodologies and approaches. It designed and implementing a communication plan for the dissemination of technology innovation identified by the national research and extension system for agriculture and forestry. Special attention is given to the implementation of ComDev services to meet the challenges of climate change in agriculture, fisheries and forestry.

A review of activities undertaken by CSDI shows that CSDI has payed special attention to the development of communication services for development, and rural radio in particular. It looked at challenges in natural resource management and climate change, particularly with regard to adaptation, risk management of natural disasters, strengthening technical assistance to farmers and rural community participation to development programs. It encourages partnerships between grassroots organizations, NGOs; research institutes (INERA M'vuazi), Rural radios broadcastings programs introduced by CSDI and focused mainly on rural development are diverse and interesting for farmers. The introduction of topics relating to climate change is a relevant initiative only of CSDI and mainly performed in the territory of Mbanza Ngungu. CSDI has transformed the religious radio "Vuvu kieto" to a rural radio and improved Ntemo community radios with relevant broadcasting programs on local langage (kicongo) related to rural development and climate change like: "cassava and its constraints including those linked to climate change," "Importance of the tree" fight against erosions', " sustainable agriculture." "the management of our forests," our environment "," our season", " save the earth" , "land tenure". The impact of these radios on rural populations is significant according to the feed back they give to rural radio technicians by asking to be given more information.

Evolution of the landscape of training

DRC has a system of intensive and broadbased formal training in agriculture at all levels, from junior (A3) to senior (engineers and veterinarians) staff. The country has 34 (thirty-four) higher training institutions and 600 (six hundred) technical colleges. There is a good geographical national training system coverage articulated on the main universities of Kinshasa, Kisangani, Lubumbashi, faculties of agronomy with high level teachers and private training institutes.

Like all other public institutions, these structures constantly lack of all sort of resources (financial, material, logistic, human) to improve their training programs and to develop research in universities and faculties. Continuous training of technicians of the agricultural sector is now provided only when there is external financing.

About climate change, there is no training curriculum either in universities or faculties. Nevertheless, the universities authorities are very aware of climate change issues and the need to create a climate change training program mainly in the faculty of agronomy and in the specific school like "Ecole régionale post universitaire en aménagement et gestion intégrée des forets et territoires tropicaux (ERAIFT)". Related to climate change, the teachers college of Faculty of Agronomy in Kinshasa focused on these priorities: (i) to develop a training program for teachers to support the conception of climate change curriculum focus on mitigation and adaptation issues, (ii)to support creation of laboratories and consequently research, studies and thesis on climate change, (iii) better access to knowledge international networks on climate change by internet and exchange between south and north universities, (iv) to create a university' chair on climate change.

Relations between research extension and communication

Public institutions of research and extension (as INERA and NES) relations are very low. The links exist, especially between public projects and INERA which provides technical support for production of basic seed, cuttings of cassava and the fight against crop pests. FAO/GCP/DRC/029/EC project: "Food security and income generation through assistance to small producers and support to INERA for increased sustainable production of cassava" developed an efficient system of multiplication and distribution of accelerated healthy cassava cuttings from varieties selected for resistance to mosaic. The project has implemented programs for participatory management of production and integrated pest management through the use of the approach Farmer Field School. Most of INERA departments which previously included participatory research entities that have developed activities to support farmers by farmer field school approaches, have disappeared because of the political and social crisis experienced by the DRC.

Roles of public and private actors

According the regulatory texts, in DRC, research and extension are considered as public service activities in the framework of public institutional policies and strategies. Communication is the most opened area to non public actors. In the current situation, agricultural research is always the prerogative of public services. Extension and communication are mainly conducted by associations and NGOs. Among the different fractions of civil society active in rural areas, are distinguished 3 types of organizations:

- Associations coming from a self-organization of rural population: village associations, management committees, unions, cooperatives. These are formed locally around a goal or a very specific activity as: purchase of inputs, marketing of agricultural products, credit solidarity, construction of a water point, management of a health center, etc...
- Organizations generated at the initiative of individuals or institutions: national NGOs, churches. They, often, focused on animation, technical support and services in all areas affecting the rural population.
- International NGOs which provide technical support, institutional and financial strengthening to national NGOs

5. Situation at field level

A lack of strategies to support the learning of rural people (social learning)

Concrete priorities expressed by farmers: At farmer's level, perceptions of climate change lead them to express concrete needs that they are awaiting a response. For example one of the most common questions is: According to the fluctuations recorded in the start of the rains and the impact so generated on the quality and quantity of agricultural products, what is the most convenient month for planting (October or December)? Where can we get adapted varieties to longer dry periods or poorly distributed rainfall?

The public and non public field institutions of research and extension are not, currently, able to meet farmers' demand by adequate technical answers specific to the different agro-ecological areas of the country where savannah and floods are ones of the most important

climate change major concerns. The socio-organizational and farmers 'capacity building requirements are not fulfilled because of the absence of a functional relationship "farmer-extension-communication-research" which is the best way to promote social learning populations. At the grass root level, there is no farmers' framework for consultation and coordination for demand raising. Except, some actions undertaken by a few NGOs, there is no capacity building improvement plan or system to strengthen farmers' capacity development. Public services of research and extension are weakly linked to farmers due to: (i) their deprivation in logistics and material resources, (ii) their lack of participatory, demand led and market oriented vision (ii) the weak organization and capacity of farmers. The extension system, although, represented at field level by the public services, projects and NGOs, is unable to meet farmers' demand in the area of climate change. The NGOs, which currently are more prevalent among farmers, lack of technician of appropriate level of knowledge. So the technical messages they disseminate to farmers are not renewed on the basis on current topics such as climate change. INERA, in its current situation, lacks of means, mainly at field' stations level, to develop research on climate change, although researchers are very aware of issues related to this phenomenon. They don't have the minimum of means required to collect and process agro-meteorological information, or to access easily to information and knowledge on climate change issues from the web.

Current projects are not dealing with climate change issues: In the field projects supported by international partners, IFAD⁷, ADB⁸ and World Bank⁹ projects are developing important integrated interventions focused on different aspects of agriculture, agroforestry, health, and infrastructure. But no project is currently dealing with specific issues to climate change. However, they are open to addressing issues related to climate change in terms of advice and services to be provided to farmers as technical support. It's much more at national level that efforts to integrate interventions in the same framework are done.

Non-public actors are the main providers of support to population at field level: The main actors, who provide the few agricultural services activities, are mainly, NGOs, rural radios and to a lesser extent, public agricultural research and extension institutions. Their most important activities are focused on technical support to populations on natural resources management and agricultural adaptation to climate change mainly on agroforestry, acquisition of improved seed, production of seedlings and creation of nurseries. Agroforestry activities are based on sequential and cyclic operations of forested plots of acacia (*Acacia auriculiformis*) of 25 acres over a period of 7 years, with a fallow year. The farmers deforest a band of about 3 acres of the parcel, each year, and transform the harvest, by carbonization, to charcoal, which is sold in the major centers like Kinshasa City. The financial gain obtained is supplemented by corn and/or cassava production on plots deforested. The same plots for agroforestry are also used for livestock (breeding cattle, pigs, and poultry) and production of fruit trees.

A multitude of opportunistic organizations of civil society: There are many networks of civil society in DRC, whose presence in rural areas is low. They are much sooner located at the city level. Nevertheless, they are interesting entrance to build coalitions capable of influencing the authorities to move towards the directions needed in terms of climate change. But , before to rely on civil society associations as farmers' support , it is necessary to learn

⁷ IFAD project: (Projet de relance de l'Agriculture dans la Province de l'Equateur, Projet de relance de l'Agriculture dans la Province Orientale)

⁸ African development bank project: Projet d'Appui aux Services Agricoles : PARSAR

⁹ World bank project: Projet d'Appui à la réhabilitation de l'Agriculture et des Services Agricoles PAARSA

more about this important group born after the war, with very opportunistic associations. GTCR is the civil society leading national platform that brings together many national networks and local organizations of civil society. It integrates associations dealing with support for indigenous peoples, minorities and vulnerable persons, women and children and associations of environmental protection and human development. This platform, as , a civil society priority partner of UN REDD, supported by international NGOs such as the Rainforest Foundation, is a potential partner for any initiative in climate change in DRC.

Perspectives to enhance capacities' development of rural populations at field level

The relevant rural radios broadcasting programs are a social link with populations: CSDI has changed the profile of the religious radio "Vuvu kieto "to a rural development radio and improved Ntemo community radio with relevant broadcasting programs on local language (kicongo) related to rural development and climate change like: "cassava and its constraints including those linked to climate change," "Importance of the tree" fight against erosions', "sustainable agriculture. " "the management of our forests," our environment "," our season"," save the earth", "land tenure". The big interest shown by farmers through the close relations they develop with the rural radio technical staff and their expressed demand for additional information are an evidence of the impact of rural radios. As feed back, specific questions are mostly, often, asked by beneficiary on how to implement, in practical way, the technical advice they have received from rural radios. Obviously, the answer should not come from the radio but rather from the extension agents, which unfortunately are absent on the side of farmers. It is evidence that the rural radio will have more impact on rural populations if there is a linkage with research and extension services.

A clear vision of researchers about their roles in climate change challenge: The researchers have a clear vision to meet the needs of populations by working on the priorities of people according to different agro-ecological zones and especially to develop research themes on climate change. They sought to develop research projects related to climate change including: "the adaptation of legumes in a changing climate", "the effects of climate change on diseases and pests of cassava," the study of precocious rot on cassava", "the analysis of drought stress on cassava yield", "the introduction of crops such as tropical dry millet sorghum in savannah areas".

Government will to set up a new extension system. Extension is the real missing link in the system of knowledge exchange between farmers and agricultural service providers. Its presence is essential especially in a country where agricultural situations and the effects of climate change are very diverse, ranging from drought to flooding. The current vision of extension, considered as a centralized public good, must be changed to set up a sustainable extension system. No public system can cover, financially and by human resources, all the regions of this huge country. The Ministry of Agriculture is showing great commitment to reforming the current extension system. With the support of FAO, a global study to reorganizing agricultural services including a new vision of demand driven, market oriented advisory services is already available focusing on a redefinition of the role of public and non public actors, a public-private partnership to provide farmers with the development capacity they need to improve their production in an environment affected by climate change and to strengthen their organization to better access to inputs and to reach the agricultural market.

Gaps and needs at grassroots level to support innovations for climate change

A long-term solution to the underlying vulnerabilities as well as to the additional challenges posed by climate change should start with an investment in rehabilitating agricultural production and related infrastructure so as to ensure its productivity and resilience. This includes the promotion and dissemination of sustainable and climate-proof agricultural varieties, inputs, information and techniques, as well efforts to reinstate technical agricultural capacity at all levels. In order to decrease underlying vulnerability among rural populations, efforts should be made to promote agricultural and economic diversification strategies that will also encourage populations to settle and to practice adequate land stewardship, while promoting food security and socio-economic development. This in turn will require the development of appropriate capacity for forecasting, early warning and for agrometeorological planning, which is lacking in the country.

Research: In short term, INERA stations needs to get particular varieties and technologies from the CGIAR centers (IITA, in particular) and SNRAs'countries in the region so as to set up a farmers' varietal selection system. Partnerships should be established with these centers. INERA needs support to: (i) collect agro meteorological data, (ii) to develop a training plan on climate change for the benefit of researchers. (ii) easy access to information on climate change through better access to Internet web. In medium term, INERA should be able to create varieties and improved technologies. This does not preclude borrowing from other SNRAs. The national agricultural system (NARS) of DRC has the advantage to be the only simultaneously member of the three regional associations of agricultural research in Africa (WECARD, ASARECA, SACCAR).

Extension: In short term, (i) a practical way is to collaborate with technical and financial partners in the framework of their current development projects in order to insert extension practices related to climate change; (ii) to provide technical support to DRC to establish a new pluralistic, market oriented and demand led extension system with a training plan for public extension workers, NGO's technical staff on climate change and participatory appraisal approaches. In medium term to support elaboration of national extension training system from high to low level and develop climate change curriculum training

Communication: The needs are: (i) to train rural radio technical staff in climate change and participatory appraisal and planning to enable them to better understand farmers' needs and to bring the appropriate message, (ii) to provide rural radios with logistic means enabling them to be better in touch with rural populations and to organize broadcasting parties in the villages, (iii) to develop new programs in rural radio on climate change, agroforestry, reduction of greenhouse gas emissions. (iv) in medium term to elaborate a Comdev national strategic plan with a vision to set up specific agroclimatic and ecological rural poles of Comdev in the country, to build a network rural Comdev and to develop national capacities in communication for development.

6. The institutional framework

Currently, there is no formal institutional framework set up to manage issues related to climate change in DRC. The Climate Change Division (Sustainable Development Direction in the Ministry of the Environment) which is mandated by Government on climate change issues is insufficiently tooled to ensure appropriate integration of climate risks with all stakeholders

at the different levels of planning. Self-evaluation of national capacities achieved in the framework of NAPA, gave an overview of potential players and an analysis of their potential contribution to the climate change issues as a whole. The close collaboration of all actors (government, civil society, farmers and private sector) is essential to promote adaptation to climate change. The current institutional framework for climate change in DRC includes different stakeholders groups: government institutions, civil society, private sector, farming community.

Government institutions: They are organized around three areas: (i) the agriculture sector (including the sub-sectors of agricultural production, animal health, fisheries and aquaculture) under the Ministry of Agriculture, Fisheries and Livestock (MAPE), (ii) the rural development sector (including sub-sectors of rural water supply and agricultural feeder roads,) under the Ministry of Rural Development (MDR), (iii) the environment sector (including the sub-sector of natural resources management and tourism) under the supervision of the Ministry of Environment, Nature Conservation, Water and Forests (MECNEF). Although there is a clear trend towards decentralization and good governance reform in DRC, many decentralized technical institutions, particularly in the agricultural sector, still, lack the essential means to provide farmers with technical advice they need to address climate change issues because of staff shortage, low levels of salary and lack of financial and logistical resources. However, the major reform of public institutions, currently supported by international partners can be a good opportunity to revitalize public rural services to address farmers' demand.

Civil society: the participation of civil society, in all its forms, is essential for successful interventions in climate change issues. There is a strong civil society movement in DRC, including professional associations, community groups, religious organizations, unions and media. Although, weak of capacity, these groups and associations can play an effective role in raising awareness on climate change and adaptation and promotion of sustainable agriculture at local level, and at national level as effective partners in Climate change policy making.

Private sector, in agriculture, is weak and not well organized (there are few large farmers). However given the size of the country, the private sector should benefit greatly from the programs of rehabilitation of agricultural production in order to play their roles as inputs suppliers and agricultural markets' actors.

Farming Community: the farming community is organized essentially into groups and associations which are generally informal. Government has sought to promote different forms of association, especially mutual and cooperative associations. However, lack of a clear vision of how to structure them and the small resources made available to the services concerned have made it impossible to achieve tangible results. With the crisis experienced over the past years, there has been a vast movement to create associations, local development initiatives (LDI) and national NGOs. This movement is caused by the action of international NGOs and, specifically, it is linked to the need for grouping required by an initiative or a development programme with immediate benefit to the members of the group. This drive helped initiate the farming community organization process. In 2003, there were 224 national associations and NGOs organized and approved by the State. Concerning women, there is a National Women's Council which is represented in all the provinces. There are representatives of public institutions, non-governmental organizations and women's associations.

Missionaries also created associations which are very active in most parts of the country; particularly the Centre and the South-east (see Annex 3 in the working document). Assisted by charitable organisations from different origins and using income generated from their agricultural and commercial activities, these associations have been able to construct basic infrastructure used to organise and train the farmers, among other things. Better organised and managed, these associations are today actively involved in introducing and promoting the use of new technologies in the rural communities.

Gender: Women represent about 57% of the total population of DRC, with 73% of them living in rural areas. Following the prolonged socio-political crisis in the country, Congolese women have become the main breadwinners in many families. Their main area of activity is in food production. They account for 75% of total food production but have little control over the income generated from farming. Women are massively represented in the petty trading sector but lack the financial resources to expand their activities. The proportion of women without access to economic opportunities is estimated at 44%, compared to 22% for men. The main problem facing women is the intensity of the tasks they perform on the farms and at home. They work very long hours, spending between 14 and 16 hours at work each day.

The participation of women in extension services is quite impressive. More than 30% of visits by instructors are to farms run by women while 46% of members of contact groups are made up of women. An estimated 12,000 women in DRC have received training on techniques for preserving and processing of agricultural products. In the rural areas, 20% of farmers' associations are exclusively for women, while women make up 35% of the mixed associations. Conscious of the adverse effects of gender disparity on poverty reduction efforts,

Current coordination mechanisms for climate change issues

NAPA institutional framework: It's set up by the National Action Plan for Adaptation to Climate Change (NAPA): Under Decision 28/CP.7 of United Nations Convention Framework on Climate Change (UNFCCC) DRC prepared a National Action Plan for Adaptation to Climate Change (NAPA). This program aims to identify priority activities to be implemented to meet the immediate and most urgent concerns of people regarding the adaptation to the adverse effects of climate change. NAPA will develop a program covering the whole country and identifying urgent adaptation activities that address immediate and harmful effects of climate change. The launch of NAPA process in the Democratic Republic of Congo, which started in January 2005, established an institutional framework:

- National Steering Committee of NAPA (CNOP);
- National Directorate of NAPA (DNP);
- National Coordination of NAPA (NOC);
- ETM: Multidisciplinary Technical Team (25 experts)
- CNCC: National Committee of Climate Change (33 members)
- PP: Stakeholders (or partners).

The institutional framework of UN REDD STRATEGY (Reducing Emissions from Deforestation and Degradation): Low rates of deforestation (about 0.25%), but a forest area of 145 million ha, put the DRC in the first 10 countries that lost the most important areas of forest cover worldwide each year. Given the urgency to reduce the negative impacts of climate change on forest cover and associated environmental issues, DRC is engaged in a process firmly focused on the action: the REDD Strategy. Preparation of REDD, supported by United Nations system is led by institutional bodies at national and regional levels:

- a national committee involving all stakeholders, including civil society, indigenous and local communities;
- an interdepartmental committee with the Agriculture, Rural Development, Environment, Mines, Land Affairs, Housing and Urban Development;
- a national coordination REDD in charge of coordinating activities and is responsible in particular for the implementation of UN-REDD programs and CFPF;
- a scientific and technical committee of national and international experts whose mission is to provide scientific and technical advice on REDD.

Projects' institutions: UNDP project: Building the Capacity of the Agriculture Sector in DR Congo to Plan for and Respond to the Additional Threats Posed by Climate Change on Food Production and Security :2010-2015 . This project aims to meet the increasing variability of agro-climatic conditions and its impact on the agricultural sector related to climate change. The project purpose is to eliminate the root causes of vulnerability of rural populations in 4 sites selected by the renewing of agro-genetic material through the provision of adapted germplasm and the creation and strengthening of agricultural services (extension services, technical tools, agro-meteorological information and planning systems) from local to provincial and national level. The project will create a supply chain for agricultural adapted germplasm centred on three basic crops (maize, rice and cassava) and based on research led by INERA. This genetic material will be transferred to appropriate agricultural multipliers for the production of improved seeds and cuttings to be distributed among households. The production and dissemination of genetic material will be supported by appropriate training and capacity building in farm management and appropriate durable techniques (agroforestry, sustainable management of land and water, agro-ecology) to be achieved by national agricultural extension (NES). At the same time will be improved collection and dissemination of meteorological information (including early warning bulletins, the use of rural radio and local associations and leaders).

Participatory mechanisms for involvement of population

Participatory management of natural resources: Over the last decade, the approach of participatory management of natural resources and the decentralization of natural resource management have emerged as promising ways to institutionalize people's participation in the exploitation of natural resources. The main reason which pushed for the need to involve all stakeholders in the management of natural resources, including the private sector, NGOs, academic institutions, research institutions, and particularly local communities is that local and indigenous communities have never truly enjoyed the benefits of the exploitation of natural resources in their environment.

In fact, social inclusion and community participation are essential tools to support the rural poor in dealing with natural resource management and climate change adaptation. In this sense, ComDev as a participatory communication approach can play a critical role to help local and indigenous communities develop their very own management practices, as well as site-specific livelihood adaptation strategies. ComDev methodologies and tools holds a good potential to reduce rural communities' vulnerability by broadening participation and ensuring equitable access to information and knowledge.

Given the interest of indigenous and local communities to be involved in the management of natural resources, the implementation of participatory natural resources management has known strengths, weaknesses and opportunities in the DRC. It should be noted that the

bilateral and multilateral donors have increased their financial contribution to support the activities of participatory management. Moreover, the government is more committed to support development initiatives including participatory management in the context of its decentralization policy being implemented since 2007.

Decentralization policy: The Constitution has structured the Congolese State administratively into 25 provinces plus the city of Kinshasa endowed with legal personality. In conjunction with central government, the provinces have the responsibilities for local development and share the national revenue respectively at 40 and 60%. The provinces are administered by a Provincial Government and Provincial Assembly. Each of them includes decentralized territorial entities that are city, county, sector and chefferies. They enjoy autonomy to manage their economic human, financial resources. Although this mode of governance facilitating decentralized decision making at local level and the participation of farmers is still new and under construction, it can be a way forward to develop specific programs and more suitable for the agro-climatic zones.

Civil society involvement: It is important to collaborate with civil society to mobilize pressure to induce change. Civil society and local communities are the ultimate beneficiaries of interventions. Engagement with them can be very productive and, generally, civil society is very experienced in lobbying and has more openings than government and international institutions. In DRC, it has been important to build on that knowledge in complex sectors such as mining and forestry in order to counterbalance the influence of personal interests and strengthen the political will for reform. A proactive communication strategy is essential, particularly in complex and sensitive areas

The existing initiatives for change: Since the end of hostilities the Donors support the country's reconstruction through a multisectoral approach "Minimum Partnership Program for Transition and Recovery" (PMPTR) as part of DSCRP. This framework of harmonization is an essential tool for building on existing initiatives for change in DRC given the multiplicity of interventions and the need for harmonization. The key programs of this framework are particularly : (i) promotion of peace and conflict resolution (EU, UNDP, DFID, USAID), (ii) rehabilitation (UNDP), (iii) health (European Union, GTZ, Belgium), (iv) HIV / AIDS (UNDP), (v) education (Belgium), (vi) urban infrastructure (French Cooperation), (vii) management of Natural Resources (GTZ, DFID, Belgium), (viii) food security (FAO, IFAD, WFP, World Bank, African Development Bank) (ix) rural infrastructure (Belgium) (x) assistance to disadvantaged groups (GTZ). Current projects and forthcoming of IFAD, ADB and World Bank are local initiatives that focus on improving agricultural services and interface with rural populations. Such projects are opportunities to build initiatives for change in the field of climate change.

The international financial partners are developing a lot of effort to harmonize their participation and assistance in developing policies, strategies and agricultural/rural programs. The Framework for Country Assistance (CAP) is one example. It's an initiative that 17 donors have launched in order to follow a consistent policy approach for their contributions to economic aid to the DRC. The CAP serves as a frame of reference for the strategy followed by each donor. Composed from a small nucleus, the group of participants in the process is passed in a short time to 17 members, including both multilateral organizations - Group of the World Bank, European Commission (EC), International Monetary Fund (IMF), African Development Bank (ADB) and United Nations (UN) - as key bilateral donors: Belgium (Belgian Cooperation), Canada (Canadian International Development Agency, CIDA), France

(French Cooperation), Japan, China , Netherlands, Italy, Sweden (Swedish International Development Cooperation, SIDA), United Kingdom (UK Department for International Development, DFID) and United States (Agency U.S. International Development, USAID) . So far, the CAP has sought primarily to build consensus around three key elements inherent in any strategies: a joint diagnosis, coordinated programming and a common results matrix. The CSDI has been working in the DRC supporting rural radios and promoting the participation of civil society and the rehabilitation of extension systems, and is now collaborating with the National Agricultural Research Institute (INERA) and the UN Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UNREDD) to introduce knowledge sharing and communication processes into the governmental agenda on climate change.

7. National policies

DRC government has set, since 2001, with the participation of development partners, actors of civil society and public institutions, a number of approaches and strategies that guide the various possible interventions in rural development . These include: (i) the national strategy for food security and agricultural development. Horizon 2015 (SNSA2015) (ii) Document Strategic Growth and Poverty Reduction (PRSP) in July 2006, (iii) updating the Master Plan of Development for Agricultural and Rural Sector (PDDAR) (iv) the national medium term investment Plan (NMTP) for the implementation of NEPAD agriculture program. In the Guidance Note on Agriculture (2009), the Government has included among its major orientations, (i) to increase significantly the national budget allocated to agriculture and rural development within five years, (ii) to restructure ministries' institutions involved in agriculture and rural development , (iii) to take into account the roles and responsibilities of the different stakeholders (public, NGOs, private, farmers associations) and to rehabilitate basic rural infrastructure, sustainable inputs delivery systems, dissemination of appropriate technology and research, sustainable management of natural resources, development of financial services in rural areas, improved marketing channels for products and agricultural inputs.

National policy on climate change

There is not a specific policy to address climate change. The government is currently developing strategies (REDD), plans of action (NAPA) on climate change without a global comprehensive vision. There are also specific strategies such as the National Plan for Environment, the National Strategy for Biodiversity, The Strategy of Environmental Capacity Building, and the National Master Plan for Land Use. It is noted that most strategies have not experienced an initial implementation. The central structures of research and extension are involved in policy development at national level with their current difficulties to develop relevant proposals for improving their situation.

Main gaps at national level to support innovation in climate change

Low investment in agricultural productivity: Even, without climate change, DRC must necessarily increase investments in agricultural science and technology to meet the needs of a growing population. The solutions based on agricultural science and technologies are essential to meet these needs. Climate change was the emergence of new applications and more difficult to satisfy, in agricultural productivity. A research and extension system aiming to increase productivity of agriculture and livestock, including biotechnology, is essential to

overcome constraints due to climate change. DRC is a country where it is possible to have a range of adapted agricultural production to face climate change effects rather than focusing on the intensive development of a narrow range of agricultural products. Research for change in the feeding of livestock for food production and management practices for irrigation are also required to reduce emissions of methane. The improvement of productivity that strengthen the resilience of farmers to the effects of climate change are likely to have significant impact on reducing rural infrastructure for poverty and also essential to enable farmers to take advantage of improved crop varieties and better management techniques.

The insufficiencies of national research and extension systems: About the research system there is a lack of strategic plan for agricultural research in order: (i) to give a global vision in terms of complementarities and synergy within the different research institutions of the NARS, (ii) to redefine the role and modalities of participation of beneficiaries mainly farmers in planning, programming and evaluation of research programs (iii) to provide a sustainable mechanism for funding research. Partnerships with other national systems with international centers are essential for DRC.

In extension, the collapse of the NES change is a strong limiting factor in improving incomes of rural populations and the fight against poverty. Setting up a new national extension system able to meet farmers' demand both in production, market access and adaptation to climate change is a need expressed by Government.

The great weakness in the collection, dissemination and analysis of national data: Climate change is currently having a relatively large impact on agriculture and natural resources in DRC. But this country has no means of forecasting these effects. This gap is a handicap to the development of good policy fighting the effects of climate change. DRC needs, therefore, strengthen efforts to collect and disseminate data on the spatial characteristics of agriculture and agro-meteorology and also increase funding for strengthening national statistical programs to better monitor climate change across the country.

The lack of a policy and strategy support to strengthen farmer's organization to become relevant development stakeholders and to develop their own networks is a major handicap for information sharing and participation of farmers in setting priorities, policies and programs. Focusing on the knowledge and information needs of rural stakeholders, participatory communication methods and tools become very important to foster horizontal collaboration and networking among the plurality of actor involved, including also farmers organizations and the most vulnerable groups. As rural communities live and feel the impact of climate change, they also feel a strong need to be adequately informed and fully included in decision-making, in order to respond effectively by elaborating their own strategies. Again communication can significantly help reduce the information gap between researchers and field agents on one side, and between rural institutions and farmers who hold traditional local knowledge.

The weakness of community coping strategies: The community coping strategies can help rural communities to strengthen their capacity to cope with disasters, improve their skills in adaptation to climate change and diversify their livelihoods. In DRC, although there are many strategies and programs supported by international partners, local communities, because of the projects' mismanagement, don't get much profit from these supports enabling them to develop their own coping strategies. Crops and livestock productivity, access to markets and the effects of climate change vary from place to place in DRC. The technical and international

partners for development and government must ensure that their technical support and financial support arrive at the grassroots level.

Absence of a national strategy for agricultural and rural training: In DRC, the government field staff as well as NGOs accused of shortcomings in agricultural and rural training enabling them to meet the needs of the variability of farmers in terms of diversity of agro -climates and ecologies of the country. The training system in DRC is disadvantaged by an aging public field staff (often not renewed), a lack of in service training system, a low educational level of NGOs agents, a lack of training curricula in the field of climate change in universities and faculties and a lack of training producers system

Need for a national communication for development programme: Communication across rural radio is currently, in DRC, the most powerful means to transfer messages to rural populations given the multitude of rural radio and entrenched habits among rural people to listen to the radio. Furthermore, a ComDev approach should be integrated into national agricultural policies and services combining a variety of media and tools, ranging from rural radio to the information and communication technologies and including different participatory communication methods. Planned communication for development activities could greatly enhance the performance of research and advisory services by: improving the sharing of technologies and knowledge for increasing resilience of rural population and reducing community vulnerability; broadening participation and ensuring equitable access to information; enhancing rural institutions' capacity to assist small farmers in assessing current vulnerabilities and future risks; and supporting livelihood adaptation strategies through communication activities according to the cultural characteristics of the local audiences . As mentioned earlier, in the country there is a long standing tradition in the use of community media , and especially rural radio, nevertheless, the current situation is characterized by a lack of a defined communication for the development strategy with clear guidelines regarding institutional setting of communication services. The promotion of coherent national programme for rural communication services would enhance the capacity of the innovation system to deal with the complex issues related to climate change by involving different stakeholders (Institutions, grass-roots organizations, community radios, etc.), ensuring better integration and national coverage to the different rural services (research, extension, NGOs, farmer associations, rural radios etc), as well as a more farmer centred approach to the delivery of the services.

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ANNEX 8
INTERMEDIATION SERVICES FOR CLIMATE CHANGE ADAPTATION:
THE INTERNATIONAL LANDSCAPE OF AGRICULTURE AGENCIES

Andy Hall and Rasheed Sulaiman V.

Introduction: A Rationale for Institutional Adaptation to Cope with Climate Change

There seems little doubt that climate change will necessitate technological adaptation in the agricultural sector. There is, however, a strong argument that suggests that a prerequisite for technical change will be institutional adaptation of the knowledge architecture so that it can respond more effectively to the unfolding challenge of unpredictable and extreme weather phenomena. Underpinning this argument is the recognition that climate change will require knowledge and sources of innovation that go beyond agricultural research and extension agencies. These new architectures will need to include the wider scientific community, civil society and the private sector and will require new policy regimens and governance arrangements. The precise nature of these new architectures cannot really be predicted in advance as they will be highly context-specific and because it is not yet totally clear how climate change will play out in different locations. What can be said, however, is that as the nature of climate change challenges reveals itself there is going to be a continuous need to rework these architectures. This is undoubtedly going to involve the negotiation of new patterns of linkages and networks as well as associated institutional and policy regimes. Whereas in the past agricultural research and extension systems were designed to be stable and independent, in the future they are going to need to be flexible and interdependent components of the wider innovation system.

Climate change makes this need for institutional adaptation urgent. But it is merely an example of a series of shocks that the agricultural sector is facing and will continue to face in coming years. Other recent examples of shocks include: the food price crisis, the financial crisis, avian influenza and other livestock/ zoonotic disease outbreaks, etc. These examples underline the fact that adaptation is moving to centre stage of processes and policies wishing to enable agricultural innovation.

We argue that negotiating new institutional arrangements and facilitating network reconfiguration are both roles of intermediation — a traditional role of agricultural extension. While extension has traditionally been viewed as intermediation between farmers and technology suppliers, adaptation to climate change demands precisely this role of intermediation, but in a much wider sphere of activity and between different actors. The implication here is that the role of intermediation for adaptation with regards to climate change is a niche role that extension professionals are ideally placed to fill. Box 1 on the next page outlines the main features of this new extension role. This is a role of innovation support services for adaptation — adaptive services, in short.

This paper explores the implications of this for the United Nations's Food and Agriculture Organization (FAO) and particularly for the OER group, which contains core skills allied to agricultural research, extension, and communication for development. So, for example one option for OER is to evolve its role in extension support to member countries as one of strengthening traditional extension systems to a new role of providing backstopping to national-level adaptive services — in other words, advice on intermediation process at a wider landscape level. This, however, raises the wider question of whether FAO has the

comparative advantage to play this role. The purpose of this note is to scan the international landscape of agencies working on agriculture-related issues in order to identify potential gaps where FAO could play a role as an international centre of excellence, backstopping adaptive services and drawing on its expertise in intermediation. The main question is: Are there any other agencies that are currently mandated to play this role? (Country case studies carried out by this study suggest that national agencies with this role are hard to identify. Indeed, it is not clear that this type of role is as yet envisaged in national policy arenas.)

Box 1. Key Features of Transition to Innovation Support Services for Adaptation

1. **Expand from Rural Space to National Space Intermediation:** Climate change adaptation is about reconfiguring roles and networks between interdependent players at different levels, all the way from the national level to the rural space with farmers.
2. **Expand from Public Agencies to Multiple Agencies:** Reconfiguration of support services for climate change adaptation not only involves public research and extension services but other actors from civil society and the private sector
3. **Expand from a Tactical to a Strategic Role:** Intermediation is no longer just a tool to deliver technology, but a tool to reconfigure systems architectures and strengthen system capacities
4. **Expand from Practice Development to Policy Development:** Intermediation is no longer just about field methods and practice with farmers, but also about strengthening the enabling environment for adaptation through policy change
5. **Expand from communication for information diffusion to communication for network-based development and innovation.** Communication becomes integrated in 'innovation intermediation' activities aimed at enhancing network formation, learning, negotiation and the building of relationships in new configurations of support and services for climate change adaptation.
6. **Expand Core Expertise from Service Delivery to Facilitation:** The brokerage function between other agencies and organisations becomes much more important than one of actually providing services

The Fall and Rise of Agricultural Research and Extension in International Development

Agricultural research and extension has been the mainstay of agricultural development in many less-developed countries. These countries, particularly those in South Asia, Africa and Latin America, all had and continue to have economies that are highly dependent on agriculture. Innovation and growth in the sector is positively linked to poverty reduction and social and economic advancement, more generally. The break-up of the Soviet Union 20 years ago has also meant that the agricultural-based economies of central Asia have also become the focus of development assistance where agricultural research and extension have played a major role.

Despite the enduring attraction of agricultural research and extension investments as a route to innovation and development, international assistance has not been uniform. Agricultural extension, in particular, has suffered a number of upswings in popularity as well as periods of investor indifference. Two notable international efforts in extension are worth mentioning. The first was the transfer of the American system of Land Grant colleges of extension to India in the 1960s. This produced a network of state agricultural universities that combined

teaching applied research and extension. Highly successful in the United States, this model ran into difficulties in the hierarchical social structures of South Asia, where socially and economically-disadvantaged farming communities could exert little demand pull for technology and advice.

In the 1970s the World Bank began investment in the Training and Visit (T&V) extension approach. Like the land grant model, T&V proved highly successful in its original setting — in this case Southern Turkey. However, its transfer to different social, institutional and political settings met with mixed success. Meanwhile, supported through a mixture of grants and loans, the approach was propagated in many countries. The widespread critique of the outcomes of the approach — and, indeed, a more general disappointment about the returns to investment in agricultural research and technology — caused wider disillusionment with research and extension in the international community. This period of disillusionment lasted from the early 1990s to the mid-2000s, when it was finally realised that under-investment in agriculture had meant missed opportunities for poverty reduction. This was clearly articulated in the 2008 World Development Report published by the World Bank.

This marked the beginning a new upswing in investment interest in agricultural research and extension. The World Bank Group Agriculture Action Plan (FY2010–2012) projects an increase in support (from IDA, IBRD, and IFC) to agriculture and related sectors from a baseline average support in FY2006–2008 of \$4.1 billion annually to between \$6.2 and \$8.3 billion annually over the next three years. This flags the importance given to agriculture and increasing agricultural productivity, and, as part of that strategy, a re-invigorated emphasis on extension. Other new agricultural investors, such the Bill and Melinda Gates Foundation, are adding to this general upswing (Hall and Dijkman, *LINK* Look Editorial, November Decemeber 2009)

There are also other signs that extension may once more be stepping into the limelight. Most notable is the establishment of the Global Forum for Rural Advisory Services (GFRAS). This is an offshoot of the Neuchâtel Initiative and seems to have strong support from the international agricultural administration (The World Bank, the CGIAR, FAO and IFAD). Within this network, we also witness attempts to develop an agricultural extension indicators data set that is analogous to the agricultural science and technology indicators set developed by ISNAR-IFPRI. Although much of the support is currently moral support rather than financial support, there is a groundswell of feeling among the international community that something “needs to be done about extension”. This coincides with rising investments in agricultural research in both national and international arenas, but with many investors still keenly aware that the conundrum of putting research into use has yet to be solved. Those with short memories may well believe that more extension is the answer to this problem.

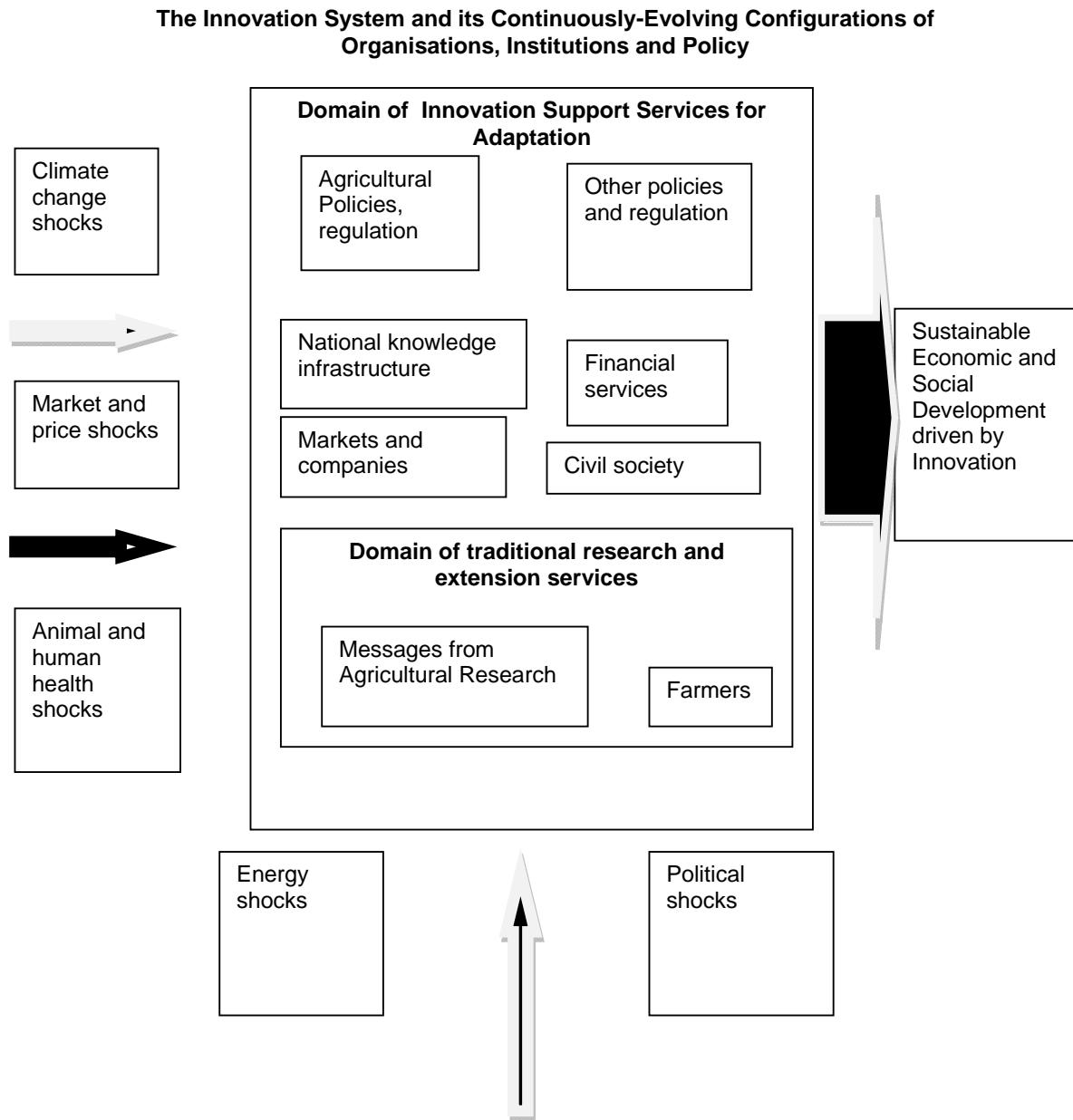
Further evidence of the upswing in donor interest in extension is the USAID supported Modernizing Extension and Advisory Services Program. While this has yet to be formally sanctioned, it is nevertheless a substantial commitment to support extension — overall this maybe as high as US\$50 million over 5 years. The underpinning logic of the initiative is that increasing concerns with global food security have drawn attention the “precipitous” decline in USAID’s support to agriculture generally. With the widely held view that agricultural productivity needs to be improved, this initiative seeks to redress the balance. In its conceptualisation the programme recognised the need for systems to promote innovation and suggest that new approaches to extension and advisory services will be needed that draw inspiration from a systems perspective. The programme focus is on identifying and promoting

best practice and new models of extension through the establishment of centres of excellence - although it does caution again falling into the trap of promoting “methodological orthodoxies”. These centres of excellence will work with national extension and advisory services to strengthen their ability to promote rural innovation. So while recent thinking on innovation has started to inform this initiative it remains bounded by the concept of strengthening rural advisory services. FAO should look positively on this initiative. It is further opening up space to experiment with an expanded view of the extension task, but at the same time does not crowd the territory of innovation support services for adaption and particularly activities in the wider policy and institutional domain. Perhaps FAO could access resources from this initiative to pilot its own vision of innovation support services.

While many of these new initiatives have been broadly discussed in terms of a relatively traditional view of the role of extension — for example, the branding of GFRAS as advisory services — there have been a series of recent intellectual advances around the topic of extension. These advances mainly stem from the reconceptualisation of agricultural development as a process of continuous innovation and the use of the idea of an innovation system as a heuristic to analyze these processes. From this perspective come ideas about innovation brokering (Klerkx et al 2009; Klerkx and Leeuwis, 2010), innovation coaching (Rhiannon Pyburn) and entrepreneur-based innovation initiatives — so called bottom-up bottom-line business models (Hall et al, 2010b) — and Research into Use programmes (Hall et al, 2010a).

The re-invigorated international investment interest in agricultural research and extension — and the injection of new intellectual and operational options that are linking research, innovation and development — present a strong opportunity for international organisations such as FAO. As discussed in the introduction an area of activities broadly-termed as adaptive services could be the new guise of traditional extension-like support. This would be relevant to a range of fast-moving global phenomena such as climate change — see Figure 1. The question is: Who could champion and support this role in the international arena?

Figure 1. The Expanded Domain of Innovation Services in a Dynamic, Global Environment



The International Landscape

It is best to make it clear from the start of this analysis of the international landscape that there is currently no international agency that has a mandate of intermediation in support of institutional adaptation for climate change and the renewable natural resources sector. The question here is whether there is an organisation playing this role for more generic adaptation purposes — a role that could potentially be expanded to include climate change. The analysis that follows has also explored the potential of existing organisations to act as partners in any such initiative that FAO might engage in.

Table 1 on the next page analyses the most obvious potential competitors and partners in the agricultural development sector. These include three broad groups of agencies:

- 1) Agriculture agencies from the UN system, from the Consultative Group on International Agricultural Research (CGIAR), global and regional fora on agricultural research and extension
- 2) Donors funding agricultural development
- 3) Academic organisations in the field of communication and innovation studies
- 4) Specialist international agencies in the area of climate change and the environment

Table 1. Summary of International and Regional Organisations and their Relevance for Intermediation Services

Organisation	Mandate	Comparative advantage	Limitations	Competitor / Partnership potential	Comments
1. International agricultural development agencies					
Knowledge, Capacity, and Innovation Division (formally (ISNAR) of IFPRI http://www.ifpri.org/book-36/ourwork/division/knowledge-capacity-and-innovation	International public goods (IPG) research on agricultural innovation and development	<ul style="list-style-type: none"> • Historical origins sympathetic to the importance of intermediation • Part of the CGIAR 	<ul style="list-style-type: none"> • Part of the CGIAR. • IPG research mandate. 	Potential research partner, rather than competitor. However economic research tradition struggles to accommodate systems and institutional perspectives	Original ISNAR was unique in the CGIAR in that it had a service role and a mandate of capacity development. This could have evolved into intermediation services. IPG research mandate under IFPRI has weakened its service and advisory role
Global Forum on Rural Advisory Services (GFRAS) http://www.g-fras.org/fileadmin/UserFiles/GFRAS-documents/GFRAS-brochure.pdf	“to provide advocacy and leadership on pluralistic, demand-driven rural advisory services. GFRAS does this in the context of the global development agenda, with a goal of promoting sustainable growth and reducing poverty”	<ul style="list-style-type: none"> • Unique global mandate for extension-related activities • Emerges from and is supported by the Neuchatel Initiative 	<ul style="list-style-type: none"> • Self-image strongly focused on extension as advisory services in the rural sense • Open to capture by old extensionists • Recently formed, only one member of staff and no secure support 	Its potential as a competitor or partner organisation is dependent on its development in coming years	Mandate currently at a formative stage and with the right orientation could move toward providing a global support forum for intermediation. However, the stakeholding of the initiative is such that this is currently questionable. An enlightened GFRAS could be a competitor for the new FAO role in this area.
Global Forum on Agricultural research (GFAR) http://www.egfar.org/egfar/website/aboutgfar	“to mobilize all stakeholders involved in agricultural research and innovation systems for development, and to support their efforts to alleviate poverty, increase food security and promote the sustainable use of natural resources.”	<ul style="list-style-type: none"> • Global mandate to strengthen the links between agricultural research and development stakeholders 	<ul style="list-style-type: none"> • Tended to be seen as a “trade union” for national agricultural research organisations. • Track record on fostering networks less than anticipated. 	A potentially strong partner as GFAR leadership is sympathetic to intermediation and systems perspectives	A fantastic mandate, but an organisation that has struggled to operationalise this, possibly because it is so broad. An enlightened GFAR could be a competitor for the new FAO role in this area, although this currently seems unlikely. Situated in Rome.

Organisation	Mandate	Comparative advantage	Limitations	Competitor / Partnership potential	Comments
Forum for Agricultural Research in Africa (FARA) http://www.fara-africa.org/	An umbrella organisation bringing together and forming coalitions of major stakeholders in agricultural research and development in Africa	<ul style="list-style-type: none"> • Regional legitimacy • Flexible interpretation of its role 	<ul style="list-style-type: none"> • Main stakeholders are national agricultural research organisations and the CGIAR 	Partner rather than a competitor	<p>A very useful mandate in Africa and it has the vision for a more strategic role in remapping agricultural innovation process.</p> <p>Partnership with an international organisation interested in intermediation could be a very powerful alliance.</p>
Institutional Learning and Change initiative (ILAC) http://www.cgiar-ilac.org/	“to strengthen the capacity of collaborative programmes to promote pro-poor agricultural innovation and to ensure that research and development activities are managed more effectively to contribute to poverty reduction”	<ul style="list-style-type: none"> • Unique mandate of trying to stimulate institutional adaptation in agricultural knowledge architectures. • Part of the CGIAR 	<ul style="list-style-type: none"> • Part of the CGIAR • Tended to develop into a specialised field of research rather than as a management tool for institutional adaptation 	<p>Strong research partner</p> <p>Potential competitor, but constrained by IPG research mandate in CGIAR</p> <p>Mission creep and lack of vision</p>	<p>A very interesting initiative that could have positioned itself internationally to undertake intermediation services and advice. Any new initiative could learn much from ILAC, although mainly about what not to do.</p> <p>Situated in Rome</p>
2. Donors					
USAID Modernizing Extension and Advisory Services Program	<p>Addressing food security with support to extension and advisory services</p> <p>Grants to establish centres of excellence to help strengthen national extension and advisory services</p>	Well resources and influential donor	Expanding but still relatively conservative vision of the extension task	Potential funding partner	<p>It is further opening up space to experiment with an expanded view of the extension task, but at the same time does not crowd the territory of innovation support services for adaption and particularly activities in the wider policy and institutional domain. Perhaps FAO could access resource form this initiative to pilot its own vision of innovation support services.</p>

Organisation	Mandate	Comparative advantage	Limitations	Competitor / Partnership potential	Comments
International Fund for Agricultural Development (IFAD) www.ifad.org	Working with rural poor people, governments, donors, <u>non-governmental organisations</u> and many other <u>partners</u> . IFAD focuses on country-specific solutions, which can involve increasing rural poor peoples' access to financial services, markets, technology, land and other natural resources	<ul style="list-style-type: none"> • Provides grants and low cost loans for agricultural development • Multilateral orientation provides a strong global platform for discussing rural policy issues and increasing awareness of why investment in agriculture and rural development is critical to meeting the Millennium Development Goals 	<ul style="list-style-type: none"> • Limited operational capacity for engaging in services or advisory work as it is mainly a grant-giving organisation 	A potential funding ally	UN-affiliated organisation situated in Rome. Could play a role in funding institutional adaptation initiatives on a pilot basis
The World Bank www.worldbank.org	Investment and policy positions on agricultural development, with renewed interest in agricultural extension	<ul style="list-style-type: none"> • Hugely influential in terms of policy and practice thinking, particularly via the policy support department, Agriculture and Rural Development • New era innovation projects coming online 	<ul style="list-style-type: none"> • Bank lending most suited to support of traditional extension systems 	Partner	If FAO could make the case that it could support the process of institutional adaptation for climate change through intermediation, it could negotiate the emergence of a new type of bank lending along the lines of adaptation agricultural knowledge architectures for climate change
3. Innovation studies organisations					
Communication and Innovation Studies group, Wageningen University http://www.com.wur.nl/UK/	Analyses communication within and between knowledge and policy networks, to gain a better understanding of innovation and policy processes. The group focuses on the development of methodologies for communication process managers	<ul style="list-style-type: none"> • Centre of excellence on studies and practice of communication as a means of intermediation. • Cutting edge on rethinking the role of extension 	<ul style="list-style-type: none"> • Academic orientation 	Very strong research partner	This group evolved out of the extension department 20 years ago and has been at the cutting edge of rethinking the role and function of extension as intermediary agency. Could be a key research partner in an international initiative to provide intermediation and advisory services

<i>Organisation</i>	<i>Mandate</i>	<i>Comparative advantage</i>	<i>Limitations</i>	<i>Competitor / Partnership potential</i>	<i>Comments</i>
Learning INnovation and Knowledge (LINK) http://www.innovationstudies.org/	Seeks to stimulate debate and share lessons on rural innovation policy and practice through research and advisory services	<ul style="list-style-type: none"> • Policy research and advisory resource centre on enabling innovation agricultural development • Part of UN system 	<ul style="list-style-type: none"> • Modest size 	Strong research partner	This group evolved out of a partnership between the United Nations University and FAO. Established to act as a focal point for thinking on the use of innovation systems ideas. Strong research partner in the area of institutional adaptation
4. Specialist international organisations on climate change and environment					
UNite to combat climate change, United Nations Development programme (UNEP) http://www.unep.org/unite/	The United Nations' campaign to encourage civil society and communities around the world to unite and act now to combat climate change. Close collaboration with the UN Framework Convention on Climate Change, the UN Communication Group Task Force and the Secretary-General's Climate Change Support Team.	<ul style="list-style-type: none"> • Linkage to inter-government negotiations on emission and other international climate change negotiations 	<ul style="list-style-type: none"> • Unclear operational focus. • Includes all sectors, rural and urban 	Potential advocacy ally	Part of a wider suite of UN initiatives related to climate change. A useful network partners for advocacy in their area, but little else

1. International Agriculture Agencies

The first group is the one that could most potentially contain both competitors and partners. All agencies analysed have historical roots in agricultural research and technology promotion. All are struggling to find a niche and redefine themselves in contemporary agricultural development settings. Many have adapted the language of innovation systems, although most are struggling to articulate this as a convincing, conceptually and operationally coherent vision. A key challenge for these organisations is to present this new vision in a way that does not alienate traditional stakeholders with a more traditional vision, particularly those in national research and extension constituencies and in the international agricultural development administration.

A number of organisations in Group 1 are actually quite well-placed to play the intermediation role envisaged for FAO, particularly GFAR and GFRAS. However, the reality is that the mandate and focus of these organisations is too broad and closely aligned with strengthening agricultural research and extension organisations because of the consistencies they have to serve. On the one hand this means that there is currently no real competition for this role in the international arena. On the other hand — and rather paradoxically — FAO is going to face exactly the same problem in its attempts to reinvent its role as an intermediation and institutional adaptation specialist.

One initiative in Group 1 that deserves special mention is ILAC. With its focus on institutional learning and change it is the only organisation with a mandate that explicitly sets out to tackle institutional adaptation. In fairness, ILAC has struggled in its attempts to stimulate institutional change in the CGIAR and its partners, but there is much that can be learnt from this initiative and it has a good network of professionals interested in the topic.

2. Donors

Donors are covered in this analysis because of the policy influence they have on modes of agricultural development. Table 1 covers focuses on the World Bank, which, because of the size of its portfolio and its influence, is the most important. Extension as a topic seems to have risen up the World bank agenda in recent years and it is anticipated that new lending in support of national agricultural extension systems will soon follow. While this may be rather traditional in outlook, the policy wing of the bank (the Agriculture and Rural Development department, ARD) has been getting to grips with perspectives that are more closely aligned with intermediation and institutional adaptation (notably their innovation systems work). If the extension and climate change debates in the World Bank could find new direction in pursuing institutional adaptation, FAO could develop a powerful partnership with them.

The USAID supported Modernising Extension and Advisory Services programme as already mentioned is likely to open up a space for experimentation where FAO could pilot its innovation support services for adaptation.

Although not discussed in the table, there are a number of niche donors that have a particular interest in climate change and agricultural development — for example, DFID and DANIDA (see the Bangladesh case). These may make useful partners in pursuing an institutional adaptation-based strategy.

3. Innovation Studies Organisations

The two organisations listed in this group, WAU and LINK, are illustrative of a wider community of innovation studies organisations that share a common understanding of the role

of intermediation in institutional adaptation and innovation. These organisations are not competitors for the role envisaged for FAO. These organisations could, however, make strong research partners, by assisting FAO in learning about the way institutional adaptation for climate change could be facilitated in different country settings. In addition both these organisations are engaged in action research experiments (see Convergence of Science, <http://cos-sis.org/open/ShowPage.aspx?PageId=5> and Research Into Use, http://www.innovationstudies.org/index.php?option=com_content&task=view&id=260 respectively that have example of the process of negotiating institutional change for innovation. Research under LINK has also explored institutional and policy responses to climate-related livestock emergencies (visit www.innovationstudies.org).

4. Specialist International Agencies related to Climate Change and the Environment

The initiative mentioned in this category is merely illustrative of the general nature of organisations working on these topics. These organisations are not competing for an intermediation role, but instead can act as a focus point for discussion about these issues. They are, therefore, a useful ally rather than competitor.

Gaps and Opportunities for FAO

As a starting point this study has taken the idea that extension professionals in the OEKR group in FAO could best contribute to coping with climate change by deploying their expertise in intermediation and negotiation to assist institutional adaptation. The argument here is that climate change requires new and evolving architectures of agricultural research and knowledge-based organisations and that the intermediation skills of the extension profession could help negotiate this new architecture. The analysis in this note explores if there is a gap in the international agency landscape for champion organisations for innovation support services for adaptation — adaptation services. The answer is that there almost certainly is a gap. However, this is despite the existence of potential strong competitors who, like FAO, are struggling to redefine their niche in the international agricultural development arena. Furthermore, the contested and often diffused mandate of these organisations results from the influence of the same stakeholder constituencies in the international agricultural development administration as those of FAO. In other words there is a role for FAO but it is unlikely to be able to play this role immediately for precisely the same reasons that no one else can.

Perhaps the answer to this conundrum is to approach the transition to this new role in a much more gradual manner. This might involve the FAO OEK-R group seeking to pilot a new role in intermediation for climate change-related institutional adaptation through a special project. For example it might seek funding from USAID's Modernising Agricultural Extension and Advisory Services Programme. This would allow the group to establish proof of concept and strengthen its professional orientation towards this sort of approach. The next steps might be to use the advice from this review to approach either the World Bank and or other niche donors (including USAID) to develop a pilot project of this sort. It is worth noting that the DFID representative seconded to the Agriculture and Rural Development department of the World Bank has an interest in these sorts of perspectives. A useful supporting activity might be for the extension group to review the way intermediation is being used in FAO climate change-related work. This would help further build the case that this is a strategic function for FAO in this development arena.

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