

Full Length Research Paper

Making knowledge-based services more demand-oriented? An experience with 'public funding, public delivery' extension in Bénin

Clément Gbêhi^{1*} and Gerard Verschoor²

¹Département d'Economie, Socio-Anthropologie et Communication (DESAC/FSA/UAC), Université d'Abomey-Calavi, Faculté des Sciences Agronomiques, 01 B. P. : 526 Cotonou, République du Bénin.

²Rural Development Sociology, Social Sciences Group, Wageningen University, Hollandseweg 1, 6706 KN, Wageningen, The Netherlands.

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This article examined newly emerging patterns of agricultural extension in the context of decentralization policy in Bénin. It assesses whether the promises of decentralization were met in the case of the 'Experimental Development on Innovation' (EDI) project. Thus, it assessed the extent to which service delivery became demand-oriented and effective in promoting production-enhancing technologies for sustainable agriculture. Semi-structured and individual interviews were used to investigate the dynamics and processes through which the project evolved. The analysis of findings showed that after its promising start, the EDI project experienced a number of setbacks, and eventually became intertwined with the supply-oriented service delivery. While it contended successfully with those involved, consideration must be given to the fact that the formal funding and delivery arrangement often contradicted the expectations that services delivery should become 'demand-oriented'. The article concluded that services delivery depends rather on the negotiation and on the quality of the process in which demand and supply are articulated and matched.

Key words: Technology transfer, extension service delivery, decentralization, public funding, public delivery, demand-oriented services, demand articulation, Bénin.

INTRODUCTION

For over twenty years now, serious doubts have been expressed about the capability and competence of the public sector to finance and manage agricultural development and innovation processes. The reason for this lies in the failures in research and extension services fostered by the public sector. In many developing countries, government agencies have been and are still criticized for their lack of effectiveness and inability to offer services which benefit resource-poor farmers. The proposed remedies stressed the need to decentralize and privatize

extension services. Such solutions were in line with the general belief in markets and government withdrawal at the time, and were further advocated with reference to a widespread dissatisfaction with the limited client-orientedness and effectiveness of extension, budget constraints, and reduced public support for subsidizing the agricultural sector (Beynon et al., 1998; Leeuwis, 2000). Obviously, this poses several challenges which demand that actors engage in, and actively search for changes and appropriate strategies in order to meet service effectiveness (Alex et al., 2004; Bardhan, 2000; Zijp, 1998). In line with these challenges, the international institutions that support agricultural development and innovations (for example the World Bank and bilateral aid organisations) turned 180° and championed demand-oriented service delivery - to replace the conventional

*Corresponding author. E-mail: clement.gbahi@yahoo.fr, clegbahi@yahoo.fr. Tel: (00229) 90041114, 66820236. Fax: (00229) 21360122.

public-funded knowledge-based services - which, they believed, should close the 'cognitive distance' between research and farmers (FAO, 2001; Garforth, 2004; Gbêhi and Leeuwis, 2012; Goovaerts et al., 2005; World Bank, 2000). Likewise, a widely shared issue in this debate is the premise that separating funding from delivery extension makes service provision accountable for the support of farmers' needs and responses to innovation opportunities (Katz, 2002; Kidd et al., 2000; Rivera and Alex, 2004).

The changing mode of funding and delivering agricultural research and extension services in Bénin reflects this world-wide trend. The purpose of this article is to critically assess how and to what extent the services delivered became demand-oriented and effective in supporting agricultural innovations. We did so by presenting a case study of an extension project called 'Experimental Development on Innovations' (EDI project) which is one of a series of emerging patterns in agricultural development and innovation in the context of decentralization policy in Bénin. It was carried out by a Research and Development organization (R&D), with the financial aid of the French government funded agency PADSE and the political support of the Béninese government (through its Ministry of Agriculture, MAEP). It illustrates the experience of a government supported project in its attempts to decentralize service delivery. This article reconstructs this major experience with a form of 'public funding, public delivery' extension in Benin. Initially, the project is assumed to make knowledge-based services delivery more responsive to farmers' demands. The project's strategy was viewed as a new pattern to break with the past and to close the 'gap' between research and farmers which caused co-ordination problems and divergent norms and expectations with regard to desired outputs. However, after its promising start, the EDI project has experienced a number of setbacks, and eventually became intertwined with the supply-oriented service delivery. This article seeks to better understand what happened, and draws lessons from this for the future.

The article provides a discussion on the background against which to understand the origin, issues and challenges of the approach adopted in the EDI project. Three particular points are made. First, we describe the thinking that underlies the current trend toward decentralizing agricultural extension services. Secondly, we underscore the continuing need for state involvement in, and specify several possible models for relevant knowledge-based services. Thirdly, we introduce the EDI project. Subsequently, the purpose of the study, the process by which the case was selected, and the methods of data collection are explained. Then, the critical events that constituted and shaped the implementation of EDI are presented. A discussion and analysis of the experience are presented and is concluded with a number of policy lessons regarding the project

experience.

THE EDI PROJECT APPROACH: ORIGIN, ISSUES AND CHALLENGES

Decentralization of extension: new role for the state

Since the 1980s and 1990s, the main debates over the role of state-led organizations in the funding and provisioning of agricultural extension services have focused on the decentralization of state services (FAO, 2001; Farrington et al., 2002; Rivera, 1996; World Bank, 1995). This change has generally been introduced on the base of the belief that in order to be successful, farming communities must play a major role in shaping extension management. In particular, with decentralization of extension, certain services and responsibilities (planning, monitoring and evaluating of impacts) formally provided by the state are transferred to, and now executed by field level offices and private organizations; and the participation of the farming communities is viewed as key in the services' effectiveness. The current literature emphasizes that this requires a shift of decision-making power to farming communities' organizations in policy making process. For many, decentralization of extension is seen as an improvement over the state systems, which, they feel, suffered from limited impact and high recurrent costs, poor coverage, ineffective service delivery and low quality products. Advocates stress the considerable benefits that can be gained, stating that decentralized extension system can transform the top-down structure and operation of public services, and positively affect several of the generic problems of extension (Anderson, 2008; Ferder et al., 2001; World Bank, 2000).

Over the past thirty years, the decentralization of extension has considerably reduced the participation of government in the financing and provisioning of agricultural extension services (Alex et al., 2004). Furthermore, dissatisfaction with the functioning of conventional extension, budget constraints, structural adjustment policies and reduced support for subsidy the agricultural sector in many developing countries have led to a redefinition of the government's role in publicly funded extension (Leeuwis, 2000; Swanson and Samy, 2002). Many studies put into evidence that the provision of knowledge-based services could no longer be the sole preserve of government organizations if extension was to meet the needs of all farmers. In many developing countries, the increasing divergence between the expectations of the government and those of farmers has led to tensions (Alex et al., 2002; Katz and Barandun, 2002). With farmers generally having few opportunities to participate in management, conventional extension proved ineffective in easing these tensions. Decentralization was expected to resolve this and increase accountability of service providers to farmers. In addition,

Table 1. Different models to financing and delivering decentralized extension services.

Who pays	Who delivers	
	Public	Private
Public	A) Public funding and delivery of extension. Deconcentration to field level offices and farmers, devolution to sub-national government, or joint budgeting/delivery with farmers' organizations, for example: i) Government projects ii) Local level office projects	C) Public funding (through voucher schemes or credit to small-scale farmers), with private delivery service. Delegation of the provision of extension services to private sector agencies, for example: i) Farmers' organizations ii) Local NGOs
	B) Private funding with public delivery of extension services. Public sector cost recovery strategies, for example from: i) Individual farmers ii) Private NGOs iii) Commercial companies iv) Agricultural cooperatives	D) Private funding and delivery ('privatization') of public sector extension services by private agencies. Transfer to private sector, for example: i) Individual farmers ii) Private NGOs iii) Commercial companies iv) Agricultural cooperatives

Adapted from Rivera (1996).

this new form of collaboration is expected to encourage local financing and ownership of extension services, result in more efficient and equitable allocation of resources, provide incentives for service delivery, ensure lower cost services, build local capacity, and respond more effectively to farmers' constraints, needs and opportunities (Neuchâtel Group, 2006; Rivera and Sulaiman, 2009; Tossou and Zinnah, 2005; World Bank, 2006).

However, progress in achieving such benefits would be partial at best, critics believe, as it is associated with several drawbacks (Fleischer et al., 2002; Purcel and Anderson, 1997). It may lead to tensions in the development of procedures for policy formulation and priority setting which reconcile government objectives with priorities emerging from decentralized extension systems. It may also lead to difficulties in ensuring that farmers' organizations are represented, and express the priorities of the people they are meant to represent, the risks of generating or aggravating conflicts between farmers with different priorities and interests, of raising expectations that may prove impossible to fulfil, and co-optation of the participation process by powerful and more articulate elites or leaders to the detriment of the resource-poor farmers. Despite these assumed disadvantages, decentralization of extension has become a 'significant impetus', for it is in line with the general belief that services may become more demand-oriented through collaboration in which the government (and/or the donor) increasingly focus on core functions such as planning, regulation, funding and controlling quality and results

while leaving the provisioning of services to autonomous local organizations.

Different models of extension services delivery

Certainly, part of the motivation behind the recent calls for decentralization of extension often stems from a view that service delivery could remain in public hands or become private, yet extension funding and delivery should be separated. This can be operationalized in many different ways. Rivera (1996) distinguishes four major arrangements through which funding and delivery can be organised (Table 1). Cell D in Table 1 (private funding, private delivery) represents the 'purest' form of privatisation of public extension services. This form of collaboration in public extension aims at relieving the central government from the responsibility of paying and providing extension services (Kidd et al., 2000; World Bank, 2000). Arrangements in cell C (public funding, private delivery) include various modes of paying private sector parties to deliver extension services. Here, the government can choose between 'demand side' funding (for example, giving vouchers to farmers) or 'supply side funding' (for example, contracting a private company to deliver specific extension services). The arrangement in cell B is 'private funding, public delivery' whereby the government uses various strategies for cost-recovery that can provide income to public services (through direct charging, for example, fee-based or contract-based services paid directly by farmers).

The last arrangement is 'public funding, public delivery' (cell A). Here, public funds are used by a local organization to deliver free extension services to farmers. For this form of collaboration in extension to work properly, certain pre-conditions are required: providing farmers with substantial influence over extension initiatives, ensuring availability of financial resources adequate for service providers to accomplish their tasks, ensuring adequate administrative capacity in field level offices to carry out their tasks, and establishing reliable mechanisms for accountability to farmers' demands. In addition, farmers must assume a 'dominant', even pre-eminent role, learn to identify and articulate their needs, negotiate and judge and control service quality and outputs. It has been argued, however, that this later arrangement can be especially sensitive to the drawbacks mentioned by many scholars and afore discussed (Alex et al., 2002; Bardhan, 2000; Klerkx et al., 2006).

Emergence of new patterns of extension in Benin: The case of the EDI project

The case study in this article examines an extension project implemented in the Guinea-Sudan transition zone in the centre of Bénin. Its own key philosophy embodied many of the features afore discussed. The EDI project emerged as a result of the restructuring of the agricultural sector in Benin, of which the decentralization of research and extension services was an important element. In particular, the EDI project pursues a 'public funding, public delivery' form of collaboration in extension, where extension services formerly provided by the central government are now delivered by the local R&D organizations, and farmer participatory involvement in problem-solving, decision making and sharing responsibility is viewed as key in services effectiveness. In addition, both the Beninese government and the international institutions committed to the view that making service delivery more responsive to farmers' demands would create an enabling environment for food security, poverty reduction, and sustainable land and natural resource management. This commitment featured prominently in the 'New Policy Framework for Rural Development' (MAEP, 2000).

Furthermore, the EDI project emerged as a response to a number of basic problems such as the detrimental impacts of local practices on the soil fertility of cultivated land that still persist in the zone. Indeed, the centre of Bénin is a poorly integrated area, of which large parts are geographically remote and whose climate often constitutes a limiting factor for agriculture. A large proportion of the people are poor. In 1998, a local R&D organization was jointly established by PADSE and the Beninese Ministry of Agriculture (MAEP) to promote sustainable agriculture. The R&D organization is staffed by three agronomists: a project coordinator (responsible for the

farming systems) and two persons who specialized respectively in agro-ecological and socio-economic issues. In 1999, the R&D organization prepared and then submitted to PADSE and MAEP an outline idea which detailed the activities and the 'Village Level Participatory Approach' (APNV) to be used to facilitate the process. The proposal was approved and the project was funded for six years from 1999 onwards.

The EDI project is distinctive from most conventional extension with respect to the nature of both funding and delivery arrangements, and of services that were supposed to be delivered at the outset. Indeed, whereas funds flowed conventionally from the donor to a central unit and were managed by the Béninese government, the EDI project fund operated in a supply-side financing mode (Alex et al., 2002; Katz and Barandun, 2002), with the R&D organization at the receiving end and in charge of fund management and service delivery. The R&D organization prepared annual sub-projects jointly with the farming communities. PADSE and Bénin's government paid part of the costs on behalf of farmers. PADSE's funding covered costs of investments, coordination and operation. Government funding was concerned with wages of the project staff and equipment costs. It was envisaged that farmers, on their part, should pay the seeds, the chemical fertilizers, and provide labour (either theirs or hired). However, farmers also had to indirectly pay part of the extension costs. Extension costs were added to the prices of fertilizers and charged to farmers, which made these payments less transparent. Gbêhi and Leeuwis (2012) refer to this in terms of indirect modes of cost-recovery. In addition, farmers should provide a financial participation which represented approximately 10% of the extension costs involved.

In contrast with previous schemes characterized by a lack of accountability to farmers' needs, the innovative aspect of the project consisted in the involvement of farmers in extension management so that they would obtain a product that fits their requirements. The EDI project did this in the following way. In the first place, the R&D organization together with farmers organized a village diagnosis with the aim to identify major experienced problems. At the end of the diagnosis, villagers helped to identify fifteen farmers, called 'model farmers'. Secondly, model farmers were given opportunities to analyze the major problems experienced, select promising solutions, and plan the experiments. Thirdly, model farmers were trained to work with and test the solutions, monitor and evaluate the results, and provide feedback to the farming communities. Fourthly, each model farmer selected ten neighbours (called 'godsons') to form an EDI project affiliated group. Once these godsons were trained, they were funded to test the solutions under funding and were granted delivery arrangements similar to those of their 'godfather's'. In turn, each of the godsons would constitute his own group, and so on.

In these processes, farmers are given opportunities to develop their capacity for problem-solving, decision-making and management. It has been argued that these processes produced to some extent divergent expectations. EDI was originally designed as an extension project that should be capable of promoting production-enhancing technologies. In the view of the MAEP, the implementation of this project should primarily improve public-funded extension policies. By contrast, the donor PADSE expected an empowerment of farmers in order to take over extension initiatives. However, despite these different expectations, all parties involved agreed on the need of making the extension services more effective. The EDI project was supposed to make extension more demand-oriented and flexible in serving the needs of farmers in general, including also resource-poor farmers with limited resources who had been poorly served by public extension services in Bénin.

ANALYTICAL FRAMEWORK AND RESEARCH QUESTIONS

According to many, the main expectation from the decentralization of extension services would be that service delivery becomes more effective and efficient. While the issue of efficiency is undoubtedly important, our primary interest in this article is first and foremost in whether and how service delivery has become more effective. Scholars view effectiveness in relative terms. Effectiveness for what and whom is the question that is commonly asked. In spite of the subjective nature of effectiveness, it is possible to evaluate decentralized extension services based upon the design requirements. In this context, we consider three design requirements derived from literature on agricultural development and innovation.

Articulating experienced problems and offered solutions

While in the past the origin of the demand was government goals-oriented or technology-oriented, it should, however, be acknowledged that the new forms of intervention are by no means exclusively designed to service farmers' demands. Sufficient efforts, then, should be made to identify and analyse problems farmers were experiencing and offer solutions. Most scholars often referred to it in terms of a wish to articulate farmers' demands (Garforth, 2004; Gbêhi and Leeuwis, 2012; Rivera et al. 2004). In addition, flexibility in turn becomes a central component to the new forms of intervention as the situations - which cause problems and in which solutions are developed - are diverse and change continuously. Connected to this, key research question (1) is: how and to what extent does the process reflect

sufficient effort to make services 'demand oriented' in the sense that solutions offered matched with problems experienced by farmers (1a) and were adapted over time (1b)?

Catering for diversity

Recent innovation studies indicate that innovation does not necessarily progress in one particular direction and that under similar conditions, farmers develop different economically viable paths. These studies find that such different patterns are explained by the diverse strategies, modes of thinking and aspirations as well as the diversity in the ways farmers organize their livelihoods (Chambers, 1997; Tittonell et al., 2005). Thus, one could argue that effective service delivery implies that services are geared and/or adapted to diverse audiences. In connection with this, key research question (2) is: how and to what extent does the process reflect sufficient effort to adapt services delivered to diverse beneficiaries?

Fostering co-evolution of technology change and institutional change

Whereas innovations were previously regarded as consisting of technology only, the current idea is that it requires deliberate efforts to create effective linkages between 'hardware' (that is, new technical devices and practices), 'software' (that is, new knowledge and modes of thinking) and 'orgware' (that is, new institutions and forms of organization) (Geels, 2002; Leeuwis, 2004; Smits, 2002). It is considered a complex, interactive process in which there is a large amount of co-evolution of technological and institutional systems. It has been argued in this light that the conventional repertoire of agricultural extension services (that is, technical advisory activity and persuasive campaigns) needs to be supplemented with more facilitative modes of intermediation and communicative support aimed at for example, building networks, developing shared visions and understandings, articulation and matching of knowledge demand and supply, conflict management, and collaborative innovation design (Gbêhi and Leeuwis, 2012; Hall, 2006; Sanginga et al., 2008). Thus, indicators for this design requirement of 'effectiveness' include attention for the development of new institutional arrangements that complement technology, and the use of new modes of intermediation to gain sufficient support and agreement in networks regarding new 'orgware'. Connected to this, key research question (3) is: how and to what extent does the process reflect sufficient effort to facilitate the development of complementary institutional arrangements that create conditions in which farmers can adopt technology?

METHODS OF DATA COLLECTION AND ANALYSIS

Since we are interested in studying how processes unfold, a case study setup can be considered an appropriate research strategy (Yin, 1994). The EDI project case study was selected from a dozen of decentralized extension projects in Bénin. Selection criteria ranged from differential involvement of farmers, to pluralism in funding and to different methodological approaches. Following the project document, the members of the R&D organization present themselves as facilitators, with the role of supporting farmers in the process of articulating experienced problems and potential solutions. With this in mind, we first followed critical events and reconstructed ex-post important events which occurred before the start of our fieldwork. In so doing, we kept track of the way in which the members of the R&D organization articulated experienced problems and offered solutions. These have been investigated between 2005 and 2007 through group discussions and semi-structured interviews with the members of the R&D organization, some authorities of the MAEP, some managers of PADSE, AGRAN, ABE, FAO, and some managers of farmers' organizations, commercial companies and micro-finance institutions, and the leaders of local institutions (traditional chiefs, the religious authorities and leaders of municipalities as well as schools). Secondly, we conducted individual interviews with 169 farmers (120 natives and 57 immigrants). We did this in a dozen villages which proved to be particularly interesting not only because they provided several opportunities for discussions as we accompanied the members of the R&D organization in its meetings there, but also because in some of these villages, the EDI project was unsuccessful.

Collected data have been supplemented and triangulated by drawing on historical documents, articles and project progress reports. The 'event history analysis' we undertook is based upon Poole et al. (2000). We first identified critical events; that is, events mentioned as important in the history of the project by several informants. These events were studied through the (re)examination of statements, definitions of problematic situations, stories about successes and failures. Various materials, perspectives, stories and figures were brought together around these, and re-discussed with the key informants during feedback meetings. What follows is a diachronical description of important critical events as they unfolded.

Important critical events in the EDI journey

The EDI project became operational in December 1999. Due to budget constraints during the first year, only four villages in the Guinea-Sudan transition zone (centre of Bénin) were selected: *Minifin and Gobé* in the zone of high demographic pressure, and *Gbanlin and Akpéro* in the zone of low demographic pressure. As agreed with PADSE, the members of the R&D organization had to adopt a step-by-step approach; for instance, no fund would be forthcoming unless PADSE had a clear idea about the number of farmers involved, the planning of activities and the cost involved. This section presented chronologically the important critical events in the journey of the EDI project and showed how the interactions between PADSE, the MAEP, the members of the R&D organization and farmers affected the dynamic of services delivery.

The village participatory diagnosis

During the first months, the R&D organization members organized, in each village, participatory diagnosis. This diagnosis had two main goals: (i) exploring the available natural resources and local practices addressing resource tenure, food crops production and social relations; and (ii) identifying major experienced problems.

The participatory diagnosis went on for 7 to 10 days and was at different levels. The members of the R&D organization have developed the following blueprint for the participatory diagnosis in each village: group works and field visits were combined with discussions of the findings in community meetings, providing complementary insights. Comment from both the members of the R&D organization and participating farmers alike revealed that many ideas and elements originate from the farming communities. In particular, while the farming communities provided ideas and elements, the members of the R&D organization produced a set of cards which presented simplified pictures of the information and visualized the consensus which was reached after negotiations. The result was a report that exposed the information gathered and finely delineated pictures. While noting that the diagnosis posed no particular problem because the farming communities were readily mobilized, the report concluded: 'two 'ethnic' groups practice agriculture in the selected villages: natives who are landowners, and immigrants. Immigrants have free access to (forest) lands and the right to clear them for food crops production. However, many natives complain that immigrants are farming in destructive way. This would place considerable pressure on the forest resources, environmental destruction and extinction of wild animals. They claimed that the major problem to address should be the 'land related management problem'.

Natives claimed that such a focus will inhibit the annual expansion of field crops for subsistence and market production. Some farmers interviewed (in particular, immigrants) also commented that this will stop them from going further and further away from houses to find new forest lands to clear, and then run the risk of losing some yam and maize fields to illegal bush fires, Fulani cattle herders and wild animals which still live in the surrounding bush and forest. This view led to the recognition by the members of the R&D organization that farmers have a desire to learn and acquire new knowledge on 'sustainable agriculture'. However, they noted that farmers' motivation for embarking on the project was reflected through their expectations that the project would provide chemical fertilizers and credits. This is expressed by the coordinator, who states: 'when farmers, especially youth, were informed that these expectations were going to be fulfilled, they found interest in participating in the meetings dedicated to the selection of model farmers'.

At the end of each village diagnosis, fifteen model farmers were selected, who would be the only participants in the project during the first year. A closer analysis shows that selected farmers represented a cross-section of the village and included old and young, natives and immigrants. However, when we searched the reports on the issue of the involvement of women, no evidence was found.

The identification of technologies likely to fit farmers' expectations

Respondents noted that with the initial interests generated among the farming communities, the project activities progressed more quickly than expected. Several meetings were organized to discuss the consequences and the causes of the major problem and the potential solutions. Several issues emerged in the meetings. Both natives and immigrants agreed that soil fertility had decreased, and that this led to decreased crop yields, and ultimately degradation of their livelihoods and economy. They found the need to shorten fallow periods and erosion as important factors. In order to address these threats, a number of technologies were suggested by the R&D organization - these included the application of either 200 kg NPK plus 100 kg urea per hectare or 100 kg NPK plus 50 kg urea per hectare. But these technologies were less interesting to farmers. 71% of the interviewed native farmers (against 47% of the immigrants) gave as reasons that they could not afford the costs

entailed: many farming involved small plots and little available capital. On the advice of PADSE's management, the R&D organization then contacted researchers of IITA and learned that five production-enhancing technologies with low doses of chemical fertilizers (50 Kg/ha of NPK and 25 Kg/ha of urea) were developed and tested on farm by INRAB in two villages: *Aglimey* and *Zouzouvou* on the *Adja Plateau*. These include (T₁): yam production in a cropping system with *Gliricidia sepium*; (T₂): yam production in a cropping system with *Aeschynomene histrix*; (T₃): yam production in a cropping system with *Gliricidia* and *Aeschynomene*; (T₄): maize production on *Mucuna* fallow; (T₅): maize production in a cropping system with *Aeschynomene histrix*.

It was these production-enhancing technologies that were proposed and negotiated with model farmers. During meetings, farmers were provided with information about the two major benefits that farmers can gain: (i) increased crop yields; (ii) produce on the same land for more than ten years before clearing a new plot. Interviews with participating farmers revealed that while these expected benefits were major reasons for them to become involved in the project activities, they also regarded these technologies as viable and adaptable to different categories of resource-poor farmers. However, although these expectations proved a source of enthusiasm among participating farmers, many remarked that solutions for the constraints which the proposed technologies would face were not negotiated. For example, farmers interviewed observed that the members of the R&D organization often seemed reluctant to discuss the prevailing land tenure arrangements. Especially, the immigrants were unwilling to invest labour and money in laborious non food crops (such as *Gliricidia* and *Mucuna*) that served no other purpose than to improve soil fertility for the next food crops. They were considering that the owners of the land could withdraw the plots at any time. However, in spite of these problems, when the negotiations concluded in each village, they were judged to be a success, with both natives and immigrants recognizing that the proposed technologies were cheap and accorded with their expectations.

Model farmers were supported in the planning of their own experiments

Although the members of the R&D organization have a high level of education and more than ten years of experience conducting agricultural research and extension projects, they were not able to provide all the support services for decision making that farmers needed. At that time, it was the norm that projects should involve the collaboration of researchers. In this case, two researchers were identified, one from IITA and the second from INRAB. In early 2000, the members of the R&D organization and the researchers set about the task of building a permanent R&D team that would coordinate the implementation of the new technologies within the budget permitted by PADSE. The R&D team together with model farmers evaluated the activities to be achieved. This proceeded towards a number of steps that included exchange visits to research centres and villages, elaboration of individual planning and group action plans. While in the research centres, model farmers had the opportunity to meet and exchange information with researchers who had developed the technologies on station. Through visiting the two villages where the researchers studied the technologies in farmers' fields, however, model farmers learned that farmers in these villages had shifted from the application of high doses of chemical fertilizers to cropping systems with leguminous-based technologies. It is clear, then, that from model farmers' perspective, the proposed technologies presented the most suitable strategy of improving soil fertility.

Once they returned home, model farmers felt at ease and planned the technologies, and so-called individual planning maps were drawn. This had implications for the way the R&D team

proceeded. Critically, a set of negotiations took place about the resources needed and how the process would be achieved, and of course, the costs involved. First, each model farmer was asked to choose some of the technologies. The reports by the R&D team mentioned that in the village of *Gbanlin*, eight model farmers were interested in technology T₁, three in T₂, eight in T₃, three in T₄ and six in T₅. Model farmers thus formed what it called 'technology-affiliated farmer group'. To effectively facilitate negotiations, each group was provided with information about the inputs needed and the costs, as well as the consequences when implementing one of the proposed technologies. A repeated comment from both the R&D team and model farmers alike highlighted that information from visited research centres and villages were assessed and incorporated in the planning process. The commercial companies selling chemical fertilisers and micro-finance institutions providing credits also provided information and were occasionally invited for discussions. Like during the village diagnosis, pictures were made to enhance communication within groups. This posed no particular problem, for the groups in question were readily mobilized, because farmers felt that their expectations were being taken into account in the design process.

In all, the meetings concluded with the elaboration of a series of documents proposing the new technologies to be tested, the number of farmers involved, the way the resources would be managed, the cost involved, and the financial contribution of farmers - which represented approximately 10% of the costs involved. The documents specified who should do, and pay, what, where and when (the 3 Ws). Farmers discussed these documents amongst themselves, and together formed a basis to set up their group's action plan. In March 2000, the documents - specifying the 3 Ws and the other agreements - were submitted for consideration to MAEP and PADSE, and subsequent assessments were carried out. Though the design of the new technologies was favoured by PADSE because it was likely to be relatively cheap and seemed to best fulfil the requirements negotiated, it was particularly attractive to MAEP because the process seemed to have the support of farmers. MAEP was also impressed by the combinations of different components in the participatory approach to facilitate the process. Written correspondence revealed that, the documents were approved and the decision was taken to perform the necessary types of actions needed to realise the 3 Ws.

The field testing of the new technologies and the initial success

By June 2000, the R&D team embarked on field testing of the new technologies. The process included training sessions, implementations, joint assessment and the restitution of results in villages. Respondents claimed that the training sessions involved a series of events and were conducted by the researchers of IITA and INRAB. Despite a focus on themes identified during previous phases, interviews with farmers highlighted that the training sessions were time consuming. However, farmers noted that the training approach was 'group learning', and that the information provided was crucial to succeed. Making use of PADSE's funding, and in order to provide technology-affiliated groups with the seeds of the leguminous, the R&D team jointly with farmers negotiated with research centres. Also, the number of bags of chemical fertilizers needed was negotiated with the commercial companies, who required advance payment. This was a problem as farmers traditionally obtained inputs on credit. The R&D team resolved this by facilitating the financing of chemical fertilizers through a credit system from the CREP, a local micro-finance institution established in each district. Both members of the R&D team and model farmers characterized this as the most fundamental arrangement, in which PADSE paid costs of coordination and operation, yet farmers contributed with their labour and plots of land (of 800 to 1.500 m²),

Table 2. Progress of EDI from 2000 to 2006.

Years	PADSE fund (US \$)	Farmer financial contribution (US \$)	Number of villages involved	Number of farmers supported	Total number of groups	Total areas under cultivation (ha)
2000-2001	35.006	0.504	4	60	4	7.8
2001-2002	219.132	1.351	12	60	32	7.8
2002-2003	252.548	1.611	23	728	43	94.2
2003-2004	227.652	1.687	23	728	43	94.2
2004-2005	28.672	1.607	27	1.248	57	174.6
2005-2006	20.000	1.350	27	1.554	57	174.6

Compilation of data from EDI progress reports.

and either paid or obtained credit for chemical fertilizers, and offered their financial participation.

While model farmers conducted the experiments, many support services were provided through the R&D team. In particular, the R&D team periodically visited farmers to discuss the progress of the experiments, met with the technology-affiliated groups and helped them to succeed. When the field testing concluded in September 2002, the experiments were evaluated to be a success. During restitutions of results in the villages, model farmers feed backed insights and knowledge. At the same time, each model farmer started to mobilize motivated godsons. While the number of godsons to be expected should at least have been 600, given the fact that each model farmer had to mobilize ten neighbours, in late 2002, 728 farmers from a dozen villages were interested and actively participated; and 43 EDI project-affiliated groups were formed. In all, the project activities received much attention among farmers, and the project's expansion was remarkable. The EDI project began in four villages and expanded rapidly to surrounding villages, and the demand for its services increased (Table 2).

Respondents expressed satisfaction with the project activities, explaining that the success of the experiments was dependent on the different activities in which farmers were given opportunities to identify and analyse the major problem they were experiencing, informed about many technologies between which they had to make a choice, assisted to form groups, and elaborated and implemented the 3 Ws. In particular, most farmers claimed that the R&D team did not 'decide for them' like others did, but 'decided with them'. As one put it:

Sometimes the decisions led to an adaptation of the process, as was the case of the new technology T₄. In fact, we were interested and implemented this technology. After two years of experimentation, the conclusion was that the technology worked. However, many farmers were not willing to continue the experiments because, in their perception, the *Mucuna* plots provided 'good' housing conditions for snakes.

At that time, the EDI project was a source of stimulus among the farming communities. Of the farmers interviewed, 67% of the natives (against 52% of the immigrants) mentioned the provision of leguminous seeds, chemical fertilizers and credits as the most positive achievements of the project; and 82% of the natives (against 63% of the immigrants) associated such interest with regular contacts and confidential relations. PADSE and MAEP authorities also commented favourably on the project, but advocated that the sustainability of these technologies would require the building of permanent partnerships with the commercial companies and micro-finance institutions. They acknowledged that these building networks do not exist for food crop production. This

was in their view the biggest challenge.

Serious problems emerged in many villages

Comments from both the R&D team and farmers alike highlighted that while the EDI project appeared relevant to bring about successful innovation processes, serious problems emerged: in nine villages, about 75% of the plots planted with *Gliricidia* were destroyed by bush fires and by roaming cattle. The news spread like wildfire. According to the PADSE authorities interviewed, hundreds of thousands of US dollars had been wiped out; for the victims among the model farmers and godsons, many years of labour had been wasted. Consequently, many farmers lost their initial interest. In response to the declining interest in the process, the R&D team organized a new diagnostic study to explore the sustainability of the new technologies. To do so, the R&D team conducted interviews with leaders of local institutions, in particular the traditional chiefs, the religious authorities (priests of *vodun*, imams and clergy members) and leaders of municipalities as well as schools.

These investigations enabled the R&D team to obtain a detailed understanding of the undesirable event and the subsequent 'given' situation. In particular, they concluded that there are reasons to expect that *Gliricidia* crops will continue to be destroyed because bush fires are a frequent phenomenon and are collectively organized in the region by hunters who set fire, and often the source of conflicts between farmers, hunters and herders. Here, the leaders of local institutions seemed apt to play a key role for the construction of the EDI project. It was at this point that the members of the R&D team took the decision that public information meetings would be the focus of their work. A key implication is that the formal project design was redrafted and presented for consideration to MAEP and PADSE. While the MAEP authorities approved the idea, PADSE's management was of the opinion that the project should not change course and start to communicate 'technical knowledge'. Consequently, PADSE's management objected to providing funds for public information meetings.

The costs of public information meetings are met out of PADSE budget

In response to the difficulties aforementioned, the members of the R&D team searched new fund providers in the course of 2003. They thus submitted subprojects to AGRAN, which already funded R&D activities through tendering and contracting mechanisms. AGRAN now agreed to subsidize the production of extension materials for the EDI project. The same story can be told about the Beninese Agency for the Environment (ABE) and the United Nations Food and Agriculture Organisation (FAO), who accepted to

support coordination and operation costs related to public information meetings, training and exchange visits. Like the PADSE funding, these new funding and delivery arrangements were operated in a supply-side financing mode.

Many public information meetings were organized to explain the new technologies

As part of the mobilization of new fund providers, the EDI project first continued to support model farmers and first generation godsons to restore destroyed plots of *Gliricidia*, and subsequently supported new godsons. Through the same demand articulation, an additional 276 farmers were supported in 2004; 106 in 2005; and 357 in 2006. This time, all possible precautions were taken: farmers planted strips of trees which cattle do not like around their fields; also, each year, farmers established fire breaks, cleaned and weeded the plots of land, and mobilized their children and others to guard the *Gliricidia* plots against bush fires and intrusion by cattle.

At the same time public information meetings were organized to present and explain the new technologies in eighty-four villages, schools were trained, and some educative materials were fabricated and made available to schools in these villages. Thirty-two field visits were organized with traditional chiefs and municipal and religious authorities in regards to what arrangements would best perform the financial requirements negotiated with ABE and FAO. Weekly radio programs were recorded and broadcast on radio stations. These involved model farmers, godsons and local leaders. Five posters and three documentary films were produced and translated into three main local languages (*Mahi*, *Adja* and *Yoruba/Nagot*) spoken by large ethnic groups in the centre of Benin. Twenty songs were composed - fifteen by local singers and five by the R&D organization. All leaders interviewed characterized their involvement with the project as a success. Similarly, hunters and cattle herders were satisfied about the knowledge products delivered: many said they joined the EDI project affiliated groups and adopted the technologies based on *Gliricidia*, and that they did so because so many people including those they trusted talked and campaigned for the technologies that they could not resist anymore.

The journey of the EDI project at the crossroads

Both the members of the R&D organization and farmers acknowledge the management of farmers' expectations and the negotiations that have been developed between them and with others as the most important achievement of the project. They mentioned that the activities developed by EDI often contrasted with, on the one hand, other extension systems, where farmers' expectations were not met by service providers, who also did not facilitate a process in which farmers and others interact and negotiate a wide range of support services for decision making, and on the other hand, with projects that provide no inputs and credits to the farming communities. While most participating farmers interviewed described the project as valuable support service for decision-making, contributing to increase confidence, the R&D organization indicated that the positive result would have not been possible without the participation of farmers' groups and leaders of local institutions, whose contributions framed effective extension within the demands for services which take into account the diversity of local constraints, needs and opportunities. However, the set of agreements with funding providers ended in December 2005. How would the process outputs and lessons be achieved after the withdrawal of the donors?

In May 2006, this concern was hotly debated during a meeting with PADSE who faced the need to take a decision about whether to end or to continue financing the project. In a paper he presented, the coordinator of R&D organization argued the need to continue

with the project against PADSE which was in favour of ending. Respondents noted that the arguments developed were constantly repeated during the discussions, and supported by MAEP: 'if farmers lack support for the years to come, they are likely to become discouraged and lose confidence'. Although the authorities of PADSE characterized the project a success story, they were quite critical of the effort that the members of the R&D organization made to execute classical extension activities during these last years. As a result, the decision was by no means clear cut: there was no consensus on any of the two options. Since then, PADSE ceased to fund the project. Consequently, the opportunities to deliver more demand-oriented services became difficult as long as no other major donor was found.

ANALYSIS AND DISCUSSION

Many findings in the case study revealed that the design requirements for achieving effective services presented in the analytical framework have been fulfilled, although after some time, responsibility for overcoming emerging challenges approach was intertwined with a top down transfer of technologies. This is particularly evident in terms of the importance of the management of the expectations and negotiations in facilitating successful services delivery. The management of the expectations provided the basis for the earlier incentives, and formed the main basis of farmers' interest in participating in the project activities. Similarly, the project's success to meet such expectations constituted major incentives for the subsequent efforts to articulate farmers' demands (question 1a), and to make services fit for diverse beneficiaries (question 2), adaptable over time (question 1b), and to broaden towards facilitating the development of institutional arrangements (question 3).

Demand articulation and diverse audience: What demand and whose demands?

As the story showed, there were many parties who contributed technically and financially, and whose expectations could enforce services delivery. However, we saw that farmers were still in a position to actually impact service provisioning and make their expectations count. Farmers participated in some diagnostic activities and in analysis of experienced problems and potential solutions that were initiated early in the project and that still succeeded to capture some relevant aspects of the context. From this, it transpires that the project proved effective in promoting six technologies of differentiated agricultural practices, involving different costs, from the cost the low to the cost the high. A focus on pathways and patterns of development showed that the project seemed to give much attention to the diversity in resources and expectations among farmers (as expressed in research question 2). From the perspective of farmers, we saw that there is evidence of enthusiasm with regard to what was offered, including the technology development components (seeds, chemical fertilizers,

credits), and the advisory and information service components (training, exchange visits). It was clear that farmers' great interests for these components originate from several sources. Only some of these were related to the way in which the processes were conducted, which focused firmly on major problems farmers were experiencing in managing food crops production. Farmers' interests were also surely linked to the degradation of soils and the natural resources on which they depended for their survival.

It was relevant to note here that the forces driving the farmers' expectations were exacerbated by the way in which farming communities were sensitized about the project's activities, which led to high degrees of mobilization of godsons. On the one hand, arguments in favour of stimulating economic demands could be found. Indeed, the analysis revealed that the project created incentives for the godsons to engage in activities that they would not otherwise have undertaken. In a retrospective interview the model farmers described how the satisfaction they expressed influenced the godsons: 'when those godsons were informed that the project makes available seeds, chemical fertilizers and credits, they were encouraged, and eventually found interest and joined the EDI project affiliated groups and adopted the technologies. These groups appeared to be a vehicle for further service delivery, and a key element for creating interactions, building local capacity and enhancing dynamics and systems. It was important to mention that this finding called into question the relevance of policy discourses that have suggested that the substantive demand should be the driving force. Klerkx et al. (2006) made similar observations, concluding that such substantive needs clearly did not exist and, consequently, the most important measure of the extension project was primary about stimulating economic demands and not about articulating substantive needs.

On the other hand, when we considered 'demand articulation' in terms of an adequate match between solutions offered and the contexts and problems that farmers were experiencing (as claimed research question 1a), we saw a number of conflicts over offered solutions which appeared in the context. It was clear that the potentially vast differences between farmers and other stakeholders involved, and the often subtle expectations that attempts to converge the stakeholders' interests produces, made conflict management a highlight complex undertaking. However, these conflicts did not pose serious problems since the project put in place appropriate mechanisms to guide and enforce agreements, including regular contacts, greater empathy and flexibility and more intensive confidence. This was visibly manifest in the continued interest of godsons in joining groups, attending training sessions and implementing the new technologies. Thus, critically important facilitative modes of intermediation and communicative support for bringing about institutional changes were adopted in this new

extension configuration, especially including the facilitation of demand and supply articulation and effective services aimed at managing conflicts and building networks. Evidently, there are numerous cases in the recent innovation studies where attempts to proceed in this way are successful (Hall, 2006; Huis et al., 2007; Klerkx and Leeuwis, 2008; Sanginga et al., 2008; Water-Bayer et al., 2009; World Bank 2006).

The negotiation of complementary institutional arrangements

Respondents acknowledge that negotiation has played a significant role in the knowledge products offered through the EDI project, an idea that appears strongly in the literature of organization management and also informs much of the studies of 'communication and intervention in knowledge' on demand-oriented and participatory approaches (Aarts and Workum, 2002; Leeuwis, 2002; Sumberg and Reece, 2004). Indeed, the facilitative modes of intermediation and communicative support developed within the EDI project are often contrasted with those of the conventional extension systems characterized by poor interaction with other stakeholders and by lack of accountability to farmers' needs. For example, an understanding of the knowledge and other services desired by farmers reveals technologies different from those initially proposed by the members of the R&D organization. Farmers explained that they still lacked money to buy the high-yielding varieties of seeds and the required quantities of chemical fertilizers, and faced uncertainties in the sphere of food crop marketing: no control of food marketing, seasonal variability of prices, and competition between improved and local varieties in the marketing arena. Such an explanation indicates which types of technologies and support services are likely to meet farmers' expectations. Yet, as the documented experience showed, the members of the R&D organization resolved this 'loyalty' conflict in negotiating effective services delivery that met farmers' expectations. A similar story could be told about the facilitation of the 3 Ws and the implementation of the experiments. Especially, when inputs and credits were lacking, sufficient efforts were taken to learn and facilitate a process in which the members of the R&D team together with farmers negotiated with the commercial companies and micro-finance institutions the conditions to access these services.

This meant that attention for development of arrangements that complement technology, and the use of new modes of intermediation to gain sufficient support and agreement in networks regarding new 'orgware' (as stated in question 3) was an integral essential component of EDI, with the members of the R&D team assuming a much broader range of intermediary roles and services than extension organizations can achieve through a

conventional model, and thus seems to have widened the scope of 'extension'. These roles and services, which involved a range of support activities at local and higher levels, have not been assumed by extension organisations (Feder et al., 2001; Von de Luhe 1991; Tossou, 1995). Comments from both the R&D organization and farmers alike highlight that these activities were determinant in formulating and meeting farmers' demands, and effective services delivery. Current academic literature on extension views such activities as important and integral components of technology development, and typically aimed at creating effective linkages between technological arrangements, people and socio-organizational arrangements (Gbêhi and Leeuwis, 2012; Geels, 2004; Sulaiman and Hall, 2004). Thus, leaving aside the discussions about the most desirable form of 'public funding, public delivery' extension, we think that a project in the name of decentralization policy should always rethink what extension is all about, what type of organizations we need for it, and what their role in fostering institutional changes should be.

Public information meetings appear to be needed but incompatible with the EDI project approach

Whereas the EDI project strove to articulate farmers' demands, the story afore presented revealed that EDI's facilitation services were intertwined with public information meetings. Demand articulation alone appeared not sufficient in the eyes of the members of the R&D organization to support effective services delivery. However, motives for supply-oriented extension systems are incompatible with the EDI project approach. Much of the extension literature suggested that these systems might not provide favourable grounds for demand-oriented services (Anderson and Feder, 2004; Garforth and Harford, 1997; Klerkx et al., 2006). Contrary to what might be expected (social conflicts and tensions, and resistance) however, interviews with the R&D team members revealed that public information meetings were attempts to address the destruction of the plots planted with *Gliricidia*. These meetings also constituted a source of considerable satisfaction among hunters and cattle herders, many of whom described the involvement of the leaders of local institutions to be a critical factor in the success. In this light, it is important to note that the EDI project concurs Röling and Leeuwis's (2001) assertion that the supply-oriented extension can also at times contribute to processes of institutional changes.

In all, the change in paradigm could be attributed to several salient given trends in decentralization policy. First of all, we might look at the EDI project as a first experience with new arrangements in extension. At the same time, the EDI project was flexible and able to adapt its approach to unanticipated events and to expand to

include the design of new services, which were not incorporated into the initial design (research question 1b). In situations of such major institutional changes, many lessons can only be learned in practice. It was clear that the members of the R&D organization were aware of the fact that demand articulation is not always needed and/or likely to be productive. More importantly, the EDI project suggested that it could be in the 'enlightened self-interest' of extension systems to merge supply-oriented with demand-oriented services delivery.

Conclusion

As the analysis suggested, the form of decentralization of extension adopted in the EDI project contributed to realising the stated goals of this international trend in service delivery. While the project's main funding source remained public, the pattern of funding changed when compared to the conventional public funded extension. A key valuable funding arrangement included the cost sharing between the Béninese government and the donor PADSE. Farmers themselves also shared in part of the extension costs (through an indirect mode of cost recovery and financial participation), and participated in many phases of articulating their demands. The R&D organization delivered services that responded to farmers' expectations and needs. Although the EDI project still failed to overcome all challenges of conventional public funded extension, the technologies promoted remained to be negotiated upon in a rather participatory manner, and foresaw farmers' conditions and the diversity among them. This is visible especially in the discussions where managing farmers' expectations and negotiation developed positive outcomes that could not have been realized through more conventional public funded extension. Thus, the case study corroborates the growing consensus that demand-oriented services delivery represents the most suitable approach for furthering effective services, especially where service providers aim to foster innovations and institutional changes (Boon et al., 2008; Klerkx and Leeuwis, 2008; Rivera and Sulaiman, 2009).

At the same time however, the case study shows that the decentralization of extension and demand-oriented services will often contradict the principle that such policies should allow the farming communities to determine the extension agenda. As discussed, there are many expectations from different parties, so that, the demands that are acted upon and articulated tend to be the outcomes of negotiation processes. Whether or not the discourses of decentralization and demand-oriented service delivery subscribe to the notion that extension should be primarily concerned with negotiation processes, extension services based on such policies acquire their efficacy by allowing the farming communities to make their demand and interest count. Any attempt to limit

effective steering capacity of the farming communities in articulating their demands risks limiting the effectiveness of services. Thus, whether a project has a 'public funding, public delivery' arrangement itself is not a decisive factor. In line with other findings (Gbêhi and Leeuwis, 2012; Klerkx and Leeuwis, 2008), we suggest that demand driven service delivery depends critically on the negotiation and on the quality of the process in which demand and supply are articulated and become matched. This requires investment in time and effort, as well as organisational and institutional change within research and extension establishments (including international donors). These investments and institutional changes are more important than changes in formal funding and delivery arrangements. In addition, effective stimulation of innovation requires a further re-thinking of the various roles that intermediaries (such as R&D and extension organisations) may usefully play, and accordingly, a widening of the types of facilitative services delivered.

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