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Successes and challenges in tackling constraints in soybean processing through multi-stakeholder innovation platforms in Agricultural Research for Development: an evidence from the Consortium Soja du Bénin

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ABSTRACT

This paper examines the role of the Consortium Soja du Bénin (CSB) in addressing constraints related to soybean value chains in Benin. The methodology applied consisted of desk research, observation, focus group discussions with two soy women cooperatives, field visits, interview with the consortium members and an evaluation workshop with 13 partners involved in the 'Project Soy Afitin and Milk'-ProSAM (with financial support from the European Commission's Directorate-General for International Cooperation and Development through the Forum for Agricultural Research in Africa (FARA)/Platform for African-European Partnerships for Agricultural Research for Development (PAEPARD)). The CSB is a dynamic multi-stakeholder innovation platform initiated in 2011 to improve soybean value chains in Benin. This paper focused on ProSAM implementation, one of the CSB projects, which aims to increase household income through improved food chain of soybean derived products (milk and afitin). The improved soy milk shelf life from one day to six months and the formulation of a soybean-based taste enhancer, 'Dadonu', are two results from the collaboration among CSB partners. The commitment of each partner to participate in the innovation and knowledge co-creation process, the good co-ordination mechanism, the internal facilitation, the effective internal and external communication contributed to these achievements and to the overall successful implementation of the project. Furthermore, the dynamic nature of the consortium, especially in identifying strategic partners to develop projects has yielded significant outputs considering the size of resources mobilized for the implementation of other projects. Other multi-stakeholder platforms can capitalize on these experiences to effectively generate innovations and efficiently tackle constraints in the agricultural sector.

Key words: Consortium Soja du Bénin (CSB), Dadonu, IAR4D, soy milk, soybean processors

RÉSUMÉ

Cet article examine le rôle du Consortium Soja du Bénin (CSB) dans la levée des contraintes liées aux chaînes de valeur du soja au Bénin. La méthodologie utilisée a consisté à faire une recherche documentaire, l'observation, des discussions de groupe avec deux coopératives de femmes transformatrices de soja, des visites de terrain, des entretiens avec les membres du consortium et un atelier d'évaluation avec 13 partenaires du Projet Soja Afitin et Milk-ProSAM (financé par la direction générale de la coopération internationale

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et du développement de la Commission européenne à travers le Forum pour la Recherche Agricole en Afrique (FARA)/Plateforme pour un Partenariat Afrique-Europe dans le domaine de la Recherche Agricole pour le Développement (PAEPARD). Le CSB est une plate-forme d'innovation multi-acteurs dynamique mise en place en 2011 pour améliorer les chaînes de valeur du soja au Bénin. L'article se focalise sur le projet ProSAM, un des projets du CSB qui vise à accroître les revenus des ménages grâce à l'amélioration des produits dérivés du soja (lait et afitin). L'augmentation de la durée de conservation du lait de soja d'un jour à six mois et la formulation d'un exhausteur de goût à base de soja, Dadonu, sont les deux principaux résultats issus de la collaboration entre les partenaires du CSB. L'engagement de chaque partenaire à participer au processus d'innovation et de co-crédation de connaissance, le bon mécanisme de coordination, la facilitation interne, l'efficacité de la stratégie de communications interne et externe sont les facteurs qui ont contribué à l'obtention de ces résultats et de façon générale au succès de la mise en œuvre du projet. De plus, la nature dynamique du consortium, en particulier dans l'identification de partenaires stratégiques pour élaborer des projets, a abouti à d'importants résultats, compte tenu de l'accroissement des ressources mobilisées pour la mise en œuvre d'autres projets. D'autres plateformes multi-acteurs peuvent s'inspirer de l'approche du CSB pour mettre au point de façon efficace des innovations et lever efficacement les contraintes du secteur agricole.

Mots clés : Consortium Soja du Bénin (CSB), Dadonu, IAR4D, lait de soja, transformatrices de soja

INTRODUCTION

The linear approaches for implementing agricultural research and development became outdated. In these approaches, technology developed is transferred 'top-down' by extensionists to farmers or other end-users (Rogers, 1962). They failed to give poor families more secure access to food and to improve their livelihoods as most of the introduced technologies were inappropriate for poor farmers in marginal, rainfed areas (Waters-Bayer *et al.*, 2004). The focus on linear technology transfer is argued to have been a central cause of the stagnation of agricultural productivity growth and development in sub-Saharan Africa (Adekunle and Fatunbi, 2014; Maru *et al.*, 2016). To enable adequate world food supply, the agricultural production must keep pace with food demand and population growth. To achieve this, the existing complex problems such as crop diseases, low yield of technologies, market issues, etc. in agricultural

value chains need to be solved. Doing so requires a holistic approach. The need to overcome limitations of the top-down paradigm in order to achieve locally beneficial social, economic and natural resource management change led to the Integrated Agricultural Research for Development (IAR4D) approach (Hawkins *et al.*, 2009; Adekunle and Fatunbi, 2014; Davies *et al.*, 2016). The IAR4D aims to break from the conventional linear approach of agricultural research and development by engaging multi-stakeholder actors, principally from along the commodity value chains (Adekunle *et al.*, 2013). Agriculture is considered as a system that is made of sub-systems combining their efforts to jointly foster the development of the sector. In recent years, there has been a growing number of research revealing that IAR4D works and it has positive impacts on productivity, income, food security and poverty reduction (Binam *et al.*, 2011; Ayanwale *et al.*, 2013; Nkonya *et al.*, 2013; Nyikahadzo *et al.*, 2013; Siziba *et al.*,

2013; Ngaboyisonga *et al.*, 2014; Maru *et al.*, 2016), as well as on social capital (van Rijn *et al.*, 2015).

The operationalization of IAR4D revolves around the successful establishment and functioning of a multi-stakeholder problem-solving forum referred to as an agricultural Innovation Platform (IP) (Tenywa *et al.*, 2011). An IP can be defined as a multi-actor configuration deliberately set up to facilitate and undertake various activities around identified agricultural innovation challenges and opportunities, at different levels in agricultural systems (Kilelu *et al.*, 2013). In recent years, players in the agricultural sector have designed and implemented initiatives following multi-stakeholder innovation platforms approach to alleviate agricultural constraints. Thus, IPs in Agricultural Research for Development (ARD) are increasingly adopted to solve complex agricultural issues by engaging researchers and non-researchers with multidisciplinary expertise. They are seen as promising vehicles for agricultural innovation and development (Van Mierlo and Totin, 2014, van Paassen *et al.*, 2014; Hermans *et al.*, 2017) and foster research uptake as they generate a greater sense of ownership of innovations. They also help create the conditions for building confidence and trust between different actors and serve as a mechanism for providing mutually acceptable solutions and win-win situations (UNDP, 2006). With this approach, research is no longer confined in laboratories or research stations. If research is confined to within institutions only, impact is very minimal as it takes place in the restricted environment of a laboratory and/or research stations without involving the key players in its uptake (Kakinda, 2012).

The CSB is a multi-stakeholder platform set up to create an enabling environment for public-private partnership in soybean value chains with the technical and financial support from the Platform for African European Partnerships

for Agricultural Research for Development (PAEPARD) (Consortium Soja du Bénin, 2012). Since 2014, CSB has been implementing a three-year project 'Re-engineered Soybean Afitin and Soybean Milk processing technologies in South and Central Benin (ProSAM)' funded by European Commission's Directorate General for International Cooperation and Development through Forum for Agricultural Research in Africa (FARA)/Platform for African-European Partnerships for Agricultural Research for Development (PAEPARD). The project aims at addressing the following key constraints faced by soybean processors: the low shelf life of soybean milk that lasts not more than 24 hours at room temperature, indicating the poor quality of the product; the reluctance of consumers to buy soybean Afitin and the harshness of operations related to its processing.

This paper examines the role of the CSB in addressing soybean processing-related constraints in the ProSAM project and highlights challenges and lessons learned from the consortium.

METHODOLOGY

The methodology used consisted of desk research, observation, focus group discussions with the end-users of the project's results, face to face discussion with the project leaders, field visits, interview with the European partners and an evaluation workshop.

From the desk research, we collected relevant documents about multi-stakeholder innovation platforms on the internet, in the library of the Réseau de Développement de l'Agriculture Durable (REDAD) as well as in reports of the ProSAM project. Discussion with project leader shed light on formation and functioning of the consortium and the description of the innovation approach used in the consortium.

The field visit enabled us to understand how the

new technologies developed were used and to hold two focus group discussions. Two women cooperatives participated in the focus group discussions, one in Zogbodomey and another one in Saclo. In Zogbodomey, the focus group was carried out with 16 soy milk processors of the cooperative Wimankon, while in Saclo it was conducted with a group of 20 soy afitin processors from the cooperative Gbénonkpo. Only two cooperatives were selected for this work because these cooperatives were the only ones targeted by ProSAM in Saclo and Zogbodomey. In fact, Saclo and Zogbodomey were the two main areas where the project was implemented because they were the most important areas in terms of soy milk and soy afitin production and also because they were faced by food insecurity. These two cooperatives have been identified during the project development as beneficiaries and key external partners of the consortium because of their commitment to the processing activity in the area. The selection of the processors was based on their availability. The benefits gained by soy milk (in Zogbodomey) and soy-afitin (in Saclo) processors from the implementation of ProSAM were discussed with these stakeholders. Data collected were essentially related to the functioning of the cooperatives, the constraints faced and the benefits gained from the project after the introduction of the new technology.

As for the evaluation workshop, it brought together 13 partners from the implementing institutions (Laboratoire des Sciences des Aliments de la Faculté des Sciences Agronomiques of the Université d'Abomey-Calavi (UAC/FSA/LSA), the Institut National des Recherches Agricoles du Bénin (INRAB), the Wageningen University and Research Centre/Food and Quality Design (WUR/FQD), ISA-Lisboa from Portugal, SOJAGNON-NGO and the Fédération des Unions des Producteurs du Bénin (FUPRO)) who discussed success and challenges of the ProSAM project. Discussion revolved around two main points: the

innovation process (Figure 1) and the ProSAM management. For the ProSAM management, the coordination, the communication strategy, the financial procedures, the monitoring and evaluation dissemination of research outputs and relationship with end-users, relation with the European partners and the consortium capacity building were the aspects where success and challenges were discussed. The relation of the Consortium with the PAEPARD coordination was also discussed.

The data collected were essentially qualitative and they were subjected to critical interpretation.

RESULTS AND DISCUSSION

The consortium establishment and functioning. The consortium was initially composed of SOJAGNON (Association for the Development of Soybean in Benin), Société des Huileries du Bénin (SHB), Institut National des Recherches Agricoles du Bénin (INRAB) and FC Agro-industriel France. The members of the consortium decided to put their effort together around soybean value chains because of the strategic importance of this crop both economically and nutritionally. They focused on the improvement of soybean value chains in Benin in order to make good quality soybean derived products available at affordable cost for the Benin population.

The process for setting up this platform was as follows:

- Mobilization of a variety of actors (researchers, private sector, NGO, farmers and processors associations) in the soybean sector;
- Inception workshop which gathered the actors in soybean value chains interested in joining the consortium;
- Drafting and submission to PAEPARD of a concept note on soybean agribusiness by the members of the consortium. The concept note was assessed and accepted by PAEPARD's partners to support the setting up of the consortium;

- Development of a consortium governance charter in March 2012;
- Development of an action plan (2012-2013);
- Development and submission of project proposals to various public calls for proposals.

Without any political ambition, the CSB advocates a long-term vision for the development of an agricultural sector that creates wealth, jobs and strives for food security. It has a long-standing collaboration with the agricultural programme of the German Development agency (GIZ) which trains its members on the ValueLinks and contract farming approaches and provides them with office equipment. The 2Scale Project of the International Fertilizer Development Center (IFDC) signed a soybean partnership with the consortium to ensure soybean supply to soy plants in Benin. The CSB also engaged in collaboration with agro-industries: Tropical General Investment (FLUDOR and SHB) (Sèwadé, 2010) and the group of farmers specialized in provender manufacturing, as well as poultry farmers.

The experiences of mobilization of partners, gained in the consortium facilitated the creation of the Réseau National des ONG Actives dans l'Agriculture Durable (RENOVA). The purpose of this NGOs network was to create synergy among NGOs involved in the agricultural sector in Benin. RENOVA bridged an institutional gap at the Ministry of Agriculture, Husbandry and Fishery of Benin (MAEP).

The consortium develops and submits proposals to various donors, implements them upon acceptance and advocates for the inclusion of soybean in the policy documents of the MAEP. This advocacy work resulted into a better inclusion of soybean in the Plan National d'Investissements Agricoles et de Sécurité Alimentaire et Nutritionnelle de seconde génération (PNIASAN, 2017-2021).

The CSB generates innovations through the implementation of its ARD projects. These innovations are turned into business to improve women's income and create jobs for youth. The

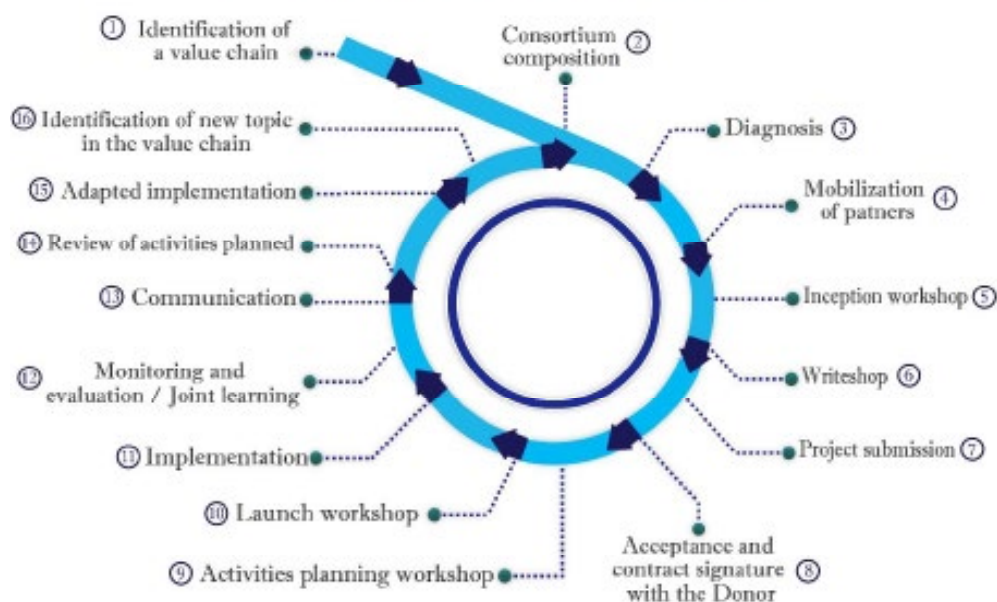


Figure 1. The innovation process in the Consortium Soja du Bénin

process is iterative and is depicted in Figure 1.

Today, the consortium is characterized by its dynamic nature. In fact, an optimal team composition depends on both the expertise needed and the availability of partners to address the end-users' constraints identified in the project development. This dynamic character of IPs was also reported by Nederlof *et al.* (2011) and Kilelu *et al.* (2013). Partners decide to join the consortium to develop and implement projects based on their interest in the challenge to be addressed and their perceived benefits in terms of business opportunities or research outputs. Creating an optimal mix requires attention in the search for partners, and omitting powerful and important stakeholders can lead to suboptimal performance (Gray, 2007; Wigell, 2008; Pattberg and Widerberg, 2016). It is worth noting that SOJAGNON-NGO remains the backbone of the consortium.

To date, the consortium has been involved in three multi-stakeholders research and development projects:

(1) CRF project 'Re-engineered Soybean "Afitin" and Soybean Milk processing technologies in South and Central Benin (ProSAM)', funded by FARA under the European Commission Directorate General for International Cooperation and Development in 2014 and is being implemented by UAC/FSA/LSA, INRAB, WUR/FQD, ISA-Lisboa, SOJAGNON-NGO and FUPRO;

(2) Applied Research Fund (ARF) project 'Matching grain quality attributes to the requirements of soybean processors in Benin', funded by NWO/WOTRO in 2015 and being implemented by SOJAGNON-ONG, le Réseau de Développement d'Agriculture Durable (REDAD), International Institute of Tropical Agriculture (IITA-Benin), Faculté des Sciences Agronomiques (FSA/UAC) and the Wageningen University & Research Centre/ Marketing and Consumer Group (WUR/MCB);

(3) ARF project 'Enhancing Kersting's groundnut (*Macrotyloma geocarpum*) production and marketability in Benin (Projet Doyiwé)', funded by NWO/WOTRO in 2017 and being implemented by SOJAGNON-NGO, La Faculté des Sciences Agronomiques/Laboratoire d'Ecologie Appliquée (UAC/FSA/LEA), Réseau de Développement d'Agriculture Durable (REDAD), Wageningen University and Research/ Marketing and Consumer Group (WUR/MCB) and Benin Agribusiness Incubation Hub-Sarl (BAIH).

This paper focused on the ProSAM project as it is ending in September 2018 from which significant lessons can be drawn. The ProSAM project started in October 2014 and aimed at increasing household income through improved food chain of soybean derived products (milk and afitin). It is composed of two sub-projects:

- Re-engineered Soybean "Afitin" processing technology: implemented by the Laboratoire des Sciences des Aliments/Faculté des Sciences Agronomiques (UAC/FSA/LSA), the Wageningen University and Research Centre/Food Quality and Design (WUR/FQD) of the Netherlands;
- Re-engineered Soybean Milk processing technology: implemented by the Institut National des Recherches Agricoles du Bénin (INRAB) and the Tropical Research Institute (ISA-Lisboa) of Portugal.

SOJAGNON-NGO and FUPRO are the non-research Institutions involved in the consortium. SOJAGNON-NGO is in charge of the coordination, monitoring and evaluation, communication and the dissemination of the outcomes, whereas FUPRO ensures the mobilization of grassroots stakeholders.

The partnership was formalized by a consortium agreement, including key points related to fund disbursements from PAEPARD to SOJAGNON-NGO and from SOJAGNON-NGO to its

partners, the allocated share of the budget to each partner, reporting, outputs ownership and conflict settlement were addressed in the consortium agreement. Such a formalized agreement is important to avoid frustration and to clearly define the responsibilities and accountabilities of each partner in a multi-stakeholder partnership. In addition, it outlines partners' agreement to cooperate, and states explicitly the interests of each stakeholder (Brouwer and Brouwers, 2017).

ProSAM management

Coordination and facilitation of the consortium. SOJAGNON-NGO is the coordinator of the innovation partnership and is directly in touch with PAEPARD for administrative and financial management. It compiles and submits progress and annual reports, organizes steering committee and technical meetings. When PAEPARD makes the instalments, SOJAGNON ensures funds transfer to the partners as per the consortium agreement. The coordinator acts as an internal innovation broker/facilitator by communicating relevant information to partners, by fostering collaboration between African and European organizations involved in the consortium and thus by enabling knowledge co-creation. The internal facilitation was important for building trust among the partners and to ignite the innovation process as a whole. In the framework of the ProSAM project, internal facilitation was provided by the coordinator of the consortium because external facilitation can be costly and there was no funding available to support hiring a facilitator. In addition, previous experience with external facilitators assigned by PAEPARD at the beginning of the consortium activities was not helpful (Stepman, 2016).

Projects partners reported during the final evaluation that the personality, the experience, the commitment, the leadership and the dynamism of the institutions' leaders involved

in the project facilitated the innovation process. In addition, the establishment of a good coordination mechanism also made the co-creation process successful. Innovation platforms generally do not emerge autonomously, but connections among platform members need to be forged and their interaction needs to be coordinated (Röling and Jiggins, 1998; Leeuwis and van den Ban, 2004; Kilelu *et al.*, 2013). This positive coordination mechanism was also noted in the Crop Crisis Control Project (C3P), a regional project that brought together more than 35 implementing partners (supported by the United States Agency for International Development (USAID) Famine Fund) to intensify and coordinate the fight against Cassava Mosaic Virus Disease (CMD) and Banana Xanthomonas Wilt (BXW) in six countries of Central and East Africa – Burundi, Democratic Republic of Congo (DRC), Kenya, Rwanda, Tanzania and Uganda (Kakinda, 2012). Weak coordination can hamper the achievement of project's objectives. For instance, PAEPARD reported that poor coordination of the actors undermined efficient use of energies, skills and resources in some research consortia it supported (PAEPARD, 2015).

Governance. Good governance is key for the success of a partnership. In the ProSAM project, the central power and the control of the partnership are held by SOJAGNON-NGO. However, in order to ensure smooth operations in the innovation process, this power is delegated to the four research units involved in the project: UAC/FSA/LSA and WUR/FQD control the soy afitin sub-project and INRAB and ISA-Lisboa control the soy milk sub-project. Besides, a steering committee composed of the leader of each implementing partner meets twice a year to assess the progress made and to make recommendations. There was also a technical committee composed of a representative of the technical staff of each implementing Institution. They discussed technical issues related to the

implementation of the projects and developed joint methodologies to carry out activities when needed. Reports, minutes, memo, terms of reference are produced by each partner to inform the coordination of the project progress. Also, quarterly, semi-annual and annual reports of activities are produced by each partner to report on the progress of the project. The activity reports of all partners are compiled by the coordination and submitted to PAEPARD. All these documents are appreciated by SOJAGNON-NGO's Monitoring and Evaluation Officer. This is essentially what the governance set-up should cater for (Critchley *et al.*, 2006).

There is sometimes misunderstanding between researchers and non-researchers concerning the timeframe in releasing research outputs. Non-researchers want to see outcomes as quickly as possible whereas researchers have an own-deviant-agenda to follow. But they tried to find common ground to comply with the work plan submitted to PAEPARD.

Communication system. Communication is important to build trust among the partners. The communication system encompasses both internal and external communications. The internal communication includes that between PAEPARD and the consortium coordination and the communication among the consortium members. The internal communication is made via emails and written materials, phone, Skype, WhatsApp, Facebook, Twitter and meetings (technical, steering committee and evaluations meetings). Right after the project launch, there were many workshops organized to bring together the implementing partners of the consortium to discuss the project. These were considered as budget and time consuming. Although face-to-face meetings remain critical to build strong partnerships (Critchley *et al.*, 2006), partners limited these and started to give importance to digital communication. But, implementing partners claimed that they were

sometimes overflowed with emails from the project coordination. For this reason, in this modern era, when overwhelming amounts of information circulate, the challenge seems to be to strike a balance between too much and too little information (Critchley *et al.*, 2006).

The external communication is aimed at improving the visibility of the project activities and to share research outputs with other stakeholders in agricultural sector. It is made both by PAEPARD and the consortium members to reach people outside the consortium. The different means used include articles, posters, policy briefs, leaflets, websites (SOJAGNON-NGO and PAEPARD websites), PAEPARD blogpost, Facebook pages, Twitter, the Online System to Improve Relationships by Sharing Information (OSIRIS) and national, regional and international events. The stabilized soy milk and posters were showcased during (1) the first African Agribusiness Incubators Network (AAIN) conference and expo in Nairobi in 2015 and the second AAIN conference and expo in 2016 in Accra under the theme: turning science into business: inclusive agribusiness incubation for vibrant economies in Africa, (2) the international workshop of the ARF projects, from July, 31 to August 02, 2015 in Entebbe, Uganda and in 2016 in Benin, (3) the food processing and packaging exposium, 3-5 November 2015 in Nairobi, (4) the Science and Technology Week organized by the Université d'Abomey-Calavi, April 21-25, 2016 (5) the training event "Making Markets Matter", 7-12 May 2017 in Cape Town, (6) the seventh Africa Science Week in Kigali (Rwanda) in 2016, (7) the Fifth Biennial Conference of the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) and African Higher Education Week, 17-21 October 2016 in Cape Town, South Africa, (8) the European Development Days 2017 in Brussels (Belgium) and (9) the 2017 African Women in Agricultural Research and Development (AWARD)

Agricultural Technology Innovation Challenge Boot Camp and Innovator Showcase, April 3-5, 2017 in Accra, Ghana.

These various communication channels favored the smooth implementation of the project, the dissemination of outputs and increased the project visibility. However, the poor involvement of the practitioner FUPRO limited its communication with the other partners of the consortium. But, this did not hamper the project implementation.

Monitoring and evaluation. Monitoring and Evaluation (M&E) are important to make sure that the project progress is in line with the expected results and to make timely adjustments. M&E enhances transparency, which in turn is instrumental for process legitimacy (Wigell, 2008; Bäckstrand, 2012; Gupta and Mason, 2014; Pattberg and Widerberg, 2016). There are three levels of M&E: the M&E set up by the ProSAM implementing partners, the M&E of PAEPARD and the M&E of the European Commission.

The M&E set up by the ProSAM implementing partners uses appropriate tools to ensure proper management and monitoring of indicators. A Results Framework (RF) was designed by the consortium members for the M&E process during the proposal development. It was managed by an M&E officer at SOJAGNON. During the implementation process, the logical framework and the planning have been adapted to realities on the ground, indicating the iterative character of the innovation process. Such an iterative process was also observed by Kilelu *et al.* (2013) in the East Africa Dairy Development (EADD) programme in Kenya and by Swaans *et al.* (2014) in innovation platforms in livestock value chains in India and Mozambique. This implies that platforms should not be seen as a development tool for executing a preconceived plan in a blueprint fashion, but they should

rather be arenas for strengthening capacities to deal with the complex and dynamic nature of agricultural innovation (Ekboir, 2003; Leeuwis and van den Ban, 2004; Hall and Clark, 2010).

The M&E of FARA/ PAEPARD involves reviewing and refining the Results Frameworks of CRF projects, levels of implementation of the activities, the constraints/challenges faced by implementers and drawing lessons that can be learned and shared to all partners for the PAEPARD project and other FARA initiatives. Assessment was made from quarterly technical and financial reports and the once-in-a-year Monitoring visit. On 23-25 June 2015 FARA/ PAEPARD conducted an M&E visit to CRF-Benin. During this period, all the four CRFs gathered in a workshop in Benin and the FARA M&E Specialist assisted the teams to revise their RFs and establish the baseline values and indicator targets for ease of tracking implementation progress. The CRF-Benin reviewed the activities of year 1, reorganized and redefined the indicators and planned the activities for year 2 and 3. To strengthen the capacity of the Coordinators and M&E officers of CRFs, a capacity building workshop has been organized by FARA/ PAEPARD from 15-17 October, 2016 in Cape Town.

In mid-April 2017, the European Commission commissioned an external and independent evaluation of PAEPARD. In this regard, two experts were commissioned to assess the whole PAEPARD system, including the CRFs. Thus, from 2-4 May 2017, the CRF-Benin received the visit of an external and independent evaluation of PAEPARD. During the evaluation mission, the expert held dialogue with the partners of the consortium and processors on the process of our partnership.

Dissemination of research outputs and relationship with end-users. As mentioned above, SOJAGNON-NGO and FUPRO are the

non-research partners of the ProSAM project. Their main role was to ensure the sustainability of the innovation through the dissemination of the research outcome among soybean processors.

There has been close relation with the end-users during the project implementation. This started by the involvement of farmers, processors and consumers in the constraints identification during the regional forum on soybean chain Innovations organized in 2013 in Bohicon (Benin). Then, field visits and the studies conducted in the project increased the interaction, which enabled researchers to understand how the traditional products were processed and the benefits of African locust bean. More importantly, researchers of the two sub-projects assessed the preferences of consumers and carried out some pre-tests with processors to validate the technologies developed. These interactions were deemed valuable as they allowed us to take into account processors needs in the technology development.

Technologies developed revealed interesting results. The technology developed in the soy milk sub-project yields 12 L of soy milk per kg of soybean as compared to 08 L of soy milk per kg soybean when using the traditional technology. In the same way, the shelf life of the stabilized soy milk is more than 6 months, whereas this was at most 24 hours with the traditional technology.



Figure 2. Status of unstabilized soy milk (left) and stabilized (right) 24 h after production

As far as the soy afitin sub-project is concerned, it was envisaged to improve the soy based-afitin product. However, soy-based afitin is not stable for long-term preservation because it is a fresh product. Moreover, Afitin alone cannot substitute commercial taste enhancers mainly because it is not able to raise the taste of foods the same way. In this regard, a soy-based recipe was produced by mixing powdered Afitin with diverse spices in order to enhance the fermented soybean cotyledons. This recipe is called 'Dadonu' which means a local taste enhancer. 'Dadonu' is mainly composed of soybean and spices.



Figure 3. Soybean afitin (left) and Dadonu soja (right)

In Benin, afitin is recognized by people as a local taste enhancer that is made from African locust bean and not from soybean. Afitin prevents high blood pressure and is rich in vitamins. Thus, selling 'soybean afitin' in an environment of afitin connoisseurs remains a taboo. The name 'Dadonu' was suggested by processors as the name of the new 'soybean afitin' product to avoid confusion and to consider the ingredients and the innovation brought about by the research.

Once the technology was developed, researchers from INRAB and FSA organized training sessions with processors and technicians from SOJAGNON-NGO and FUPRO on soy afitin and soy milk technologies developed, using technical manuals. In turn, the institutions are responsible for disseminating the technologies to other processors in the areas (Abomey-Calavi, Aplahoué, Bohicon, Bonou, Djidja, Glazoué, Porto-Novo and Zogbodomey) targeted by the

project. Engagement with non-research partners enables researchers to demystify and simplify scientific information so that it is user friendly and also meets processors' needs (Kakinda, 2012).

The training sessions encompassed the processing techniques as well as best hygienic practices. In total, 97 soy entrepreneurs have been trained on the stabilized soy milk in five municipalities: 27 in Zogbodomey, 13 in Glazoué, 21 in Porto-Novo, 25 in Azovè and 11 in Parakou. They are now aware of the different steps and equipment required for producing stabilized soy milk. For the 'Dadonu', 27 processors were trained in Bohicon and surrounding localities.

During the final evaluation, processors claimed that the new technologies, on which they had been trained, improved their living conditions. Soy milk processors reported that they processed up to 450 kg, i.e., 3 bags of 150 kg, over a period of three months, which tripled the soybean quantity they processed before the project intervention. This project has indeed provoked the birth of new groups that invest their efforts in this activity. 'Dadonu', the newly formulated soybean-based taste enhancer can be stored longer than afitin and it has a higher market value. But challenges still exist: (1) 'Dadonu' processors lack relevant equipment such as roaster and husker, (2) no certification exists yet for the commercialization of 'Dadonu' and milk, and (3) the market of 'Dadonu' still remains to be developed.

New partnerships were formed during the course of the project. The consortium went into partnership with AAIN to set up a private sector organization in 2016, the Benin Agribusiness Incubation Hub (BAIH-Sarl) that will turn research outputs into business.

Relation with the European partners. In the ProSAM project, the European partners

include ISA-Lisboa from Portugal and WUR/FQD from the Netherlands. ISA-Lisboa set up in close collaboration with INRAB the research agenda relating to soy milk. It also supported the analysis the microbiological and physicochemical composition of the stabilized soy milk through its laboratories and participated in field visits and exchange visits in Benin. WUR/FQD defined with the UAC/FSA detailed research methodologies, analyses to be performed and action plan for the improvement of Afitin. WUR/FQD also contributed to nutritional and microbial quality assessment of Afitin (traditional and reengineered) by offering laboratory facilities to UAC/FSA/LSA staff for analyses. Moreover, WUR/FQD participated in exchange visits in Benin.

It is noteworthy that partners from Benin also had some exchange visits with the European partners in the Netherlands. Although involving European ARD organizations and researchers remains a challenge (van Veldhuizen, 2016), this has not been so complicated for the UAC/FSA partner to involve WUR/FQD as both have been collaborating for over 30 years. For instance, previous joint research on leguminous grain (cowpea), and studying soybean food chain with an African perspective have provided a novel path for strengthening Africa-European partnership. This long-standing collaboration contributed to facilitating the 'Dadonu' formulation process. The participation of WUR/FQD in this project was motivated by the possibility to strengthen the existing research relationship.

As for ISA-Lisboa, it had no previous relations with INRAB, nor with the other members of the consortium. This did not nevertheless affect the innovation process as they quickly got familiar with each other. The idea to establish a partnership that also includes non-Portuguese partners to bridge gaps in the African agricultural sector was what motivated ISA-Lisboa partners to be part of the partnership.

The challenge faced by the European partners is the insufficient resources to carry out research in Europe given the fact that this was a small-scale project. Overall however, the European partners reported that the governance was very good, very professional and they were satisfied with the partnership and it provided fruitful experience for them.

Financial procedures. The rules for the implementation of the project followed the procedures of the European Commission (EC). The consortium agreement, clearly stated the amounts to be allocated to each Partner. PAEPARD makes an installment to the coordination of the consortium every year upon submission of the annual report and the planning of the year to follow. The amount is then shared amongst the Partners of the consortium according to the consortium agreement and the activities they budgeted for. Each partner is entitled to apply at most 7% overhead charge on the total amount of directly eligible costs (eligible expenditure only) incurred in the course of the implementation of the project.

During the evaluation workshop, partners mentioned that there was no flexibility in the resources allocation scheme by PAEPARD, which did not enable a smooth supply of equipment to researchers and caused delays. There was also inconsistency between the resource allocation mechanism by PAEPARD and the research cycle. In other words, the fund allocation mechanism did not keep pace with research activities. Furthermore, change in the reporting templates and expenditure documentation created inconvenience in the management of the project.

At SOJAGNON-NGO, there is a manual of administrative and financial procedures, a Board of Directors and a control committee. The administrative and financial management of ProSAM is regularly approved by the Board of Directors every six months and as part of

financial control, there is annual review by the control committee. In the same way, each year, the project is subjected to an external audit commissioned by FARA. It is noteworthy that the project has already undergone two international audits.

The consortium capacity building. The CSB benefited from many capacity building workshops through PAEPARD, RUFORUM, NWO/WOTRO and International Centre for Development Oriented Research in Agriculture (ICRA). Over the past years, PAEPARD and its partners funded many proposals write shops. These included: (1) Cotonou, Benin, from 26-31 March 2012 to respond to the African Union Research Grants call, (2) Entebbe, Uganda from 27 November-1 December 2013 to respond to the NOW/WOTRO call, (3) Entebbe, Uganda from 10-14 November 2014 to respond to the NWO/WOTRO call, (4) Write-shop in Entebbe, Uganda from 16-20 March 2015 to respond to the IDRC - CIFSRF 2015 Call, (5) Accra, Ghana in 2016 to respond to the 2016 African Union call.

These write-shops resulted in designing many proposals. In total, the consortium won three grants: (1) Re-engineered Soybean 'Afitin' and Soybean Milk processing technologies in South and Central Benin (ProSAM), funded by PAEPARD in 2014, (2) Matching grain quality attributes to the requirements of soybean processors in Benin, funded by NOW/WOTRO in 2015 and (3) Enhancing Kersting's groundnut (*Macrotyloma geocarpum*) production and marketability in Benin (Projet Doyiwé), funded by NWO/WOTRO in 2017.

With the trainings received, the Consortium is now able to respond to funding opportunities. The evidence is that the consortium was awarded a grant for its proposal 'Projet Doyiwé', without attending an additional capacity building workshop. The consortium's capacity in

project management has also been improved. Moreover, the consortium is now able to facilitate multi-stakeholder partnership bringing together farmers organizations and researchers from Africa and Europe. More importantly, the capacity building of the consortium has a snowball effect. Write shops helped other researchers (UAC/FSA) and non-research teams to develop, submit and win grants.

The consortium also participated in many webinars, including: (1) hygienic practices for food safety in small and medium-size businesses, organized by the USAID Feed the Future Innovation Lab for Soybean Value Chain Research on January 9th, 2017, (2) packaging techniques to improve soy food shelf life, organized by the USAID Feed the Future Innovation Lab for Soybean Value Chain Research on September 29th, 2016, (3) Agents of Change in Capacity Development for Agricultural Innovation: the Value of Facilitators, organized by Global Forum on Agricultural Research (GFAR) in collaboration with the Tropical Agriculture Platform (TAP)/ PAEPARD in 2017.

Lessons learned from the partnership. It is worth mentioning some key lessons drawn from this partnership:

- good personality, the experience, the commitment, the leadership, good communication and the dynamism of the coordinators from the various implementing institutions are key to the success of a multi-stakeholder partnership;
- researchers are more involved in development activities as they interact with end-users.
- integration of researchers and practitioners' knowledge leads to novel outcomes;
- the partnership encourages better understanding and inclusion of end-users' needs;
- improving the quality and productivity of soybean food products and linking

processors to markets, enhances their capacity to generate more income;

- the partnership benefits the local economy as it increases employment and income;
- an innovation broker is essential for a multi-stakeholder innovation platform;
- searching for funding together to sustain the partnership has become a permanent activity;
- a partnership led by a non-research partner leads to increased uptake of innovation and thus ensures sustainability.

CONCLUSION

In this paper, we have examined the role of the CSB in addressing constraints in the soybean value chains. The CSB is a dynamic multi-stakeholder partnership set up by a group of actors to develop soybean value chains with the support from the platform for African European Partnerships for Agricultural Research for Development (PAEPARD). The consortium develops and submits proposals following a multi-stakeholder approach. The ProSAM project was designed and implemented by researchers and non-researchers embedded in a multi-stakeholder partnership within the CSB. The partnership clearly stated the responsibilities of each research partner in designing adapted solutions for soybean milk and soybean afitin processors. European research partners also facilitated the process as they offered laboratory facilities for soy products analysis and participated in defining the research agenda.

Once the innovations were developed, non-research partners facilitated their dissemination and uptake. Partnering with non-research actors like NGOs, leads to impact beyond the laboratories and research stations. With the training received, soy women processors are able to produce soy milk and 'Dadonu' in a better way than before.

A good coordination mechanism, internal facilitation, effective communication among partners and with the public for visibility and

the commitment of each partner to participate in the innovation and co-creation process contributed to the success of the consortium in effectively implementing the project. Besides, the dynamic nature of the consortium especially in identifying strategic partners to develop projects to respond to specific call for proposals has yielded significant outputs considering the number of projects granted. The contributions of partners, researchers and non-researchers, European and African, have been of great benefit that was not expected. Their availability and added values made it possible to develop new projects to tackle constraints faced by soybean actors. Other consortiums can capitalize on these points to make their multi-stakeholder partnership work better in order to generate innovations and efficiently tackle constraints in the agricultural sector.

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STATEMENT OF NO CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this paper.

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