Social and Technological Transformation of Farming Systems:

Diverging and Converging Pathways

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Workshop 1.6: Merits and limits of innovation platforms to promote sustainable intensification in farming systems

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Farmers operate in an increasingly complex and uncertain socio-economic and agro-ecological environment, which requires continuous adaptation and innovation. The agricultural innovation systems theory maintains that innovation in agriculture often requires a combination of changes in technology and infrastructure (hardware), knowledge, skills and information (software) and organisation of agricultural systems (orgware). Agricultural intensification for its part requires different types of innovations and associated innovation processes: breakthrough innovations, diffusion of proven agricultural techniques, support to endogenous innovation, etc. They are complementary to each other and may involve different sets of stakeholders, levels of organisation and timeframes depending on the specific context. Research and development initiatives increasingly use multi-stakeholder approaches in order to promote innovation in general, and sustainable agricultural intensification in particular. Innovation platforms are one instrument that is increasingly used and promoted to operationalise a multi-stakeholder approach to innovation fostering and diffusion. By bringing different stakeholders together to work towards a common vision or goal, innovation platforms provide a specific space and resources which can be used to foster information exchange, negotiation, planning, action and reflection. However, recent experiences in sub-Saharan Africa (e.g. Africa-Rising, ABACO, DONATA, SIMLESA) suggest that innovation platforms tend to be implemented in a rather mechanical and narrow way. Furthermore, IP leadership tends to devote (too) much energy and resources to the technological aspects of sustainable intensification and not enough to tackling the underlying learning, institutional and organisational issues which affect sustainable intensification. It also struggles to tackle the non-linear, multi-dimensional, multi-scale and unpredictable nature of any innovation process. Furthermore, focusing too much on the IP tool itself, as is often the case, tends to overlook the fact that there may be other means and avenues for fostering participatory, multi-stakeholder innovation design, delivery or adaptation (such as policy, subsidies, taxes, market regulation, etc.). This half-day workshop was an opportunity to share experiences on the use of innovation platforms and similar multi-stakeholders endeavors for sustainable intensification and to develop generic lessons and recommendations for the AR4D community. Researchers and practitioners were invited to present empirical cases, describing candidly the successes and failures, the opportunities and limitations of using an AIS approach for sustainable intensification of farming systems. We were also interested in papers focusing on conceptual or analytical frameworks which are being used or could be used to design, monitor and strengthen the approaches to innovation in general. The intention was to use the workshop to produce a subsequent joint review or comparative paper.

Agricultural innovation platform dynamics: a conceptual framework to analyse knowledge production

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Abstract: Innovation platforms (IPs) appear to be one of the most appropriate tools to operationalise research for development. Increasingly, agricultural research initiatives for development set up innovation platforms to facilitate the management and support of innovation processes; yet the mechanisms by which they operate are not well understood. This paper seeks to open the 'black-box' and proposes a framework to analyse processes that occur in innovation platforms from inception to maturity. Firstly, we use a New Institutional Economics (NIE) based analytical framework for the monitoring and evaluation (M&E) of IP performance. Secondly, from a review of the literature, we identify three ways through which research could be done within IPs: 1) soft transfer, when research has readily available results that could help solve jointly identified problems; 2) co-creation, when researchers and IP members develop research objectives and protocols together; and 3) community-based research, when IP members set up experiments on their own. We propose that both frameworks should be used to improve the monitoring of IP dynamics.

Keywords: Demand-driven research, innovation platform, innovation processes

Introduction

An increasing number of agricultural research initiatives for development use innovation platforms (IPs) to facilitate the management and support of innovation processes. Innovation platforms are increasingly seen as a promising vehicle to operationalise research for development. The innovation platform is an arena where various categories of stakeholders related to a specific crop or crop system can meet to exchange and discuss problems and constraints, and collectively propose solutions. Essentially they are spaces for learning, to implement change and to support the scaling-out and scaling-up of solutions. In the field of agricultural research for development (AR4D), IPs are an important element in working towards more structural and long-term collaboration and engagement between stakeholders in the agricultural sector, and essential to achieving development impacts. Ideally, through innovation platforms, researchers and other stakeholders rely on each other to achieve impact at scale but unfortunately collaboration for AR4D has been insufficient so far. Understanding what affects IP performance and by what processes IPs achieve impact is therefore important to be able to improve the success of this potentially valuable development tool. IP short term performance is mainly measured through its capacity to support the implementation of activities. The complex processes leading to the identification of R4D activities in IPs are poorly understood and not well documented, but are crucial to assessing mid- and long-term performance of IPs. Structural data such as the type of actors, the level of their participation, their attendance at meetings, have to be complemented with observations and monitoring of details such as who raises issues, makes complaints and contributions, and particularly who takes the decisions and what type of decisions they are. This allows for the identification of processes not working as desired within an IP, which structural information alone would not reveal. For example, when powers are unbalanced within an IP, decisions could be taken by a small group of actors, and yet the same number of people may be recorded present at the meeting.

In this paper, we provide a framework to analyse and assess the level of maturity of IPs, particularly those established within research and development projects. We hypothesise that IPs function as a governance body (Mathé, 2009) and that the management and support of innovation processes have a strong influence on IP performance. Accordingly, we develop a New Institutional Economics (NIE) based analytical framework for the M&E of IP performance which goes beyond identifying categories of stakeholders and their interactions. We detail this framework and identify three processes within IPs: 1) *soft transfer*, when research has readily-available results that could help solve joint-identified problems; 2) *co-creation*, when researchers develop research objectives and protocols together with all platform members; and 3) *community-based research*, when communities set up their own experimentation. These three processes can co-exist within the same platform but at different levels, depending on the maturity of the platform, and we identify the main characteristics and drivers that lead to the transition from one process to another. We investigate whether IP functioning influences the type of processes that lead to activities carried out by the IPs (demonstration plots, trainings, participatory trials). A key assumption is that IP platforms often face difficulties in reaching maturity before the end of the project due to the forms of institutional arrangements between researchers and other IP members. Reaching maturity is not directly related to longevity or the number of activities implemented. In fact, maturity has various dimensions, and can be assessed through the multiplicity of embedded commodities, the capacity to address system trade-offs and policy impact and scaling as a long term vision of innovation platform performance (Schut et al., (2015)). Humidtropics, a CGIAR research program on integrated systems for the humid tropics, has built on innovation platform initiatives and successes to pilot two multi-stakeholder platforms (MSP) to develop joint action and science-based solutions through an integrated agricultural systems research.

We take a case study of three innovation platforms and one AR4D platform in Cameroon, and analyse them in the context of the developed framework. This paper is structured as follows. The first section describes the analytical framework and the three processes we want to study.

The second section presents the methodology we used to identify the nature of processes occurring during the establishment of mother and baby trials (Snapp, 2002) with IPs in the Cameroon field sites of Humidtropics. In the third section, we discuss how this framework could be used to evaluate platform maturity and, more generally, long term performance. From there we make some recommendations for future research in this field. We conclude that the benefits of focusing on actor interactions within a system approach, and also on the IP governance mode, help to assure their performance in achieving development goals in the long term.

Conceptual framework

IP functioning conceptual framework

There is no universally accepted evaluation tool for innovation platforms within Research and Development (R&D) projects. Some practitioners have proposed grids and parameters to monitor and analyse innovation platform performance (Damtew & Duncan, 2015). These manuals propose to monitor IP in a structural manner, focusing on the number of meetings and the number and categories of participants. However, these elements don't provide enough information to monitor the processes occurring within the IP. Instead, we propose to analyse IP dynamics by looking at processes rather than simply structures, using an analytical framework that builds on New Institutional Economics (NIE) approaches (North, 1990; Ostrom, 1990). This approach focuses on the extent to which the performance of a governance body is linked to its functioning. It identifies two elements: (i) the institutional environment (policies, laws, regulations), i.e. 'the rules of the game' and (ii) the institutional arrangements, i.e. how actors 'play the game'. The former is related to a set of institutions and the latter to a set of organisations, both of which could be formal or informal (North, 1990).

In this study, we take IPs as governance bodies and identify the mechanisms through which they function. Some interactions occur outside of the IP boundary, but can have a strong influence on its functioning. We identify three core mechanisms through which IPs work: (i) decision-making mechanisms; (ii) operational mechanisms; and (iii) knowledge and information systems. In addition, we distinguish two secondary components that impact IP function: (i) the institutional framework, policy and financing; and (ii) the social network that are potentially pressure groups outside of the platform boundary (Figure 1). We describe in detail each of these three core mechanisms of IPs.

Decision-making mechanisms

Decision-making theory describes two elements to making decisions: (i) how problems and constraints are analysed and articulated; and (ii) the rationale and criteria used to make the decision.

The former, how situations are analysed and articulated, is similar to the process of sense-making described by Weick et al. (2005): "*Sense-making involves turning circumstances into a situation that is comprehended explicitly in words and that serves as a springboard into action"*. Identifying problems or constraints through a sense-making process is a central step and facilitates collective decision. In IPs, this is linked primarily to the capacity of the platform members to collectively analyse problems and constraints. Through the presence of multiple stakeholders, IPs facilitate the capacity to analyse problems in a holistic way through to the sharing of information.

Secondly, the set of rationales and criteria used to make choices within an IP is influenced by institutional arrangements that outline the range of actions and potential solutions. Each stakeholder has their own rationale and criteria to solve problems based on information available to them, the way risks are evaluated and behaviours related to these risks. These elements represent potential transaction costs (Williamson, 1985) which could slow down the process. It is in the interests of the platform to access, produce and make available to members all information in order to identify best-bet solutions. The decision then consists of identifying a range of solutions available and choosing the most adapted solutions. In other words, IP decisions are larger than whether or not to adopt a technology. Decisions within the platform are taken collectively through institutional arrangements, but the degree of collectiveness depends on the distribution of power within the platform.

Knowledge and information systems

The lack of information and knowledge, often associated with power imbalances, can be a main source of high transaction costs which can slow down institutional arrangements within the platform. In an IP, information and knowledge generally comes from various stakeholders of the platform but new knowledge can also emerge from the dynamics of interactions between stakeholders through learning-by-searching and learning-by-doing. Knowledge management involves knowledge provisioning and also hybridisation (Callon et al., 2001; Mathé & Rey-Valette, 2015; Lyet, 2016) or conversion (Nonaka et al., 2000) of the knowledge. In fact, two types of knowledge are identified. The most obvious is the *scientific knowledge*, which contrary to the model of innovation based on technology pull, is no longer dominating the knowledge domain. The second type is the *tacit knowledge* that is non-codified and is generated through exchange of experience, observation and imitation (Nonaka et al., 2000). Tacit knowledge is crucial in demand-driven innovation processes because it is the invisible reservoir of experiences. The main issues are how to reveal and activate this tacit knowledge and how to facilitate hybridisation between tacit knowledge and scientific knowledge, especially given that information sharing is not obvious. Issues around appropriation of scientific knowledge by communities, and recognising community needs and know-how within research activities, remain insufficiently understood. Analysis of the information–sharing component of IPs therefore permits a measure of the level to which knowledge is capitalised within the platform. It also allows us to understand the extent to which researchers and community members share a common set of knowledge to build on. In the different innovation processes, the size of this component could vary.

Operational mechanisms

Operational mechanisms result from the convergence between decision mechanisms and the information and knowledge systems. This component describes the activities implemented within the platform through institutional arrangements (market or non-market based) between actors. Most activities are not directly related to marketing, such as the implementation of demonstration plots or training sessions. Some marketing activities may be implemented, such as developing trade contracts between producers and traders, or between nursery operators and producers. In essence, this component measures the capacity of the platform to implement concrete activities and develop formal or informal market contracts.

Institutional framework, policies and financing

The institutional framework depicts the context in which platforms evolve and is a part of the institutional environment (North, 1990). The institutional environment is defined as the social, political, financial and legal rules that support interactions in a society. It is related to institutional arrangements that represent the way individuals coordinate when they interact - i.e. the intermediary level between the institutional environment and individuals. Innovation processes occur within an institutional environment and emerge through the construction of a multitude of institutional arrangements. There are different levels of institutional environment: the general one that covers all activities in a society, and more specific levels linked to specific activities, in this case R&D. According to Hall et al. (2003), the institutional context for R&D concerns the rules and norms that govern it as a social process of learning. The institutional framework contains the institutional environment and arrangements. For Edquist (1997), it refers to routines, norms, shared expectations, and morals that pattern behavior. This institutional framework contains the modality of research financing that influences directly decision-making mechanisms within the platform due to the high power this financing can give to researchers.

Social network

The influence of the social network outside of the IP should be considered. Each IP member represents a group of actors who have their own interests and can influence their representatives. These social networks are also the channels through which the knowledge built within the platform can be disseminated (Bandiera & Rasul 2006). Indeed, these networks are an important means of scaling out new knowledge.

The NIE analytical framework

In this New Institutional Economics (NIE) based analytical framework, understanding the interactions between components is crucial to explain processes that occur with the platform. For example, decision-making mechanisms are influenced by the information and knowledge available and produced, feedback from the activities implemented, the institutional framework and the social networks which may influence the platform members' decisions. Figure 1 shows a diagram of the system. The platform facilitator and other free actors (Wielinga & Vrolijk 2009) can influence the intensity and direction of the efficacy and success of interactions between the components (the arrows in Fiigure 1) in order to enhance IP performance. The following analytical framework should lead to a better understanding of IP members' involvement in the different components, and allow the identification of disturbing and unbalanced situations within the platform that could reduce its performance. Each component and the influence it wields (the size of the arrow) can change depending on the context, the phase of the IP and the function emphasised.

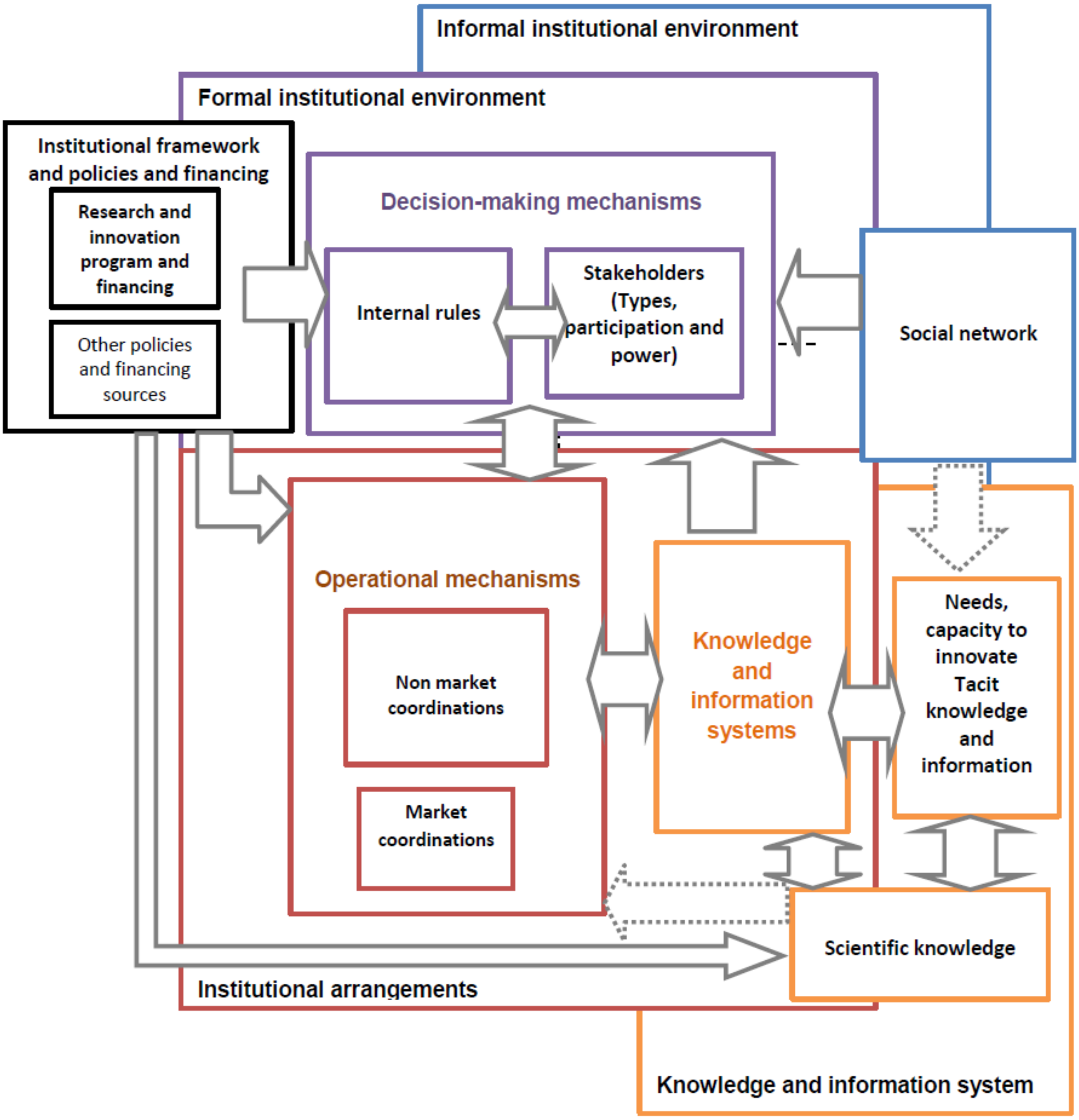

Figure 1. Analytical framework to study innovation platform functioning (*Source: Adapted from Mathé (2009)*)

Innovation processes within IPs

We describe a typology of processes which can occur within an innovation platform, particularly within an agricultural context (Figure 2), namely: (i) soft transfer; (ii) co-creation and (iii) community-based research. These three processes have been described in various ways in the literature. *Soft transfer* is where research has readily-available results that could help solve jointly identified problems or could also occur when research tries to enforce its own interests using its powerful position (financial or social). This model aligns with the Transfer-of-Technology (ToT) model (Nagel, 1997) and diffusion theory (Rogers, 2003). Soft transfer in innovation systems requires that we bring the linear logic of innovation into systems thinking. This model can be appropriate when the relations between research and its intended beneficiaries are quite new and both need to better know each other through interactions. In addition, soft transfer can gradually reduce resistance from researchers to move away from a traditional ToT model to a new way of interacting with the final users of their research (Paulré, 2004). These resistances can be unlocked thanks to learning processes and the way researchers embed their work in the platform activities. Soft transfer processes are more present at the inception stage of the platform.

Co-creation processes occur when researchers develop objectives and protocols jointly with platform members (Wielinga & Vrolijk, 2009; Nederlof et al., 2011; Kilelu et al., 2013; Schut et al., 2015), resulting in the integration of scientific and tacit knowledge to create new knowledge. Co-creation requires some time after IP inception to allow researchers to develop a good understanding of the context and the demand, but also to gain the trust of stakeholders. It is based on the capacity of researchers and other IP members to build sense-making of problems and find solutions together. The presence of this type of process in a platform comes from the investment of both researchers and other IP members. When it occurs, it can have self-reinforcing effects, which means that co-creation processes can generate other ones. The existence of an IP facilitator playing the role of intermediary or broker is critical to support this type of process.

Community-based research occurs when platform members are empowered to carry out their own research and experiments. They can call upon researchers' expertise to endorse or improve their experiments. These processes are well described in literature using various concepts, such as positive deviant (Pant & Hambly Odame, 2009), farmer-lead research (Waters-Bayer et al., 2015), endogenous innovation and social innovation (Bock & Fieldsend, 2012). All these concepts emphasise the primary role of communities within innovation processes.

The platform is an arena that promotes knowledge exchange and learning among members. From the community point of view, the three processes correspond respectively to knowledge transfer or internalisation, knowledge hybridisation and knowledge externalisation.

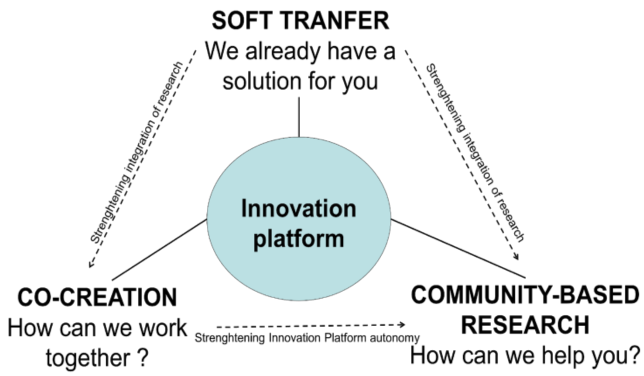

Figure 2. Three ways to undertake demand-driven research with innovation platforms (*Source: authors*)

The three processes can occur simultaneously within platforms and depend on the type of activities that are implemented.

Methods

Characterisation of the three processes

From the previous analytical framework described, we developed a matrix-type table crossing the three processes and the three primary components of an IP. This matrix aims at characterising what happens in the different components of the IP functioning relative to the three processes that we identified (Table 1).

Table 1. Description of the three processes through the analytical framework

	Soft transfer	**Co-creation**	**Community-based research**
Decision-making mechanisms	Strong presence and influence of research in the decision-making	Co-decision between research and IP members	Community-based decision. Research could play the role of advisor
Operational mechanisms	Community applies research recommendations	Implementation of activities in an interactive way	Community implements its own research activities / experiments
Knowledge and information systems	Little conversion of scientific knowledge into shared information and knowledge	Strong hybridisation of tacit and scientific knowledge	Tacit knowledge is used and valued.

The passage from one to another comes through moments of bifurcation or transitions that change the nature of the relation between members of the platform including researchers. This does not mean that the passage from one process to another is irreversible. However, the probability of a switch from co-construction to soft transfer processes becomes lower with time.

Description of the case study

Using the grid in Table 1, we observed and analysed the processes occurring as platforms within the Humidtropics programme were set up and established. Humidtropics is a research programme on integrated systems to improve the livelihood of rural poor. This programme uses a system-based approach to put people at the centre of research interventions.We describe the platforms established by HumidTropics in Cameroon. This includes a national platform, 'R4D platform' and three regional IPs in the North-West (Batibo), the South-West (Kumba) and the Centre (Mbalmayo) (Figure 3). These three sites were selected by the R4D platform during its first meeting in February 2014. The R4D platform is composed of national representatives from farmer organisations, private sector, government, research and academic institutions and civil society. Its roles are: (i) to identify the constraints and main challenges for the development in the region; (ii) to identify the entry points for R4D interventions; (iii) to conceptualise and develop research protocols; and (iv) to organise and implement R4D interventions. IPs are established at the lowest level such as district or communal level and are composed of the same categories of R4D stakeholders but acting at this lower level. They aim to support and co-implement activities on the ground.

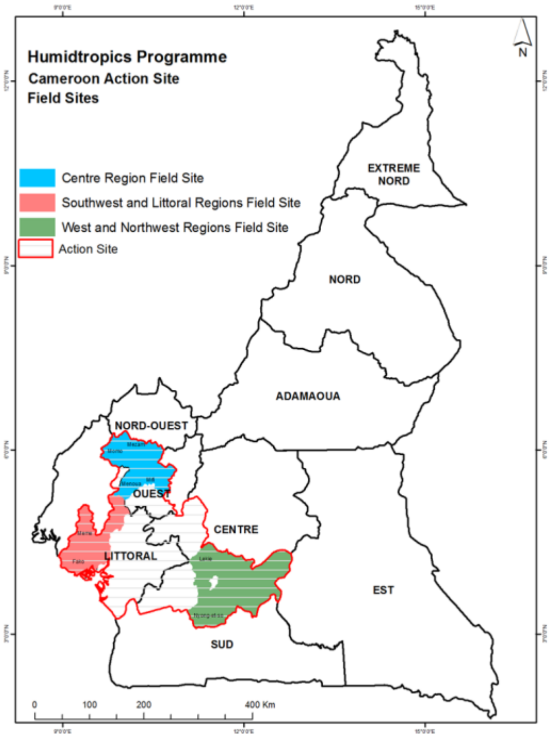

Figure 3. Field sites within Cameroon

IPs in Cameroon

A R4D meeting in May 2014 identified the main entry themes for the Cameroon Action Site through the use of Rapid Appraisal of Agricultural Innovation Systems (RAAIS) (Schut et al., 2015). They were: (i) improving the input supply system (improved planting materials, seed in quality and quantity, fertilisers and pesticides); (ii) soil degradation and fertility management; (iii) pests and disease management; (iv) improving access to land and property rights; (v) farmer access to financial and agricultural product markets; and (vi) develop partnerships among agricultural sector stakeholders. These entry points were decided upon at the IP level during the first IP meetings in each of the three field sites. Main tree crops and food crops related to their constraints were specified.

The three IPs in Cameroon have followed the same sequence during the inception steps. The meetings gathered representatives from farmer organisations, researchers, government, private sector (marketeers, processors, transporters...), NGOs and civil society, etc. In the first meeting organised (from June to July 2014), after presentation of the programme, participants were asked to rank the main crops grown in their farming system. In the Centre IP, the main crops, in order of importance, were cassava, cocoa and maize but participants emphasised the short term profitability of maize, tomatoes, chilli and okra. The main constraints were low access to seeds, conservation for maize, price and market issues for maize and cocoa, and pests and diseases for cocoa. The same exercise was repeated for the other two platforms. In addition, at each platform, a steering committee was elected with a representative from each of the stakeholder categories present at that meeting. These committees were set up to serve as a link between the IPs and the Humidtropics' management team. A facilitator was also designated to each IP.

After this initial meeting, a long period of platform inactivity followed. During this time, R4D members, and particularly researchers, were able to evaluate their capacity to respond to the platforms needs, i.e. (i) by providing ready-formed solutions that had already been developed, (ii) by formulating research questions able to respond to the IPs' demands and (iii) by raising funds to make these platforms work. During this period of latency, some ad-hoc meetings were organised at the field side level, but all activities were concentrated within the R4D platform. Funds to develop activities at the field level eventually came through a mechanism called cluster 4. These funds, from a Humidtropics programme, were dedicated to implementing activities involving IP members.

The funds now being available, a meeting was organised at each platform to reorient the focus towards what researchers could offer to address the priorities raised by IP members one year previously. For example, in the North-West IP, researchers proposed working on maize constraints instead of yam, as there was no expertise or proven technology on yam cultivation and conservation available within the R4D platform. After the reorientation, researchers proposed the establishment of mother and baby trials with selected crops from their portfolio of proven technologies, and cropping practices specific to each IP were developed. In addition, they proposed capacity building activities to strengthen the IPs. In the North-West, IP members accepted the proposed interventions and the trial design raised enthusiasm among participants, who promptly proposed sites where the trial plots could be established. In the Centre, there were more discussions around the proposed crops and trial design. Participants argued for inclusion of more local varieties, particularly of cassava, in the proposed trials. They insisted on local varieties that seem to be more suitable for processing into 'baton' (the main commercial product from cassava in the area), compared to the improved varieties. The experience of the Centre shows the importance of a strong facilitation of this step in co-creation where participants should be encouraged to express themselves and amend propositions from researchers. We clearly identify the strong role of research at this stage and the difficulty of hybridising tacit and expert knowledge in the processes. Activities, such as the establishment of mother and baby trials, were implemented in each field site soon after these meetings with the IPs (Table 2).

Table 2. Establishment of mother and baby trials in Cameroon action site

	Centre (Mbalmayo)	South-West (Kumba)	North-West (Batibo)
Principal crops selected for the plots	Maize, cocoa, plantain, vegetables and cassava	Maize, cocoa, plantain, vegetables and cassava	Maize, beans and cassava associated with calliandra and thitonia for soil enrichment
Number of mother trials established (place)	2 (Nkolget and Bilik)	2 (Kumba and Konye)	5 (Batibo, Bali, Bafut, Nsongwa and Tubah)
Number of farmers who established baby trials (origin of seeds*)	20 (IRAD, AVRDC, IITA)	30 (IRAD, AVRDC, IITA)	60 (IRAD, IITA)

**IRAD: Institut de recherche agricole pour le développement, AVRDC: The World Vegetable Centre, IITA: International Institute of Tropical Agriculture*

Since then, we have seen some evolution in the three platforms. They have become increasingly autonomous, particularly in terms of organising meetings and the identification of new topics they want to work on. For example, the South-West platform wrote a proposal, with the support of the AVRDC (The World Vegetable Centre), to raise funds from the Forum for Agricultural Research in Africa (FARA) to finance cassava processing. In the Centre, there is a real interest among the platform members for the activities set up, people are increasingly, openly expressing their needs and what type of activities they are interested in. For example, they are strongly interested in vegetable cropping even though it is quite a marginal crop in the area. There are some arrangements between researchers and farmers for training on seed multiplication. In the North-West platform, they are also interested in testing new vegetables and they asked for support from research to better understand how they could have a better use of their local market information system. We observe a tendency of the platform to be more able to discuss with the researcher through co-creation processes and also to be more autonomous and envisaging testing new ideas themselves and asking for research support.

Discussion

Supporting platform maturity

From Table 2 we can see that more activities were implemented in the North-West platform than in the Centre, in terms of the number of farmers who established baby trials. However, this is a view of the end-point, and does not show anything about the processes that lead to IP activities or why those differences might exist. In order to achieve more co-creation and community-led research in IPs through a R4D project, three main challenges need to be tackled; all of which require time and trial-and-error experiences to help researchers and other platform members to work together.

The first challenge, from the researchers' perspective, is the need to learn to work with IP members to formulate research questions related to demand and to avoid the pitfall of proposing existing technologies without adapting them to the local situation. The researcher's capacity to make this adaptation sometimes requires a change in research posture or practice, which may imply the need for simple and double-loop learning processes (Argyris & Schön, 2002). Simple loop learning is guided by a new way of doing research and double-loop learning is related to changes in terms or values. For the present case study, it is about how researchers change their vision of research and adopt or reinforce the system dimension in their work.

The second challenge, for IP members, is the need to formulate their constraints more clearly, and also to build sense-making for these constraints to be able to formulate a well-defined demand to the R4D platform.

The third challenge, for all IP members and researchers, is taking the time to build trust, particularly if they have never worked together within a system approach before. Inter-personal trust is a key element of innovation processes (Torre, 2008). This trust is built through interactions between stakeholders and also building the capacity of both researchers and IP members to share and reconcile their respective scientific and tacit knowledge.

One of the first aims of the IP is to build a common base of knowledge and information. In this process, the role of the facilitator is crucial in order to break down scientific knowledge so that it can be understood and to explore the tacit knowledge of members. To this effect, a training session was organised for West African Flagship facilitators. It aimed at strengthening facilitators' capacity to analyse tricky situations and support processes within the platform. The facilitator has to help with the implementation of shared internal rules and the organisation of the continuity of information and knowledge exchange. The facilitator also helps to balance the power between actors within the platform.

The advantage of the system approach and the use of platforms within this lies in its potential to facilitate the development of 'mature' platforms. Yet often platforms are set up within R4D projects with the sole goal being the 'transfer of technologies' (ToT). The ToT approach, however, underestimates the various functions innovation platforms could play in the long term (Hekkert et al., 2007). Platforms can in fact support various functions if their path to maturation is supported. These functions include entrepreneurial activities, knowledge development, knowledge diffusion through networks, guiding the search of knowledge, market formation, the creation of legitimacy and counteracting resistance to change. These functions all support the generation of sustainable outcomes.

Indicators to monitor processes within IPs

Based on Dror et al. (2016), we propose a model showing the distribution of the processes occurring in IPs from their inception to maturity (Figure 4). In most cases of platforms that are set up by R4D projects, the soft transfer of technologies seems to dominate in the initial stages as researchers try to find solutions to constraints expressed by the platforms by going through their portfolio of research results. This situation can be accentuated by pressure from donors to show evidence of dissemination and adoption of research results. The trajectory to co-creation and then community-based research occurs when the three main challenges highlighted above, start to be addressed. This is a common trajectory in group dynamics, namely starting from divergent thinking and eventually reaching convergent thinking (Leonard & Sensiper 1998). These convergences can be explained by the multiplication of institutional arrangements between researchers and other stakeholders within the various processes. At the inception of platforms co-creation could exist if researchers and IP members were already used to working together. Similarly, community-based research can occur when platforms are built on existing groups that are already dynamic. The trajectory from soft transfer or co-creation to community-based research could be driven by strengthening IP members' capacity to innovate (Leeuwis et al., 2014).

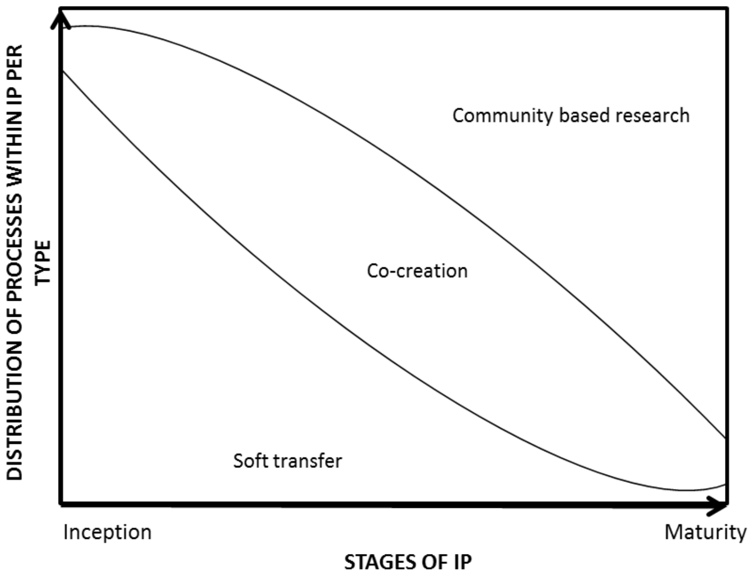

Figure 4. Dynamics from inception to maturity of innovation platform in R&D projects (*Source: authors***)**

The framework we propose to monitor the types of processes leading to activities within platforms is useful to guide a long-term vision of platforms. Mature platforms are more able to support and promote sustainable intensification in farming systems and its scaling out and up. These monitoring indicators help to assess whether an IP is on the right track to achieve maturity through empowerment of IP members. It could also highlight tension between researchers' needs and other IP members' needs.

Conclusion

The operationalisation of IPs for integrated agricultural systems research and interventions does not follow a linear process. The soft transfer process tends to dominate in the initial stages when researchers and other platform members are learning to work together, and in the absence of a facilitator or any type of skilled facilitation. Interactions between researchers and other platform members and the roles they play co-evolve with IP maturity, as processes of co-creation and community-based research develop. How demand-driven research is implemented depends on the maturity of the platform and particularly on the capacity of researchers, facilitators and platform members to create genuine interactions and learning processes based on trust, decision-making and the capacity of researchers and IP members to integrate various sources of knowledge to build new ones.

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Innovation platforms beyond projects and commodities: a case study of Lundazi, Zambia

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Abstract: Innovation Platforms (IPs) are undoubtedly the most common manifestation of the growing popularity of Agricultural Innovation System (AIS) thinking in Agricultural Research for Development (AR4D) in Africa. Born out of the realisation that constraints to agricultural development are not merely technical in nature, and often located beyond the farm-level, AR4D projects increasingly initiate such multi-stakeholder platforms from a utilitarian perspective. The formation of IPsis - often driven by donor demands for stakeholder participation and impact at scale - may be merely to act as a communication tool serving projects' dissemination strategy. This utilitarian approach towards IP formation is also evident in a common disregard for existing multi-stakeholder fora, which may result in a plethora of project-based IP's. The focus of AR4D projects usually determines the organisational modus of such IP's; platforms may bring together actors along a particular value chain or stakeholders involved in the extension of particular agricultural technologies such as Conservation Agriculture (CA). Project focus and organisation usually also shapes at what level IP's are organised – locally or at higher levels. Project-initiated IP's also raise the issue of sustainability; they run the risk of disappearing when a project ends. This case study analyses the institutional development, embedding and integration of different multi-stakeholder fora in eastern Zambia. It describes how different project-based IP's developed alongside one another undermine one of the key functions of IP's – network brokering and coordination. The paper makes a case for linking IP initiatives to existing (government) structures, not merely for coordination, but to improve agricultural sector governance. In the absence of a government policy framework for agricultural system innovation, the Lundazi district government in eastern Zambia now chairs an integrated multi-stakeholder platform. Such local embedding does not mean, however, that the platform has the capacity to innovate or that its sustainability is secured. Platforms are, by definition, dynamic and somewhat fragile. After all, they depend on an enduring capacity to bring together and broker interactions between stakeholders with only partially overlapping interests.

Keywords: Innovation platforms, agricultural innovation system, multi-stakeholder, agricultural research for development, project-based.

Introduction

Innovation Platforms (IPs) are undoubtedly the most common manifestation of the growing popularity of Agricultural Innovation System (AIS) thinking in Agricultural Research for Development (AR4D). Born out of the realisation that constraints to agricultural development are not merely technical but often located beyond the farm level and of organisational and institutional nature, AR4D projects increasingly initiate such multi-stakeholder fora. IPs are a well-documented 'phenomenon' (see, for example, Nederlof et al., 2011; Nederlog & Pyburn 2012; Sanyang et al., 2016; Dror et al., 2016). They are conceptualised as a group of individuals or organisations, often interdependent, that come together to exchange knowledge and tackle problems (Nederlof et al., 2011; Homann-Kee Tui et al., 2013; ILRI, 2012; Schut et al., 2016).

This case study documents and analyses the institutional development of one such multi-stakeholder forum in Lundazi, eastern Zambia. It describes how two different project-based initiatives were integrated in order to strengthen project activities and coordination within the district; a major function of IPs. This case study makes a case for linking IP initiatives to existing coordinating institutional structures, not merely for coordination - which is key to scaling-up - but also for improved agricultural sector governance and learning (Nederlof & Pyburn, 2012; Mur & Wongtschowski, 2013; Pyburn & Woodhill, 2014).

Methodological approach

The authors supported the IP in Lundazi from 2013 until 2015, in the context of a collaboration between the Consultative Group on International Agricultural Research's (CGIAR) research programme on maize (referred to as MAIZE) and the Royal Tropical Institute (KIT). The authors used a participant observation approach by actively engaging with platform members and local stakeholders in Lundazi. The authors have been present at, and documented the results of, five IP meetings in the above-mentioned period. In addition, semi-structured interviews were carried out with representatives of the District Administration, the Sustainable Intensification of Maize Legume Systems for the Eastern Province of Zambia project (SIMLEZA) and the Conservation Farming Unit (CFU) of the Zambian National Farmers' Union (ZNFU).

Results

The formation of the Lundazi agriculture stakeholders' platform

To understand the emergence of agricultural innovation platforms in eastern Zambia, it is first necessary to elaborate on how agricultural governance is organised, and how government organisations coordinate the activities of different stakeholders.

Lundazi District[1], on which this case study focuses, is a relatively remote district, two hours' drive to the north of the provincial capital, Chipata, which is located on the main road and trade route connecting Lusaka and Lilongwe in Malawi (Figure 1). Population densities in Lundazi are substantially lower than in Chipata District (23 persons/km^2 vs 68 persons/km^2) (CSO, 2014). Both input markets and agricultural produce markets for Lundazi farmers depend to a large degree on the connection with Chipata. Important crops grown in Lundazi include maize, cotton, tobacco, sunflower, soya bean and common bean. There is a guaranteed market for maize as the Zambian government buys maize through its Food Reserve Agency (FRA). There is a good presence of private sector input suppliers and produce traders in the district. There is also considerable NGO presence. The NGO with the highest coverage is CFU. CFU's focus is on disseminating conservation farming: a set of soil and water conserving practices that aim to sustainably intensify agriculture. Many other NGOs and projects work on conservation farming/agriculture (CA) in the area.

[1] Lundazi District borders Malawi, covers 14,068 km^2 and has a population of approximately 324,000 people (CSO, 2014).

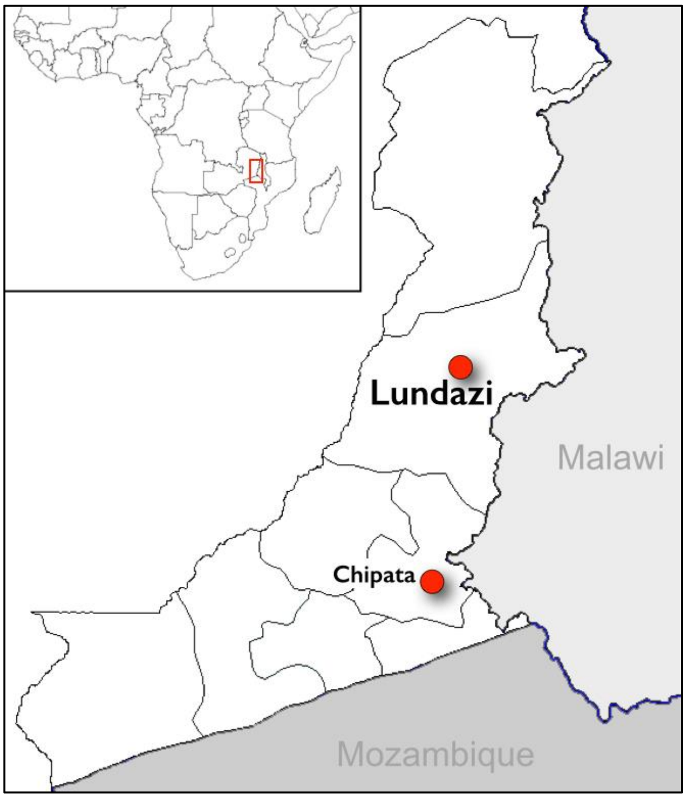

Figure 1. Lundazi district in Zambia's Eastern Province

Local governance bodies are operational at different levels in Lundazi (and overall in Zambia) (Figure 2). Of particular importance is the Camp Agricultural Committee (CAC), the camp level governance body and the Office of the District Coordinator Agriculture and Livestock (DCAL). The DCAL plays a pivotal role in providing marketing information both to input suppliers and to buyers.

The District Development Coordinating Committee (DDCC), is a high-level meeting bringing together government officers from different sectors at district level. All projects and organisations are expected to report to the DDCC on a quarterly basis, indicating both activities carried out and plans for the following quarter.

The extension workers at camp level (CEO – Camp Extension Officers) work under the leadership of the DCAL, and act as secretariat to the CAC. The level of their real presence at the camp varies greatly, due to staff shortages. Not all camps have a resident CEO. Sometimes a CEO has to cover up to three camps which are relatively far from each other. Where functional, the CEO operates as a link between the District Agricultural Office and the camps, bringing and taking news and linking farmers to other initiatives and actors. The DCAL in turn acts as a bridge between projects and the agricultural camps. The DCAL's office is supposed to be informed of all activities taking place in the district, and has to make sure these activities are well coordinated. The DCAL meets with the CEOs and is supposed to bring key challenges and issues to the DDCC.

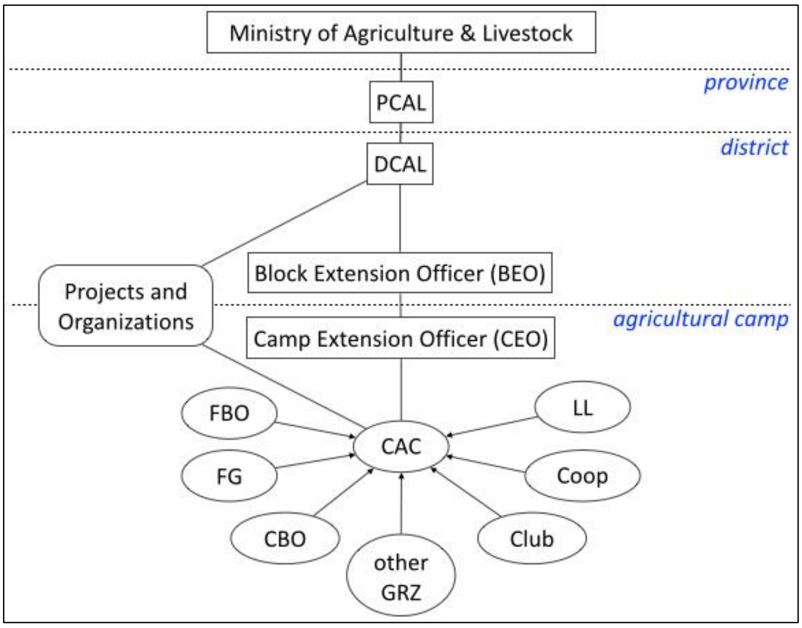

Figure 2. Organisation of Ministry of Agriculture and Livestock from national to local level and relations with local level stakeholders.
(PCAL/DCAL – Provincial/District Coordinator Agriculture & Livestock; CAC – Camp Agricultural Committee; FBO – Faith based organisations; CBO – Community based organisations; FG – Farmer group; LL – Local leaders; Coop – Cooperatives; Other GRZ – Other Government of the Republic of Zambia institutions)

The Conservation Agriculture Committee

Conservation Agriculture is a common focus in agricultural interventions in rural Zambia. International agencies (such as FAO and NORAD), NGOs and research organisations promote CA in the country. Lundazi is no exception.

There are, nevertheless, considerably different definitions of CA (see: Andersson & D'Souza, 2014). Whereas FAO defines Conservation Agriculture as a combination of three principles (minimal soil disturbance, crop residue retention and crop rotation/diversification), the CFU uses the term Conservation Farming (CF) for this, and speaks of CA for a situation in which farms' dependency on external inputs is reduced. CA then, is CF with the integration of nitrogen fixing *Faidherbia albida* trees and fruit trees (Andersson & D'Souza, 2014). In the CF the use of chemical fertilisers and herbicides is strongly supported. CFU recommends farmers to dig small basins for planting or to use animal draw rippers. COMACO (Community Markets for Conservation), another NGO working in the area, discourages the use of agro-chemicals. It promotes zero-tillage, retaining crop residues and the application of home-made fertiliser - the latter element is seen as an important component of "their" approach to CA. Although they also work with planting basins, they promote much larger ones.

In 2010 the CFU set up its first office in Lundazi, headed by Clement Mwankotami. Clement had just been transferred from Chipata, where he was the chairman of a district-level IP on CA, supported by the DFID-funded project Research Into Use (RIU).

When arriving in Lundazi, Clement realised that projects working in the area had very different approaches to Conservation Agriculture. These differences posed challenges to those promoting CA at camp level. When CFU started working in the district farmers with whom it worked refused to follow its recommendations, sticking to what they had been taught earlier.

CFU approached the DCAL and shared the problem, suggesting (building on the experience with the IP in Chipata) that all stakeholders should be called to a meeting to discuss the definition(s) of CA. The first meeting of what was later to be known as the "Conservation Farming Committee" was held in June 2010 and brought together all organisations working with CA in the district. The objective of the meeting was to ensure that organisations would 'make space' for each other, recognising each other's approaches to CA. As it evolved, the committee started to support the alignment of different CA projects, for example by agreeing that projects should not use the same lead farmers.

For the DCAL the Conservation Farming Committee turned out to be an effective way to gather the necessary data for their own reporting, such as to the DDCC and the provincial government. In 2013, the committee formally became a sub-committee to the DDCC. The DCAL acted as its chair, and the CFU as secretariat of the meeting. Originally started as a committee trying to harmonise CA promotional messages of different agricultural development projects, the committee's main activity thus became to gather and share reports on all the projects working in the district.

Organisations and projects active in the district would attend the meetings, covering their own transportation costs, while lunch and drinks were provided by the different projects on a rotational basis. This was an important change Clement had made in comparison to the organisation of the Research-Into-Use IP in Chipata, where the project had paid allowances to participants. After the project ended, the Research-Into-Use IP in Chipata became defunct as no other organisation took on the task of paying allowances. Participants from both the public and private sectors became discouraged. As well as the unsustainable allowances the collapse of the IP was also due to some key persons being transferred to other districts.

The SIMLEZA project: linking on-farm experiments to a wider set of stakeholders

Launched in 2011 by CIMMYT (the International Maize and Wheat Improvement Centre) and IITA (International Institute for Tropical Agriculture), SIMLEZA combines on-farm research on new maize and legume varieties, CA and soya agronomy, with the targeting of such new technologies and household-level training in soya processing. The project aims to increase maize and legume yields by 25% in project communities over four years and directly benefit at least 30,000 farm households. It works in three districts in Eastern Province: Chipata, Katete and Lundazi.

SIMLEZA set-up project-based IPs in these three districts as an out-scaling mechanism - for communicating project findings to a wider audience. IITA staff organised the first IP meeting in Lundazi in April 2012. This first innovation platform meeting brought together 22 people from private, public and non-governmental organisations. The concepts of agricultural innovation systems (AIS) and Innovation Platforms (IP), as well as participatory research and extension approaches were introduced. Participants went to an initial farming system analysis and problem inventory and ranking meeting, together with farmers. A list of follow-up actions was developed. Despite this initial attempt at involving stakeholders in identifying technological, organisational and institutional constraints, the focus on stakeholder participation was limited and mostly focused on the on-farm experiments.

The approach had several weaknesses. No institutional landscaping exercise was done. Consequently limited knowledge existed about other stakeholders and projects (not present), other multi-stakeholder initiatives and potential partners needed to create the enabling environment for scaling the project's technologies and practices. Second, the action plans that were formulated during IP meetings did not allocate responsibilities to specific persons/stakeholders; activities were therefore largely not implemented.

Due to reduced funding and institutional capacity, the project’s innovation platform work was scaled-down late 2012. What continued though were the local level project activities linked to the implementation of on-farm experiments. Researchers and farmers continued to implement and evaluate ongoing on-farm experiments, yet without much of an idea of what the implications would be of large-scale technology adoption. One consequence of this was that farmers stimulated to grow more legumes or produce legume seeds, experienced difficulties in selling the grain and seeds that the project had enticed them to produce.

Lundazi agricultural stakeholder platform: the result of a merger
In late 2013, with external support from the CRP MAIZE programme, SIMLEZA set out to revive its Lundazi Innovation Platform. Individual stakeholder visits were used to increase attendance at the meetings in which a wider set of stakeholders participated. At one of these new IP meetings participants realised that other multi-stakeholder fora existed in the district, whose mandate (partly) overlapped with that of the SIMLEZA IP. CFU – the secretariat to the CF committee – was approached and SIMLEZA was invited to a committee meeting. The suggestion to merge the Conservation Farming Committee and the SIMLEZA IP led to their integration; the Lundazi Agricultural Stakeholder Platform (LUASP) was formed in April 2014.

The objective of LUASP changed to coordinating different stakeholders’ actions and the joint identification of organisational and institutional constraints in agricultural development in the district. LUASP (in the same way as the CF committee) is a sub-committee of the DDCC. Nevertheless, since LUASP was formed, reports are no longer read and presented at length during the meetings (which resulted in low attendance), but rather the focus is on discussing common challenges faced by agricultural sector stakeholders.

With a larger membership and one that spans beyond CA projects (see Box 1), the meetings are geared towards identifying constraints to agricultural development and the development of action plans which are implemented by sub-sets of interested stakeholders. In addition, SIMLEZA’s research outputs are no longer the main focus. Instead the platform provides SIMLEZA and other projects with a better understanding of the context they work in, enabling the project to better understand the constraints to technology adoption that farmers face. In addition, the different projects get better informed about the issues that research needs to address as well as new opportunities for collaboration with other stakeholders; some of those are well-positioned to scale-out SIMLEZA’s research outputs, such as new seed varieties or farmer-produced seed.

Box 1. LUASP membership

Government: Ministry of Agriculture (District administration, camp extension officers), USAID local coordinator.
Non-governmental: ASNAPP, CFU, COMACO, Community Development, MAWA, Mthilakubili, Profit+, Relief and Development CCAP, TLC, World Vision, WVZ, farmers' union (ZNFU).
Private: AGRICOOP, Cargill, Dekelb, Kick Start, Manjeet Cotton, MRI Syngenta, NWK, Pioneer Dupont, Royal Quality Seeds, Zamleaf, Zamseed.
Research: CIMMYT, IITA, ZARI

Farmers are not directly present or represented in the platform.

As in the CF committee, organisations cover their own expenses for participating in the meetings and meetings are chaired by the district administration. Recently, it has been decided that the secretariat of the Lundazi Agricultural Stakeholders Platform will function on a rotational basis.

LUASP's results so far
Since the 'merger' meetings have been well attended with particularly strong interest from the private sector. According to those interviewed, this is a result of more efficient (i.e. shorter) and action-oriented meetings. An excerpt of an action plan from a platform meeting can be found in Table 1. The central role of the district government's agricultural office, inviting projects and organisations as well as chairing the meetings, may also contribute as many stakeholders depend on the DCAL's office for field work activities.

Table 1. Excerpt of LUANAR action plan April 2014.

Challenge	Organisations who participated in discussion at the meeting	Description	What can be done about it?	By whom? Responsible organisations	When?
Marketing of certified legume seed (cowpeas, soybeans, beans, G/nuts)	MAWA, SIMLEZA, Mthilakubili, MAL	• Pricing: farmers do not know how much it costs them to produce the seeds so they bargain (often too hard) and so miss reasonable market opportunities. Market then fluctuates quickly and farmers end up losing money.	• Farmers training on gross margin analysis (seed growers from Vuu, Kapichira, Mthilakubili.)	MAL (Dept. of agribusiness and marketing – Mr. Thembo and Mr. Holmes), Muthilakubili, SIMLEZA	End of May
		• Attitude of farmers who do not trust each other (and therefore do not bulk) not buying from fellow farmers	• Exchange visit on bulking to Kapichira and Mthilakubili	MAL	End of June
Organisation of and attendance at field days	CFU, SIMLEZA, MAWA, World Vision, Manjeet, Cargill, Community Development	• Coordination/poor attendance at field days by stakeholders. • Coordination needed for field days within camps (so that one field day covers different projects, now stakeholders working in isolation)	• Jointly plan field days. In October, through the camp officers, decide where the main field days take place (where many stakeholders should be present) • In 3rd week of January share the calendar for the minor field days (by one organisation only) and agree on the dates for the main field dates	MAL – through camp officers Committee (at a meeting)	October committee meeting January 2015 committee meeting

Immediate effects of Lundazi IP include improved farmers' marketing opportunities. For example, participating Camp Extension Officers report that more buyers are venturing into their areas in search for produce (legume seeds and grain). These buyers learned about SIMLEZA-supported, community-based seed production and increased legume production during the IP meetings. They also approached the Camp Extension Officers after the meetings for more information and to schedule visits to the camps.

Another immediate result from the IP existence is better coordination. Whereas the DDCC has the formal task of keeping actors informed, the DDCC meetings do not go into operational issues. DDCC meetings are used to feed information to the District Administration, not to plan and coordinate field-level activities. As a result of discussions in the platform, the projects/organisations now organise farmer field days in close collaboration with each other, saving time and resources and enabling cross-project learning during field days. Better knowledge on what other projects are doing also helped stakeholders to avoid "double targeting"; i.e. working with the same farmers in similar projects.

Another important benefit that platform members mentioned is that researchers now better understand local realities. When the Zambia Agriculture Research Institute (ZARI) researchers go to Lundazi for the meetings they do not only hear from other organisations on the latest challenges and opportunities at farm level; they also often take the opportunity to visit the field. For example, in 2014 ZARI promptly diagnosed common bean stem maggots, saving many infested bean fields in the district, at the request of other platform members.

As the platform is the subcommittee of the District Development Coordinating Committee (DDCC), issues raised by farmers which require immediate attention are acted upon quickly. Future plans of the platform in Lundazi include broadening the types of organisations participating (for example to incorporate church leaders) and organising field days for platform members so that they can better understand each other's work. Participation of the Camp Extension Officers from the areas where projects operate could still be improved, bringing the information shared at the meetings back to the farming communities and enabling CEO's to raise farmer concerns at the platform.

Discussion: institutionalising innovation platforms in local structures

A number of challenges remain. First is the need to strengthen the capacity of the DCAL's office to organise meetings, follow-up with key actors and to facilitate the action-planning oriented meetings. This demands a capacity building strategy for its staff.

The second major challenge is the difficulty of tackling complex issues. When the discussions concern a practical local problem, the platform members quickly design ways to tackle these. However, when faced with more complex issues such as the slow adoption of CA or a dysfunctional market for legume seeds, devising a concrete plan of action is much more difficult. As a consequence, the plans drawn up remain unclear to the platform members themselves or are not realistic. This is due to a number of reasons. Platform members realise they are ill-equipped and ill-positioned to fully understand the issue at stake. In addition, many participants are implementing projects that are designed elsewhere by people who have limited understanding of the local realities. The project implementers participating in the LUASP may feel they are not in the position to question the approach taken by their respective organisations. Finally some of these issues e.g. the slow adoption of CA are sensitive. Many projects operating in the area focus on CA promotion, and any discussion that may be seen as challenging this approach is difficult to do publicly.

Thirdly there is a need to be alert as new agricultural development initiatives in the district are often very similar to existing ones. This problem at least refers to the setting up of multi-stakeholder fora. Innovation platforms are fashionable in development policy thinking and many donors want to create structures that ensure projects collaborate and coordinate. As few of these initiatives start with an institutional mapping exercise, there is a real risk of creating overlapping and even competing structures. For example, in another district where SIMLEZA operates, a new project is setting-up a maize value chain-based innovation platform. Without prior institutional mapping or deliberate attempts at integration of new initiatives into existing structures, such initiatives may lead to fragmentation of multi-stakeholder collaborations. The DCAL therefore has an important role to play in preventing fragmentation, in its role as “gate-keeper” for organisations and projects operating in or entering the district.

Conclusion

IPs are often seen as project-led. The project’s focus usually determines their organisational modus; platforms may bring together actors along a particular value chain, or stakeholders involved in the extension of particular technologies such as CA. Project focus and organisation usually influence whether IPs are organised locally or at higher levels; rather than a purposeful analysis of key challenges faced and the best level from which to tackle them.

Mapping the institutional landscape prior to IP establishment is often not done. As a consequence a plethora of fora tends to develop (often operating in isolation), as in the case of the CFU and the SIMLEZA-led platforms in their early years. When that happens two key functions of the IP’s are lost: network brokering and coordination. These functions are key to solving institutional barriers to agricultural development, including providing an enabling environment for bringing new innovations to scale.

Project-initiated IPs do also raise the issue of sustainability as these initiatives tend to disappear when a project ends. In Lundazi, the district government chairs the platform, while a stakeholder with long-term presence in the area runs its secretariat. Although a good start this does not mean that the platform’s sustainability is secured. ‘Ownership’ of the platform depends on how useful the platform members perceive the platform to be. ‘Usefulness’ of the platform hinges upon its successful dealing with issues at the platform operational level. In addition the platform will only be ‘functional’ if those attending commit to the proposed actions. This demands close follow-up and leadership. Finally, platforms are by definition dynamic and somewhat fragile. After all, they depend on an enduring capacity of local actors to bring together and broker interactions between stakeholders with only partially overlapping interests.

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Design and implementation of innovation platforms in facilitating the local adaptation of conservation agriculture: lessons from case studies in Burkina Faso

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Abstract : Numerous interventions implement innovation platforms (IPs) to support agricultural innovation processes and stakeholder interactions within a value chain in west Africa. Yet in this context, little research has been undertaken on the design and implementation of IPs focussing on issues other than market access, such as aiming to encourage the technical and organisational feasibility of complex cropping systems. Conservation Agriculture (CA) is one such area where IPs may be useful, since its complex nature calls for technical, organisational and institutional changes involving several stakeholders at both production system and village territory levels. This paper highlights the design and implementation processes of platforms established in three villages in Burkina Faso aiming to assess the relevancy of CA for the West African context by developing CA technical references with local stakeholders and analysing how to renew rules of interaction between stakeholders within a territory. The design of the IPs was initiated by a multidisciplinary research team and based on three complementary steps: (i) the diagnosis of existing forms of organisation; (ii) the development of an IP model, and (iii) the validation by stakeholders of the IP model followed by the planning of activities. After three years of activities, we assessed the effects of IPs on farmers' perceptions, attitudes, practices and networking in relation to the initial objectives assigned to the IPs. The platforms enabled farmers in the three villages to actively participate in the specification of the cropping systems tested and to improve their perception of CA. They furthermore promoted networking in terms of exchange among farmers and the spread of CA principles in the communities as well as facilitating the development of new rules for crop residue use. The platforms thus appear to be relevant mechanisms enabling complex innovations to be explored. However some modifications and improvements are necessary to ensure the sustainability of the platforms and the evolution of their objectives and activities beyond those of the project under which they were launched.

Keywords: Forms of organisation, participation, innovation systems, Burkina Faso

Introduction

Conservation Agriculture (CA) comprises a family of cropping systems based on the use of three complementary principles (minimum tillage, organic soil cover, crop diversification) (Scopel et al., 2013). Across tropical countries, including Africa, CA promoters consider it to be a possible means to improve agricultural productivity and strengthen farmers' resilience to climate variability (Pretty et al., 2011; Tittonell et al., 2012) in a context of increasingly frequent extreme weather events (Cooper et al., 2008) and rising demand for agricultural produce. However, the principles of CA depart from prevailing cropping systems typically based on tillage and monoculture and hence usually require a significant transformation of cropping practices, farm organisation and support networks (Ekboir, 2012, Goulet & Vinck, 2012). Before CA adoption may take place, farmers must be convinced that there is a need to switch to CA, and that CA can respond to their key objectives such as improving food security and income. For this, technical references adapted to local conditions must be developed. Also, because successful application of CA requires that soil remains covered, rules governing the management of and access to crop residues at the community level must be renewed, which usually implies delicate negotiations between crop and livestock farmers. Farmers' access to inputs (cover plant seeds, herbicides) and equipment required in CA also must be facilitated (Kassam et al., 2009).

In the past, approaches based on a linear conception of technology transfer have had limited success in achieving CA adoption on small family farms (Giller et al., 2011; Knowler & Bradshaw, 2007; Nkala et al., 2011; Wall, 2007). New approaches are needed which allow local stakeholders to find acceptable solutions. In the wake of innovation system thinking (World Bank, 2012), innovation platforms (IP) have emerged as a relevant means for the support of innovation processes. IPs bring together different stakeholders to facilitate collective planning and decision-making, conflict resolution, negotiation, and social learning for concerted action around the development of technical and organisational innovations, recognising that innovation is a socio-technical process (Nederlof et al., 2011; Röling, 2002). In Africa, IPs have been tested in projects aiming to improve agricultural productivity, most often in tandem with the creation or reinforcement of local actors' access to markets (Defoer & Dugué, 2012; Hounkonnou et al., 2012; Kilelu et al., 2013; Nederlof et al., 2011 ; Nyemeck, 2011; Nyikahadzoi et al., 2012; Sanyang et al, 2014; Tenywa et al., 2011). Few studies, however, have examined how IPs may be implemented to address complex systemic innovations such as CA, although the potential of the IP approach to respond to such challenges appears high (Ekboir, 2012; Nederlof et al., 2011).

This article assesses the process by which three community-level IPs were designed and implemented in Burkina Faso under the leadership of a research team working under the *Agroecology-Based Aggradation Conservation Agriculture* (ABACO) EU project. These IPs aimed to explore with stakeholders how relevant CA principles are to encouraging the development of sustainable production systems (Tittonell et al., 2012). After presenting the design process and the structure of the IPs, we analyse several monitoring indicators and discuss the relevance of IPs in facilitating the adaptation of CA.

Methodology

Study area

The three villages included in this study are located in contrasting regions in Burkina Faso (Table 1).

Table 1. Characteristics of the three study villages in Burkina Faso

Characteristics	Sudanian zone	Sahelian-Sudanian zone	
	Koumbia	**Yilou**	**Sindri**
Latitude	12° 42' 207'' north 4° 24' 010'' east	13°0'020'' north 1°32'777'' west	13° 41'' 844'' north 13° 740'' 72'' west
Climate	Sudanian Rainfall: 1200 mm/year	Sahelian-Sudanian Rainfall: 900 mm/year	
Cropping season	May-October	June-October	
Population (habitants)	7 000	5 000	3 023
Socio-political organisation	Village community	Traditional chiefs	
CA introduced	2011	2009	2010
Other experiences with the introduction of innovation	Compost pit, legumes	Planting in rows, zaï and half-moon techniques	
Main crops	Cotton, Maize, Cowpea, Peanut	Sorghum, Millet, Cowpea, Peanut	
Stocking rate (TLU = Tropical Livestock unit)	4 TLU/hectare	2 TLU/hectare	3 TLU/hectare
Existing technical model	Monocropping, mineral fertiliser and mechanisation	Combined crops, little mineral fertiliser and manual farming	

Koumbia, located in the Sudanian zone of the cotton production basin, has a good biomass production potential combined with significant pressure from livestock rearing. The dominant farming system in the area includes the monoculture of cotton in rotation with cereals (maize and/or sorghum) and the use of mineral fertilisers. Up until 2011, Koumbia farmers had not experimented with CA; however it had been a research site for the participatory design of agro-pastoral innovations (Vall & Bayala, 2014). Sindri and Yilou, are located in the Sahelian-Sudanian zone of the country. Compared to Koumbia, they have more limited biomass production potential, and face less pressure from livestock rearing. The dominant farming system in these two sites is based on cereals (sorghum and millet) combined with cowpeas or peanuts. The first participatory experiments involving CA were begun in 2009 under an externally-funded project (ACT et al., 2012).

Innovation platform design process

A multidisciplinary research team (two agronomists, one sociologist, two animal production scientists, one geographer) implemented the IP design and development process[1]. Inspired by the three stages identified by Nederlof et al. (2011), the process relied on three complementary steps: (1) the diagnosis of existing forms of organisation, whether endogenous or exogenous; (2) the development of an IP structure; and (3) the validation by stakeholders of the IP structure followed by the planning of activities.

Diagnosis of existing forms of organisation

This step was carried out through semi-structured interviews with the leaders of existing farmers' organisations (3 in Sindri, 11 in Yilou, 13 in Koumbia), local government representatives and traditional leaders. The interviews included questions about the identity of the organisation, how it emerged, its internal structure and governance, its operations, and its communication system, partners, strengths and weaknesses.

Development of an innovation platform model

Based on the outputs from the diagnosis, the research team developed a proposal for the structure and functioning of the IPs aiming to: (i) co-design technical references adapted to local conditions, facilitated by individual and collective learning about CA; and (ii) revise the rules governing stakeholder interactions at the community level in order to facilitate connections between local stakeholders and via them the technical and organisational challenges linked to the adoption of CA. The research team furthermore made two methodological choices coherent with the objectives pursued: (i) to focus at the village scale as it seemed best suited to entertain questions about adapting to local conditions and learning; and (ii) to rely on existing forms of organisations to build IPs, to avoid creating an artificial new structure overly dependent on the ABACO project.

Validation by stakeholders of the IP model and the planning of activities.

Four one-day discussion workshops were organised in the study area with the following stakeholders from each village deemed likely to join or interact with the IPs: seven representatives of farmer groups; two to five government outreach agents; between one and six retailers or artisans selling (or growing/producing?) agricultural products; between two and four local government agents; and one to two traditional leaders. Researchers from the ABACO project were also involved. These workshops aimed to allow stakeholders to define potential constraints on the application of CA, their expectations of the IP model proposed, adaptations which they might propose for this model, the role they wished or did not wish to play, and the activities they wished to conduct.

Operation of the IP

The activities conducted by the IP were recorded as follows: the number per actors that participated in these activities (number of participants was recorded for each activity); and the first outputs of these activities regarding the co-design of technical references and the revision of the rules for governing of stakeholder interactions at the community level.

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[1] Five of the co-authors of this paper were part of the IP construction process

Results

Design of the IPs

Step 1: Diagnosis of existing forms of organisation

Diverse forms of organisation co-exist in the three villages. The endogenous forms of organisation identified include self-help groups (exchanging labour) and service provision groups. There are also traditional organisations grouping male household heads or lineages under the authority of traditional leaders who play a role in the management of conflicts at the village territory level. These organisations are experiencing some difficulty in mobilising members due to a rise in individualism.

The exogenous organisations identified are the product of various external dynamics. Public authorities were behind the creation of village development councils (VDC) and chambers of agriculture (CA) committees. These organisations have formal structures and sometimes even action plans, but their actual activities are low (VDC) to non-existent (CA) because they do not have their own funding, members lack training, and they have become polarised by diverse power struggles. Farmer organisations were started by value chain promotion schemes. In Sindri and Yilou they are characterised by a lack of initiative, a low level of technical equipment and low skill sets among members, and are structured around cereal, legume and vegetable crops destined for home consumption rather than markets. In Koumbia, cotton farmer organisations have comparatively more equipment and technical partnerships. Village Coordination Committees (VCC) and farmer field schools (FFS) were initiated by research and development (R&D) projects. They group together farmers from diverse social and ethnic backgrounds. While they differ somewhat in terms of their history and operations, they all function as spaces or fora for interaction and learning about technologies between farmers, the research teams which launched them and public extension services. Beyond the solidarity between members, one of the main strengths of these fora resides in the desire of members to maintain a partnership with research teams to continue to test new techniques and gain access to training and agricultural inputs. However, those in charge of existing fora point to numerous difficulties and concerns such as a lack of interest and availability of members to participate in experimental activities without some form of material or financial compensation, failure on the part of members to apply the technical recommendations of the researchers, and questions regarding the legal status and sustainability of these fora.

Step 2: Definition of the innovation platform model

The diagnosis showed the strong interest of existing forms of organisation in learning via experimenting with new systems (VCC, FFS), managing shared resources and related conflicts (traditional authorities), and promoting access to inputs and markets (farmer organisations), which are objectives coherent with those expected of the IPs. Inspired by Faure et al. (2010), the research team opted for an IP structure consisting of two bodies, a technical body and an institutional body, with each addressing one of the two main objectives under pursuit (Figure 1).

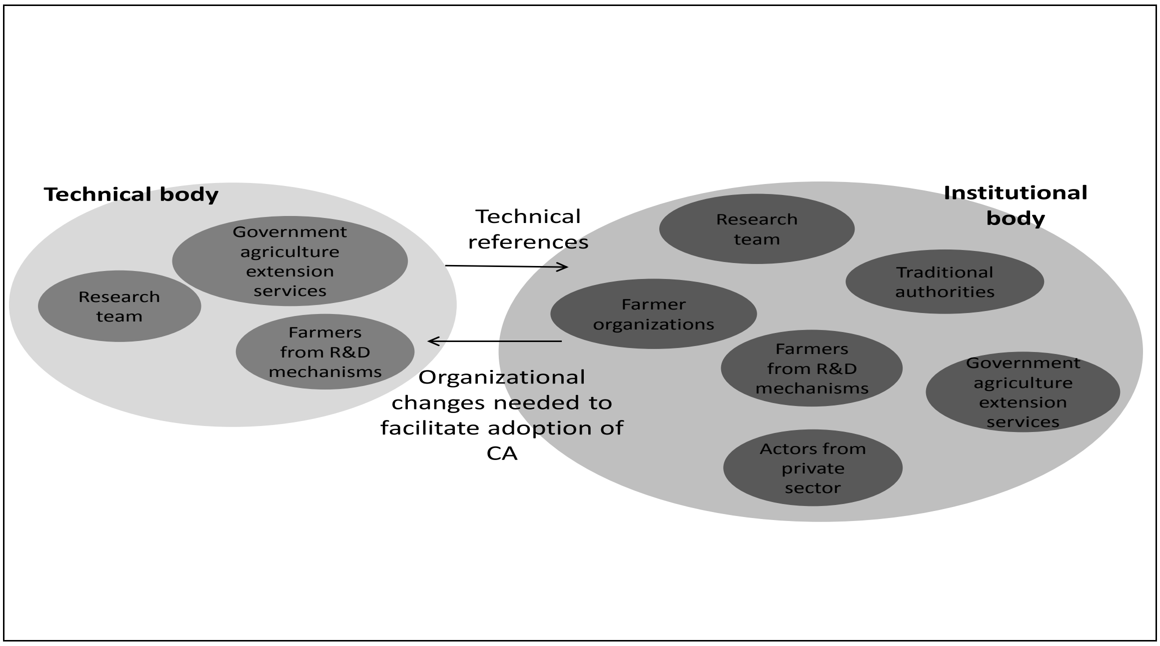

Figure 1. Proposed structure and composition of village innovation platforms for CA in Burkina Faso

The technical body (composed of farmers from R&D devices, government agriculture extension services and the research team that decided to participate on a voluntary basis) is meant to generate CA technical references by proposing and testing cropping systems based on CA principles. **The institutional body** (also called the "forum") is meant to facilitate the coming together and interactions of all stakeholders with a link to CA that decided to participate on a voluntary basis. The interactions between actors gathered within the forum aim to identify and engage organisational changes needed to facilitate access to crop residues and land, markets and equipment. The forum also aims to lobby political decision makers at the village and communal level to support the implementation and spread of changes in the farming systems that build on CA principles. The research team proposed an informal mode of coordination within the IPs so that they could function in a flexible manner (Nederlof et al., 2011). The decision was motivated by lessons learned from past experience with more formal modes (within existing R&D devices) which had mixed results (Koutou et al., 2012).

Furthermore, some activities which had proven successful in previous projects conducted in the study sites were retained, such as the organisation of training, guided tours and inter-village exchanges focusing on innovative techniques. New tools to facilitate discussion and sharing were proposed such as maps to use with forum actors to identify areas where CA could be introduced (Diallo et al., 2014) and simulation models to assess at the farm or village scale the effect of different levels of CA adoption (Djamen et al., 2015).

Step 3: Stakeholder validation of the IP model and planning activities

All of the actors who attended the validation workshops appeared to share a common vision of an IP as a space for coming together and exchanging information and experiences about CA. The stakeholders furthermore proposed ways to contribute to the functioning of the IP coherent with their respective conventional roles, for example, the public extension services offered to monitor the implementation of cropping system trials based on CA. Each type of stakeholder, however, also had his or her own, at times opportunistic, vision of the IP. For example, men saw in it a means to acquire inputs and agricultural equipment while women saw a means to add value to their production and commercial activities involving milk, shea butter, peanut butter, and cowpeas. The IP validation workshops also provided an occasion for some stakeholders to express their doubts, particularly in relation to the CA technical model, regarding the feasibility of obtaining permanent soil cover and of consequently modifying rules on access and management of crop residues. Some public extension agents expressed doubts regarding the possibility of intensifying existing systems through CA. Despite these various expectations and specific doubts, the stakeholders were able to define an activity plan structured around activities involving training, field trials, study visits and trips, and work on a land charter, with clear responsibilities shared between different members of the IPs. The heads of the VCC in Koumbia proposed innovative instruments such as a field trial competition which would award prizes to farmers who had best conducted their trials and who could explain the principles of CA to stimulate respect for the collectively defined technical specifications. Communication and awareness raising activities were proposed also by farmers to promote better understanding of CA among other villagers.

Operation of innovation platforms

IPs activities

The action plans served a route for action in the different study sites. The activities actually carried out from the end of 2011 to the end of 2014 are presented in Table 2. They include training, on-farm experiments, exchange visits, radio shows, and fora about crop residues management at the territorial levels. In the implementation of these activities, the themes of the training sessions conducted were proposed either by research (on CA principles) or by the farmers (on the use of the direct seeder). The trials were the products of the interaction between hypotheses made by the research team, farmers' expectations and lessons learned from the first trials.

Table 2. Activities carried out by the IPs in Koumbia, Sindri and Yilou

	Koumbia	Sindri	Yilou
Learning and spread of knowledge	5 Training sessions on CA and leadership	2 Training sessions on CA	2 Training sessions on CA
	6 Protocol discussion meetings 3 trials of CA based systems 4 ex-post assessments of trial meetings	5 Protocol discussion meetings 3 trials of CA based systems 3 pilot assessment general assemblies	5 Protocol discussion meetings 3 trial campaigns 3 pilot assessment general assemblies
	3 Guided visits	2 Guided visits	11 Guided visits
	1 Study trip	1 Study trip	2 Study trips

	2 Competitions	2 Technical data sheets and caps	Not conducted
	1 Show on national news	-	-
	Open door days for 400 participants	2 Competitions	2 Competitions
		Participation of 6 producers at Koumbia open door days	Participation of 9 producers at Koumbia open door days
Crop residue management	Identification of potential CA areas 4 Meetings on the introduction of CA in the territory	2 Fora on the introduction of CA in the territory	2 Fora on the introduction of CA in the territory

Stakeholders' participation and contribution to IPs operation

The IPs attracted a growing number of stakeholders over time to their meetings including researchers, farmers, extensions agents, municipality agents, private actors and traditional leaders (Table 3). This may have been due to some activities carried out such as study trips, competitions, guided visits and open door day which were seen as opportunities to enhance farmers' interactions and knowledge around CA while emulating their interest. Among them, three stakeholders contributed strongly to keeping IPs running. The researchers performed the major role, followed by the farmers and the municipalities. Extension agents, traditional leaders, private actors and NGO performed a marginal role. This difference in contribution to IPs operation among stakeholders may be explained by the focus of the IPs on CA participatory experiments. Those actors who assumed that IPs and CA could be useful for them participated strongly compared with those who were more doubtful re the benefits.

Table 3. Stakeholder mobilised and their contributions to IPs operation in the three villages

Types of stakeholders	Number of participants (*)	Contribution to IPs operation
Farmers (individual and organisation representatives)	351	Provide meeting rooms and plots for implementing CA trials; take part in CA trial monitoring; sharing their knowledge and experience; provide information; organising IP's activities
Researchers (researchers, technicians and students)	36	Finance, organise, coordinate, monitor and evaluate IPs activities; sharing their knowledge and experiences

Municipality agents	16	Provide meeting room; sharing their knowledge; provide information
Extension agents (agriculture, livestock and environment)	13	Sharing their knowledge; monitor CA trial; provide information
Private actors (inputs providers, artisans and products sellers)	12	Sharing their knowledge; provide information
Traditional leaders (land chief and village chief)	7	sharing their knowledge; provide information
Value chain actors	5	Sharing their knowledge and experiences during the meetings
NGO	3	Sharing their knowledge and experiences during the meetings
State representative	2	Sharing their knowledge and experiences during the meetings
Microcredit agents	1	Sharing their knowledge and experiences during the meetings
Total	446	

(*) the figure corresponds to all the persons in each category who participated in all IPs meetings organised during the three years across the 3 villages, based on monitoring data

IPs achievements

After three years of existence, the IPs demonstrated two main achievements in line with their declared objectives: the adaptation of CA principles (minimal tillage, permanent soil cover and intercropping) to local conditions; and the definition of the rules governing the stakeholders' access to crop residues. Firstly, the IPs' members defined a new CA cropping system adapted to local conditions after a long process of interaction and exchange among them. In Koumbia, the CA system selected at the end of the process (mechanised direct sowing of maize intercropped with cowpea with soil cover) was different to that selected at the beginning (direct manual sowing of sorghum intercropped with pigeon pea) because farmers rejected the manual sowing given its arduousness, the sorghum given its low performances and the pigeon pea due to its late flowering (Table 4).

Table 4. Dynamics of co-construction of cropping systems in Koumbia

		Farmers' objectives	Research team's proposal	System tested after discussion/validation by farmers
2012		Ensure grain production to feed the family and forage production to feed the herds	Over 10 cropping systems consisting of various combinations of main crops, associated leguminous crops and soil tillage patterns	Direct manual sowing of sorghum intercropped with pigeon pea, soil cover by residues from other fields or brushwood
2013		Limit the arduousness of sowing and soil cover given the difficulty of conserving biomass in the dry season	Introduction of animal drawn direct seeders. Test of three levels of soil cover on yields and water infiltration	Mechanised direct sowing of maize intercropped with cowpea with three levels of soil cover
2014		Improve use of animal drawn direct seeders	Test of different conditions of use of animal drawn direct seeders	Mechanised direct sowing of maize intercropped with cowpea with three levels of soil cover and analysis of conditions of use of direct seeders

In Yilou and Sindri, the process was similar and led to the selection of two CA cropping systems: (i) cereal (sorghum or millet), directly sown under a mulch of crop straws, intercropped preferably with leguminous food crop for resource (land) constraint; and (ii) cereal, directly sown under a mulch of crop straws, intercropped or in rotation with leguminous fodder crops for farmers with larger farms and who also keep cattle. The majority of the farmers opted for leguminous food crops (mainly cowpea and groundnuts - that can more easily be found on the local market - and amberique) leaving leguminous fodder crops (*Mucuna* sp., *Dolichos* sp.) to farmers who keep cattle between several existing or new species of leguminous crops presenting specific or combined functions including food, fodder and soil fertility, and which were proposed initially by the research team.

The specific activities conducted around the revision of the rules governing stakeholder interactions at the community level were focussed on the access to crop residues. Iterative discussion and experience sharing in the IP's fora showed that: in Koumbia there was an existing land charter that could be a valuable tool to regulate the access to crop residues, but that needed support to overcome specific challenges linked to the activation of the land conciliation village commissions; in Sindri and Yilou, where land charters do not exist, the fora supported the collective definitions of rules regulating the access to crop residues (Table 5).

Table 5. Rules of crop residue use defined in the forum to be included in the land charters of the villages of Sindri and Yilou

Sindri	Yilou
- collection of crop residues prohibited in degraded areas - residues collected in low-lying areas and ravines - collection prohibited in gravel areas - inform the owner before collecting - open the fields to animals - lay down stalks produced in sealed and crusted bare soils (locally called *zipéllé*) after the harvest - lay down stalks produced in low-lying areas and let animals feed on leaves - use the stems of millet, the piliostigma pods (bagna), the stems of sesame and sorrel for the potash	- systematically cut down the stems after the harvest - common pasture is not prohibited as long as the owner is notified - burning crop residues prohibited - stealing crop residues prohibited - collect thin stems to keep and feed to livestock - collection of residues on degraded areas (*zipéllé*) prohibited

Discussion

Our results show that the three village-level CA IPs attracted a growing number of participants who shared responsibilities for implementing and assessing CA activities, despite the predominant role of research. A monitoring and evaluation of the process is in progress regarding new knowledge, attitudes, practices, networking and skills gained by the IPs members (and particularly the farmers) but first outputs obtained are positive with cropping systems co-designed by farmers and research, and new decision rules defined. We chose to base the IPs on existing organisations as opposed to creating them from scratch. The option to base on existing networks is often considered to be the best and the most sustainable in terms of “institution building” allowing IPs to quickly gain legitimacy and an audience, and to rapidly become operational and limit the risk that parallel, but conflicting, processes of decision making may take place. However, with this option, it can be difficult to propose “innovative” activities, modes of operation, or interactions which depart from those which the existing organisations and their members are accustomed to and are prepared to undertake. Furthermore, like local society, these organisations are underpinned by more or less structured and stable power relations linked to the socio-cultural and religious functioning of the communities involved.

The degree of leadership actually exercised by local stakeholders and their progressive empowerment with respect to the role played by outside intervention and resources (reflecting a deliberate increase in their capacity to innovate) are two key features of the sustainability of IPs which have not yet been explicitly addressed in our work (Kilelu et al., 2013; Leeuwis et al., 2014; Nederlof et al. 2011).

The research team was well- placed and indeed almost obliged to exert leadership and steer the process of building and putting into operation the village IPs. This was due to the relative lack of experience with CA and the IP approach in the study area, a lack of technical references, and the relative weakness of local organisations. In the context of a short-term project, it also aims at saving time so that meaningful activities take place rapidly. Yet it has its drawbacks: by remaining in the driver's seat, whatever the valid reasons it had to do so, research was less able to change some of its typical 'top down' attitudes and practices towards multi-stakeholder approaches. Consequently, the points of view of local stakeholders were perhaps not sufficiently taken on-board in the design of the IPs and in their functioning (focused mostly on experiments and knowledge production). A more bottom-up approach would most probably have yielded a different type of IPs, perhaps easier to sustain in the long run. If nothing is done soon to reduce this dependence on the research team, these IPs could very well rapidly disappear or fall dormant as soon as the ABACO project ends, as has often been observed in similar situations elsewhere. The importance of local leadership is demonstrated by the fact that the cases where CA has been developed successfully have occurred in the context of multi-stakeholder, 'bottom-up' processes in which farmers had and/or still play leading roles (Ekboir, 2012; Triomphe et al., 2007). To avoid the risk of the IPs getting bogged down we must identify among the 'local' IP members those who are most likely to assume leadership (farmers' organisations, public organisations – notably extension services – or NGOs with a long term local or national level presence) and sufficiently interested in continuing the IPs. For these stakeholders this would involve obtaining (including through self-financing activities) a sustainable source of resources needed for their routine operations (cost of periodic member meetings, exchange visits for experimental trials) (Nederlof et al., 2011; Triomphe & Hocdé, 2010), even if that means modifying the initial objectives and operations of these IPs.

Lastly, it seems evident that regardless of their purpose, there is a limit to what village IPs can do to help change local agriculture. It is critical to also work at the level of the "enabling environment" (Hounkounou et al., 2012) in order in particular for agricultural policy to be more supportive of the implementation of complex systems such as CA systems. A medium-term strategy would thus need to be developed, as a complement to local platforms, with one or several provincial or national level platforms better able to influence institutional and policy changes which could promote CA production systems. These may include, for example, training for extension services required to accompany the CA transition, setting up subsidies or financial incentives for good practices, changes in rules of land access for migrants and women, or, more globally, innovation policies favourable to family farming (Devaux et al., 2009; Kilelu et al.,2013; Nyikahadzoi et al., 2012; Thiélé et al.,2011).

Conclusions

This article presents the design and implementation of innovation platforms piloted by a research team aimed at promoting the co-design of local technical references and adapting the rules of interaction between stakeholders in three villages in Burkina Faso. At the initiative of research, these IPs were structured into two components: a technical body to test new cropping systems; and an institutional body to organise local actors into a network to address the challenges posed by CA, such as access to crop residues and land. The IPs thus structured engaged in a wide range of activities (negotiation of protocols, experimenting, annual assessments, meetings, competitions for the best pilot farmers) while the research team steering the process provided appropriate methods and animation tools.

This mode of functioning has allowed stakeholders, and foremost among them the farmers themselves, the opportunity to design cropping systems based on CA principles and define new rules of access to land The IPs thus appear to be an appropriate instrument to promote the design of complex innovations such as CA among a diversity of stakeholders.

Various improvements should be made in the near future if these platforms are to outlive the framework and funding of the project through which they were created. In particular, this will involve reducing the platforms' dependence on the research team. This may also involve a closer link with economic objectives and more clearly reinforcing the capacity of diverse local actors to take part in innovation, notably the extension services, which are the real "innovation facilitators". This may allow the platforms to address relevant innovations other than CA in the future. Another challenge will be to eventually complement the village level mechanism with the development of provincial and national platforms, which will allow key institutional and economic challenges related to the enabling environment to be addressed.

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The merits and limitations of innovation platforms for promoting Conservation Agriculture in sub-Saharan Africa

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Abstract: Despite many efforts, Conservation Agriculture (CA) has not been embraced on a large scale by African farmers. CA requires technological, organisational and institutional changes, as well as a strong capacity in problem solving from farmers and service providers to adapt CA practices to the local context. Such a broad set of changes is not suited to a top-down, linear approach of technology transfer. Over the last decade, various CA initiatives have therefore adopted an innovation systems approach, using innovation platforms (IPs) as an instrument to promote CA. However, to date CA innovation platforms have tended to focus on CA as a solution, thus overtaking the attention to tackle underlying problems and constraints such as declining soil fertility, insecure property rights, conflicting demands on farm resources, or lack of inputs and services. Innovation platforms that have functioned well in terms of experimenting with different CA practices required a lot of time and effort to facilitate the platform activities. Drawing on experiences from different projects (primarily ABACO[1], but also from DONATA[2]), we identified several lessons and strategic questions regarding the use of innovation platforms for CA. Some of the issues to be considered when using IPs for sustainable agriculture are: identification of suitable themes for IPs; the influence of different starting points and structures that are used for the set-up of IPs; the use of external resources and facilitation in establishing and maintaining the IPs; opportunities and constraints to foster autonomous IPs; and relevant criteria for measuring success of IPs. The paper further discusses under which conditions, and to what extent, IPs are an improvement on conventional ways of developing and promoting agricultural technologies.

Key words: Conservation agriculture; innovation platforms, agricultural innovation systems

Introduction

The rapid environmental, economic and social changes occurring at national and local levels in sub-Saharan Africa require a research and development approach that is able to identify suitable technologies and provide the enabling environment (i.e. suitable policies, technical adaptation, social structures, infrastructure, facilities, resources, materials, skills and information) that will make them viable innovations in different situations. For this, donors[3] and government programmes are increasingly turning to *agricultural innovation systems (AIS) approaches* (Pound & Essegbey, 2007). Since the 1970s, alternatives to top-down, linear approaches to research and extension (e.g. technology transfer) have been evolving. They include farming systems approaches, and a host of participatory approaches, such as Participatory Rural Appraisal, Participatory Technology Development, Participatory Learning and Action, Farmer Field Schools and Action Research. Each one stresses different aspects

[1] Agro-ecology Based Aggradation-Conservation agriculture (ABACO) funded by the EC and managed by the African Conservation Tillage Network through in-country and international organisations
[2] Dissemination of New Agricultural Technologies in Africa funded by the African Development Bank, managed by FARA and implemented by ASARECA in eastern and central Africa
[3]Including the World Bank, DFID, the African Development Bank and Regional organisations such as FARA

or different stakeholders in the technology generation and utilisation continuum. During the same period there have been major shifts towards the de-centralisation of extension, the liberalisation of input supply, the empowerment of farmers to demand services relevant to their needs, and greater emphasis on post-harvest activities and marketing of products. *The agricultural innovation systems approach brings these different components and actors together by emphasising the linkages between actors, covering the spectrum from producers through processing and marketing to consumers* (Triomphe et al., 2007). The AIS approach is still evolving, and there is no blue-print for how to apply it. Rather it is a set of principles, experiences and best practices that together add up to a new way of conducting agricultural research for development (AR4D). The applied nature of the AIS approach is clear from the definition. It places innovation at the centre of a partnership, rather than technology or research organizations. One of the practical applications of the AIS approach is the design or strengthening of multi-stakeholder coordination to address a challenge or exploit an opportunity. One such way is through innovation platforms (IPs) that can operate at national scale (e.g. a task force made up of partners from government, academics, NGOs and the private sector) or local scale (e.g. local government, locally-based NGOs, locally-operating extension, training and research organisations, local entrepreneurs along the value chain and interested farming families).

Conservation agriculture (CA) is heralded by many as a means to achieve sustainable agricultural intensification, increase farmers' resilience to climatic variability and address soil degradation in sub-Saharan Africa (e.g. Kassam & Friedrich, 2011; Marongwe et al., 2011) through its three central principles of soil cover, zero (or minimum) tillage and intercropping. However, there is also increasing recognition that the spread of CA in sub-Saharan Africa has been limited because of diverse agro-ecological and socio-economic factors, and that CA needs to be tailored to local circumstances (Giller et al., 2009; Knowler & Bradshaw, 2007; Nkala et al., 2011; Tittonell et al., 2012). The transition from conventional agriculture to CA requires technological and institutional changes, as well as a strong capacity in problem solving from farmers and service providers to adapt CA practices to the local context (Posthumus et al., 2011). The promotion of CA as a full and indivisible package that farmers need to adopt leaves little room for manoeuvre for local adaptation, and has contributed to the very limited adoption of CA by resource-constrained farmers in Africa.

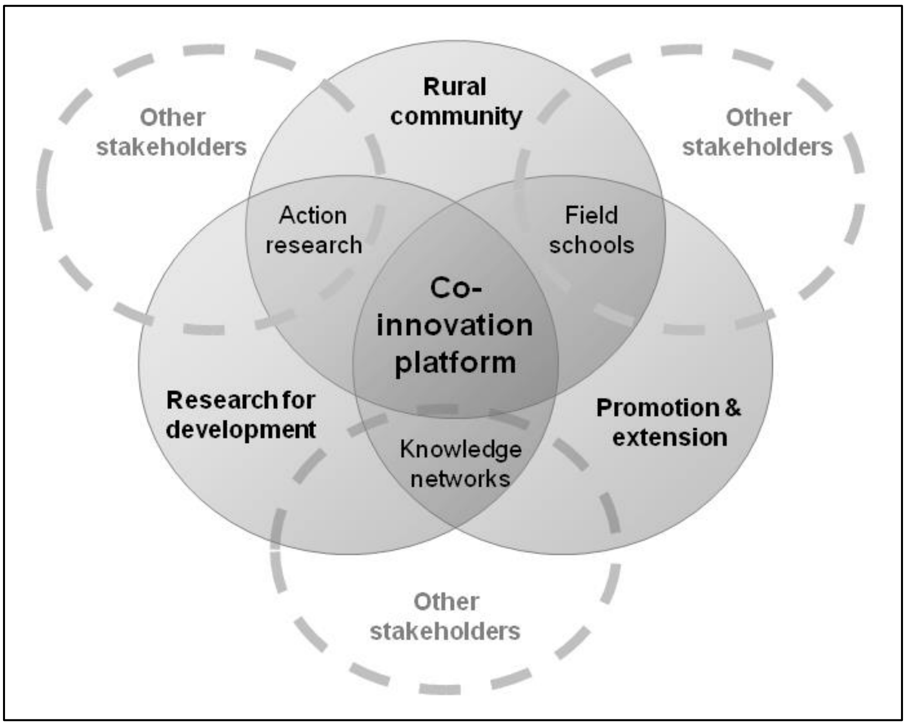


Figure 1. Co-innovation platforms in the ABACO project

The 4-year ABACO project, funded by the European Commission, applied an AIS approach to the promotion of CA. ABACO aimed at establishing site-specific innovation systems that rely on agroecology principles and recuperation measures to restore soil productivity in semi-arid regions of Africa. ABACO tried to achieve this through the creation and support of co-innovation platforms that involve the farmer, extension and research communities interacting with other relevant stakeholders specific to each situation. The participation of farmers in technology development through action research, with a solid involvement of researchers working together with farmers and others (co-innovation), was thought to be a pre-requisite to the adoption of soil improving technologies. Figure 1 depicts how co-innovation should work in theory, bringing together a range of relevant actors (stakeholders) and activities.

This paper reflects on the outcomes of the ABACO project, in particular on the use of IPs in its project approach, and presents the lessons learned. The authors also draw on first-hand experience with the DONATA[4] project (African Development Bank project managed by FARA[5] and implemented by ASARECA[6] in eastern and central Africa).

Innovation platforms for the promotion of CA: experiences from ABACO

At the start of the project, it was decided that the IPs would be a core tool in the ABACO project. The IPs were expected to involve a range of stakeholders (community, state, commercial, civil society, international) in dynamic, creative and productive partnerships that benefit all of the stakeholders in some way. Without benefits of a magnitude and over a time-scale that are significant and interesting to the stakeholders, it was assumed that the partnership would falter.

[4] Dissemination of New Agricultural Technologies in Africa (DONATA)
[5] Forum for Agricultural Research in Africa (FARA)
[6] Association for Strengthening Agricultural Research in central and Eastern Africa (ASARECA)

The functions of the project IPs were defined as:

- Coordination: provide co-ordinated relationship between organisations (leadership, common goals, roles and planning)
- Information and capacity building: assist the flows of information and knowledge (including training) for the understanding and application of CA
- Experimentation: testing and adaptation of CA options
- Socio-economic study: understand farmers' circumstances, aspirations and support needs for CA options
- Advocacy: engagement with national-level actors – influence on policy

IPs can exist at different levels (e.g. national, district and local). Some ABACO countries already had stakeholder structures of different sorts and at different levels at the start of the project. The priorities assigned to the various functions outlined above was different at each level, as follows:

- **National level functions** included: awareness raising of CA at Ministry and general public levels; influence on relevant policy formulation; influence on national strategy/action plan for CA; influence on allocation of resources to CA; import or manufacture of CA equipment; training of CA technical personnel (research, extension, NGOs etc.), resource mobilisation, linkage with District level
- **District level functions** included: coordination of District-level partners and resources, linkage and communication with national and local level Co-IP; information exchange; capacity development; development and implementation of workplans; diagnosis and assessment, monitoring and evaluation,
- **Local level functions** included: site-specific definition of CA and how it should work; planning and implementation of CA workplans including experimentation; linkages with District partners (for input supply, marketing, information, training…); capacity development.

ABACO field experiences with Innovation Platforms

The functions and priorities of IPs given above constitute the theoretical model that the project ideally would have followed. In reality there was a big difference in the application of the IP principles between the five project countries: Zimbabwe (functioning IPs at four levels); Mozambique (partially functioning but fragile IPs at local and national levels); Kenya (no functioning IPs - but established Farmer Field Schools and a wide range of associated stakeholders); Madagascar (relatively weak and unsustainable farmer groups inherited from a previous project); and Burkina Faso, where a strong research-led process has had some success in establishing functioning IPs.

In **Zimbabwe**, there are functional Innovation Platforms at Ward, District, Provincial and National levels. At local level these are centred around Farmer Learning Centres that were present before the project started. At Ward level the Platform members are female and male farmers, the Ward extension worker(s), locally active NGOs and locally active private input suppliers or traders. District level IPs are coordinated by the District Agricultural Office with the participation of other District-level officials as well as private companies and the District representative of the Zimbabwe Farmers Union (ZFU). At National level the Zimbabwe Conservation Agriculture Network (ZIMCAN) is coordinated by AGRITEX (the national extension service). The ABACO project IPs were expected to mobilise farmers and stakeholders to co-learn, innovate and generate specific solutions around Conservation Agriculture, climate change and variability and other identified agricultural problems constraining food, nutrition and income security in the smallholder sector. The function of the District IPs (DIPs) was to link smallholder farmers to extension, the Environment Management Agency, the University of Zimbabwe, Rhizobium manufacturer, input suppliers, markets (including the Grain Marketing Board), Banks, the ZFU and the Meteorological Department. Although no NGOs are members of the DIP committee at present they are invited to meetings when relevant (e.g. Environment Africa). The DIP mobilises farmers into groups for the dissemination of technology and the sharing of experience. The DIP identifies training needs and coordinates input provision across all commodities. The DIP also coordinates inter-farmer visits. Modest resources come from ABACO through SOFECSA[7] to facilitate this agenda (e.g. stationery, refreshments for meetings etc.). Because CA is a mainstream government activity, government resources - such as transport - can be used to mobilise farmers. Apart from training, inputs, information and market access, the DIP now organises CA Learning Centres, field days and farmer exchange tours with the facilitation of the SOFECSA National Innovation Platform (NIP) and the research group at the University of Zimbabwe (UZ) These include prizes, which introduces an element of competition and pride among farmers in good work. The DIP links to the national level IP for support. For instance training advice is provided by CIMMYT/CIAT, E-Africa, Restless Development and UZ. A specific challenge is the very limited quantity of CA equipment at present (only one jab planter and one ripper per District). The DIP has a wider scope than CA. It is more correctly seen as an IP for agriculture as a whole into which issues such as soil fertility, climate change and CA can be inserted. It is both a discussion forum and a platform for action. CA participatory trials are conducted through the District IPs, while the local IPs are also used for wider objectives, such as advocating for a new community hall.

In **Mozambique** there is a national level Conservation Agriculture Working Group that comprises research, extension and the National Farmers Union which meets once per month, and reviews present activities, identifies future needs and shares experiences. There are, as yet, no IPs at District level or at local level. However, the National Agricultural Research Institute (IIAM) is conducting a set of trials on CA in two locations. The sites were selected for the presence of research and extension staff and other service providers, accessibility and their provision of contrasting agro-ecological circumstances. Efforts have started in building IPs at the two locations but the Mozambique research system is suffering from a serious lack of human capacity to fulfil its mandate. The facilitation of meetings and problem solving tends to be done by individuals from the Provincial level because those at the lower level lack the skills and experience necessary. Training and support is needed for them to be able to act more autonomously.

In **Kenya** there are two starting points for IPs – the **national-level** Conservation Agriculture Task Force, and the **local-level** Farmer Field Schools (FFS). As they stand, neither could be

[7] *Soil Fertility Consortium for Southern Africa – the body implementing ABACO in Zimbabwe*

seen as a fully functioning IP[8], and there is also little linkage between the two. The National CA Task Force was not active during the project period. At local level there were 9 FFS groups engaged in participatory research through group plots that compare CA maize with conventional agriculture, but there has been a diminishing trend in membership partly due to some poor harvests because of waterlogging (leading to members working for wages on flower farms and elsewhere), and due to old age (the group members have a high average age). Each FFS group has its own internal governance structure, but there is no structure coordinating service providers and the FFS groups (which would constitute an IP). At District level (Laikipia East) there is a wide range of stakeholders (including other projects/NGOs promoting CA), but again no structure that meets to discuss direction, assign roles and coordinate actions. There is a lack of materials and skills at farm level to implement CA properly, and there is a negative social pressure on the group members from the community. CA farmers were accused by their peers of laziness as they do not remove the stover nor produce a clean, ploughed seedbed. There is also social tension within some families. Normally only one family member, either the husband or the wife, attends training and works on demonstrations as a member. While they may be convinced of the benefits of CA, they have a hard time convincing their spouse, who then continues with his/her traditional practices. However the project has stimulated discussion within the family, and raised the status of women in the eyes of their husbands. Progress of the ABACO project in Kenya has been limited in terms of the number of committed adopters. However, encouraging signs are the number of knowledgeable, committed, extension staff who now have good experience with the practicalities of implementing CA in the field, and the level of interest shown in field days by non-CA group farmers. They have noted that many of the CA-group member families are at, or near to, food self-sufficiency unlike many of their conventional farmer neighbours.

In **Madagascar**, ABACO was working with two existing local farmer groups near Lake Alaotra, but no regional IPs for CA have been created. The two farmer groups were considered as technical IPs, but operated as FFS, where researchers, farmers and extension agents carried out on-farm CA experiments. Farmers in the North used the group in an effective way to achieve rather advanced, technical objectives, but the group was perceived to be exclusive and closed to non-members, while the less-organised group in the South was more open to interested people but less active. The farmer groups allowed its members access to services provided by a previous comprehensive development project, BV/Lac. BV/Lac was instrumental in CA research and extension in the region. BV/Lac came to an end in 2013, and NGO activity has remained low since then as funding and staff capacities are low. CA adoption remained low and various constraints (e.g. lack of public and private service providers, insecure land tenure) and other interests (e.g. alternative income activities on- and off-farm) restrained farmers' interest in the groups as well as in CA. A national umbrella organisation, *Groupement Semis Direct de Madagascar*, engages stakeholders interested in agroecology and CA at national level by sharing knowledge and experiences.

Numerous IPs have been implemented in **Burkina Faso** to encourage the adoption of agricultural innovations and stakeholder interactions within a value chain, in particular under DONATA. Innovation platforms have emerged gradually as a relevant means for the

[8] According to the ABACO project document (page 18): *"ABACO will adopt a definition of co-innovation platform which is a flexible and informal, dynamic, multi-stakeholder partnership working together to develop and use technologies and processes to improve livelihoods – in this case to implement/monitor/promote CA".*

development and diffusion of many kinds of innovations. Few studies have examined how to implement IPs to address complex systemic innovations such as CA. Under the ABACO project three complementary steps were followed to establish three local innovation platforms for CA: (1) the diagnosis of existing forms of organisation; (2) the development of an IP model; suited to local conditions; and (3) the validation by stakeholders of the IP model and the planning of activities. The emphasis was on the village scale, building on existing structures, rather than imposing new ones. Following analysis, the research team opted for an IP structure consisting of two bodies, a technical body and an institutional body. The researchers viewed IPs as a space for experimenting and assessing innovative cropping systems, a means to ensure more effective participation on the part of local stakeholders in the production of knowledge and the adaptation of CA, and, in the medium term, a means to promote the adoption of CA. Stakeholders defined an activity plan and farmers played an active role year on year in modifying the cropping systems. As a result IPs attracted a growing number of farmers to their meetings. IPs improved the networking of farmers and interaction with external stakeholders was strengthened. The IPs also resulted in changing perceptions and attitudes regarding crop residues and grazing regimes. IPs have been an effective space for the joint design, testing and discussion of new cropping systems and crop residue management modes, and for training, emulation and networking of stakeholders. Basing the IPs on existing organisations allowed the IPs to quickly gain legitimacy and an audience, and to rapidly become operational. However, it can be difficult to propose “innovative” activities which depart from those which the existing organisations and their members are accustomed to and are prepared to undertake. There is a dependence for facilitation and ideas on the research team that suggests weak prospects for sustainability. Regardless of their purpose, there is a limit to what village IPs can do to help change local agriculture. It is critical to also work at the level of the “enabling environment” in order for agricultural policy to be more supportive of the implementation of agro-ecological systems like CA.

Experience with innovation platforms for the dissemination of technologies in DONATA

The experience of ABACO can be contrasted to those of DONATA. This African Development Bank-funded project, managed by FARA, operated in three regions - western, southern and eastern/central Africa. In eastern and central Africa the 10 national research institutions served by the regional research body, ASARECA, chose two novel technologies for promotion though innovation platforms: orange-fleshed sweet potato and quality protein maize. Both were seen as ways to improve nutrition and to provide income through sale of the primary product and processed products along the value chain.

The national research organisations established innovation platforms at district and local levels. This was a time consuming process as it took a long period of negotiation for the stakeholders to understand and appreciate the idea of innovation platforms. In the first instance the platforms were mainly used to multiply the planting material of the two commodities, but as this became more readily available attention switched to developing the value chain. Thus for sweet potato, farming families and some private entrepreneurs started to use orange-fleshed sweet potato for making and selling cakes and doughnuts, while quality protein maize was found to enhance the growth of chickens and was used for fortifying the nutritional quality of bread . These linkages along the value chain took time to develop, and some were more successful, or on a larger scale, than others.

Kimenye and McEwan (2014) found that the factors that tended to result in successful innovation platforms in the DONATA projects in eastern and central Africa were as follows:

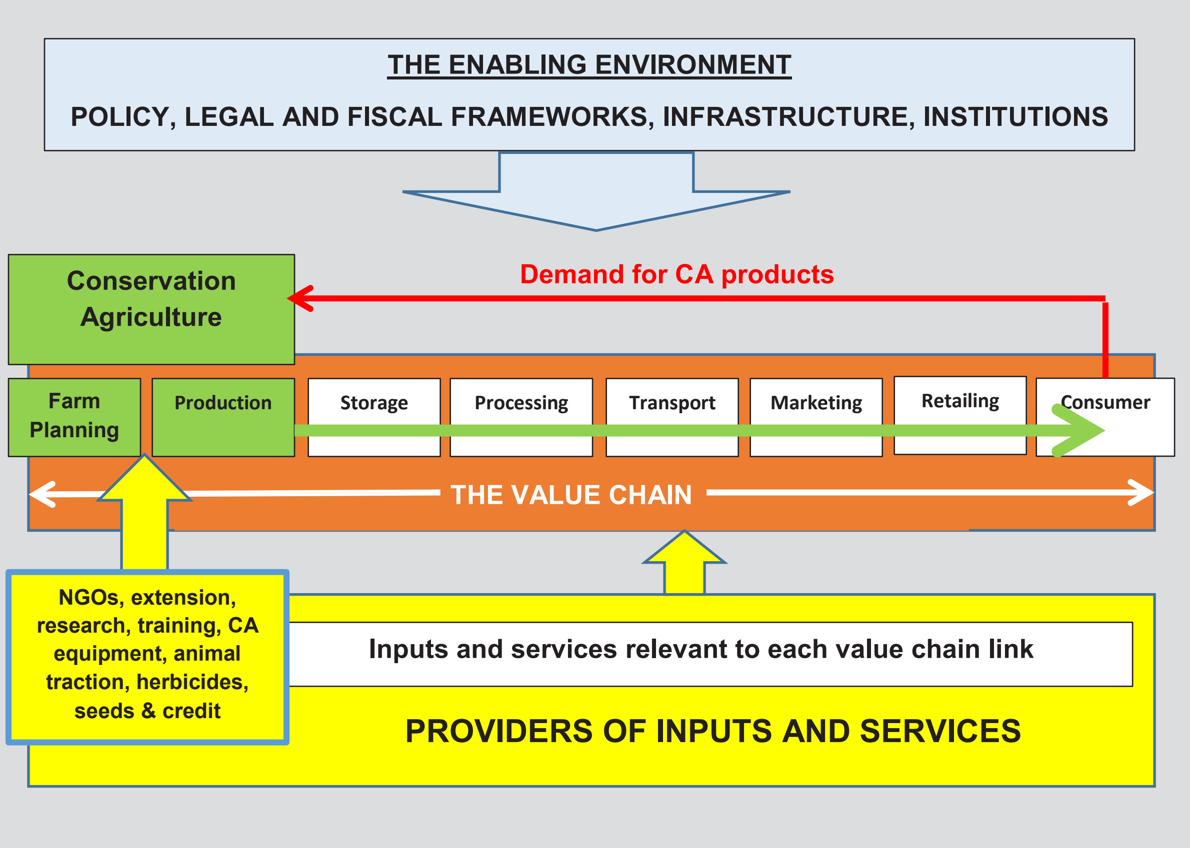
- Bringing together a diversity of actors to support learning, innovation, technology generation and dissemination processes.
- Using a range of tools and processes that can support the establishment and functioning of the IP, such as value chain analysis, stakeholder analysis and SWOT analysis.
- Building capacities and competencies for supporting innovation processes and IP functioning.
- Choosing a committed and energetic lead organisation to coordinate and advocate for the IP at institutional level.
- Taking time to establish democratic, participatory governance and management processes.
- Ensuring good flows of information and feedback, and encouraging continued innovation.
- Encouraging sustainability by founding platforms on a sound business model and good business management principles.

Contrasting the use of IPs for promoting CA and for promoting value chain commodities

The main difference between the ABACO and DONATA situations is that ABACO was trying to promote a way of working that might bring environmental and production benefits in the long term, whereas DONATA was promoting technologies that brought tangible, short-term results (once the innovation platform was established and once good quality planting materials were available). DONATA technologies had a **commercial driver**, giving all stakeholders **along the value chain** an easily appreciated benefit in participating in the platform. Both of the DONATA chosen technologies had nutritional benefits[9] that provided further incentive for the involvement and support of international bodies such as CIMMYT and CIAT, and humanitarian NGOs (see Kimenye & McEwan, 2014).

[9] *Orange-fleshed sweet potato is rich in Vitamin A, while quality protein maize has enhanced levels of the amino acids lysine and tryptophan*

Figure 2. Conservation Agriculture within a commodity value chain context



(Source: Pound and Posthumus, 2013)

Figure 2 shows that Conservation Agriculture operates very much at the production end of the value chain. Unless there is a developed market paying a premium for CA products there is not much of a commercial **pull** driving the adoption of CA. An alternative might be policy instruments (such as a government payment to farmers during their transition from conventional to CA farming) to provide a **push** for the adoption of CA. For the widespread adoption of a set of practices such as CA, the enabling environment and the provision of inputs and services have to work in harmony and have continuity over time.

Farmers have to be convinced that the new way of doing things is better than what they have been used to for many years, and the trade-offs are, on balance, more productive (and carry less risk of failure). For instance leaving crop residues on the field means they either have to find new sources of animal feed to replace the residues or dispose of some livestock. Social change may be necessary within the village to stop cattle owners from free grazing the residues in the field, as happened in Burkina Faso. Technical changes will be needed to plant through the trash left on the soil surface and new skills need to be learned to apply herbicides at the correct time and in the correct dosage, assuming the farmer has cash to purchase these inputs. The farmer has to weigh all these factors and decide if radical change is worth the investment and the risk. In addition, CA is a long-term measure, and the investment and upheaval caused by changing to CA are not recompensed in the first one or two years. For resource-poor farmers with little spare capacity (cash, labour or land), it may be difficult to weather this transition without some assistance.

Conclusions

The introduction of **CA requires fundamental change in the production system**, with implications for many farming operations and activities (including land preparation, stover management, cropping practices, weed management, animal feeding and grazing management). These imply big changes in commitment and behaviour for a range of stakeholders (farmers and service providers), requiring innovation in the 'software' (knowledge, information, skills of farmers and service providers) and 'orgware' (structures, linkages and ways of working) of the agricultural system (World Bank, 2012). There is also a need for the 'hardware' (materials, equipment) specific to CA (including specially designed hand, animal or tractor-mounted planters and weeders, herbicide applicators and effective herbicides) to be readily available to farmers, and accessible to them in terms of cost - with credit where necessary.

To date CA innovation platforms have tended to focus on CA as a solution, thus diverting attention from tackling underlying problems and constraints such as declining soil fertility, insecure property rights, conflicting demands on farm resources, or lack of inputs and services.

This suggests that **innovation platforms should not focus solely on CA**, but rather on underlying shared complex problems which form obstacles to sustainable agricultural intensification and agricultural sector development. The focus on these problems enables innovation platforms to widen their mandate, to bring in innovative solutions that are not prescribed and go beyond technological fixes. Innovation platforms are instruments to reduce barriers to innovation in the agricultural sector. Low adoption rates of CA are not the issue, but the underlying problems and constraints that farmers face are. Solutions may include farming systems that are based on elements of CA, but do not adhere rigidly or exclusively to all CA principles.

The complexity of the challenge means that, despite many efforts, Conservation Agriculture (CA) has not been embraced on a large scale by African farmers. Such a broad set of changes is not suited to a top-down, linear approach of technology transfer, but **IF innovation platforms are applied fully and supported over an extended period by a dynamic enabling environment**, they would seem to be a valid instrument for experimenting and adapting CA systems, within a broader sustainable intensification agenda.

However, establishing, supporting and maintaining innovation platforms is very resource-intensive, and there is not enough skilled capacity available in most countries to coordinate and facilitate them as a public good (as in the case of conservation agriculture, which enhances the environment) where there is no commercial driver bringing in service providers and providing an economic incentive to farmers to change their practices.

The experience of the five ABACO countries suggests that it is possible (as in the case of Zimbabwe and Burkina Faso) to build on existing farmer group structures, and, with intensive external support, to change farming attitudes and practices, at least among some farmers and in some ecological situations. But the impacts of the innovation platforms has remained limited to the localities of the platforms.

Some of the issues to be considered when using IPs for sustainable agriculture are:

- Identification of suitable themes for IPs;
- The influence of different starting points and structures that are used for the set-up of IPs;
- The use of external resources and facilitation in establishing and maintaining the IPs;
- Opportunities and constraints to foster autonomous and sustainable IPs;
- Relevant criteria for measuring success of IPs.

A major constraint to adoption has been the inadequate linkage of farmers to CA service providers for production inputs, output markets and financing. The design of the ABACO innovation platforms has failed to deliver as expected because they were anchored on the delivery of *knowledge* to farmers, rather than the tangible *services* demanded by farmers.

Discussions in Zimbabwe and Madagascar in particular have crystallised the opinion that IPs should be broader-based than CA, and that they should be “an innovation space” looking for value chain opportunities, with CA being integrated into those value chain activities.

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