

STATUS OF
**AGRICULTURAL INNOVATIONS,
INNOVATION PLATFORMS AND
INNOVATIONS INVESTMENT**

Benin



PARI

**Program of Accompanying Research
for Agricultural Innovation**

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Status of
**Agricultural Innovations,
Innovation Platforms and
Innovations Investment in Benin**

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ACRONYMS AND ABBREVIATIONS

BUPDOS	Bureau des Projets de Développement et des Œuvres Sociales
CARDER	Regional Agricultural Centre for Rural Development
CRA	Agricultural Research Centre
EFSSP	Emergency Food Security Support Programme
CAADP	Comprehensive Africa Agriculture Development Programme
ECOWAS	Economic Community of West African States
FAO	Food and Agriculture Organization of the United Nations
FWA	French West Africa
GDP	Gross Domestic Product
IEMVT	Institut d'Élevage et de Médecine Vétérinaire des pays Tropicaux
IITA	International Institute of Tropical Agriculture
INRAB	National Agricultural Research Institute of Benin
IPAR	Initiative Prospective Agricole et Rurale
IRAT	Institute for Research in Tropical Agriculture and Food Crops
IRCT	Research Institute for Cotton and Exotic Textiles
IRD	Research Institute for Development
IRHO	Research Institute of Oils and Oleaginous Plants
LDPDR	Rural Development Policy Declaration Letter
MAEP	Ministry of Agriculture, Animal Husbandry and Fisheries
MPDEPP-	Ministry of Prospective, Development, Public Policy Evaluation and
CAG	Governmental Action Coordination
NARS	National Agricultural Research System
NGO	Non-Governmental Organization
ORSTOM	Office de la Recherche Scientifique et Technique Outre-Mer
OSP	Operational Strategic Plan
PDRA	Master Plan for National Agricultural Research
PFR	Rural Land Development Plan
PRSA	Project to Restructure Agricultural Services
PSRSA	Strategic Plan to Boost Agricultural Sector
RAMR	Applied Research in Farmers' Field
R&D	Research and Development
RDPD	Rural Development Policy Declaration
SAP	Structural Adjustment Plan
SDDAR	Master Plan for Agricultural and Rural Development
TFP	Technical and Financial Partners
TFTC	Tropical Forest Technical Centre
WAAPP	West Africa Agricultural Productivity Programme
WACIP	West Africa Cotton Improvement Program

STUDY BACKGROUND

Science and technology remains the fulcrum for development over the ages. There is hardly any national development in contemporary history that is not based on consistent efforts from the science and technology sector. The spate of development in agriculture follow suit; the state of efficiency in science and technology generation correlates highly with the development of agriculture. In Africa, agriculture is considered as the sector with the best potential to lead the socioeconomic development of countries on the continent. However, the sector is bedevilled with many constraints that could be categorized as technological, socio-cultural, institutional, infrastructural, and economical. The poor productivity of the enterprise stream in the sector is clearly seen from its contribution to a country's GDP versus the number of active workers engaged in the sector. Africa's agriculture currently engages about 65% of the working population and its average contribution to GDP still stands at 22.9%.

The crave to develop Africa has received good attention in recent years, starting with the political will of the heads of states, under the auspices of the Africa Union Commission, to develop and implement the Comprehensive Africa Agricultural Development Programme (CAADP), the Science Technology and Innovation Strategy (STISA). The Forum for Agricultural Research in Africa (FARA) also came up with a handful of continental initiatives, such as the Sub-Saharan Africa Challenge Programme (SSA CP), *Strengthening Capacity for Agricultural Research and Development in Africa (SCARDA)*, Dissemination of New Agricultural Technologies in Africa (DONATA) and several others. The different initiatives aim to foster change by addressing specific issues that constitute constraints in the path of progress in Africa agriculture. The notion that African agricultural research system has generated a lot of technologies with great potentials, but which are not realized due to different institutional and organizational constraints—more specifically, the way agricultural research and development systems is organized and operated—is prevalent among stakeholders in the sector. Indeed, this notion appeals to reasoning. However, there is no known cataloguing or documentation of existing technologies and their veracity in delivering broad-based outcomes. The possibility of finding some documentation in annual reports of research institutes, journal articles and thesis in the universities is known, but this will not meet an urgent need.

Thus, the Programme of Accompanying Research for Agricultural Innovation (PARI) commissioned the three studies reported in this volume to provide a compressive

analysis of the state of agricultural technology generation, innovation, and investment in innovations in the last 20 years in selected countries in Africa.

Study 1 is the “situation analysis of agricultural innovations in the country” and provides succinct background on the state of agricultural innovation in the last 30 years. It provides useable data on the different government, international and private sector agricultural research and development interventions and collates information on commodities of interest and technologies generated over the years. It also conducted an assessment of the different interventions so as to highlight lessons learnt from such interventions, with regard to brilliant successes and failures.

Study 2 concerns a “scoping studies of existing agricultural innovation platforms in the country”. It carried out an identification of all the existing Innovation Platforms (IP) in the country, including identification of commodity focus, system configuration, and partnership model. The study provides an innovation summary for each IP for use in the electronic IP monitor platform. It further synthesises the lessons learnt from the agricultural IPs established through different initiatives in the country in the last ten years.

Study 3 was an “Assessment of the national and international investment in agricultural innovation”. It is an exhaustive assessment of investments in innovation for agricultural development, food and nutrition security in the country. It collates updated data on investment levels in the past and present, including a projection for the next decade requirement to assure food and nutritional security in the country.

The three studies form the comprehensive collation on the state of agricultural innovation in the 12 countries where the PARI project is being implemented. It is expected that these studies will benefit all stakeholders in Africa’s agricultural research and development, including the users of technologies, research stakeholders, extension system actors and, more importantly, the policymakers.

STUDY 01

**Inventory of Agricultural
Technological Innovations
(1995 to 2015)**

INTRODUCTION

The agricultural sector plays a privileged role in Benin economic development. It secures this economic position by improving the productivity of all other sectors and providing raw materials to several other sectors. Consequently, since 2008, agricultural policies of government have been instituted and translated into concrete actions and projects (MAEP, 2011). This is the case of the Programme to Support Agricultural Diversification, a product of the Special Programme to Boost Agricultural Sector (PSRSA), which is implemented with many projects/programmes through support from technical and financial partners, including the World Bank. The nationwide actions of the West Africa Agricultural Productivity Programme (WAAPP), the Programme to Support Agricultural Diversification (PADA), the Emergency Food Security Support Programme (EFSSP), Agricultural Diversification Programme through the Development of Inland Valleys (PDAVV) and the Programme to Support the Establishment of Agricultural Infrastructures in the Ouémé Valley (PAIAVO) are also examples.

The political will to make Benin agriculture a competitive employment provider began to take shape with the different government initiatives and reforms to build institutional capacities and reposition actors in agricultural research and development for higher efficiency. A lot of speculations were transformed into promising agricultural interventions and programs, especially with regard to such commodities as maize, soya, tomato, cotton, yam, cassava, cashew, shea butter, mango, palm oil tree, poultry, fish, and domestic ruminants. The objective of these interventions was to increase the country's Gross Domestic Product (GDP) and reduce poverty.

Despite the interventions, however, Benin agricultural production could not meet, even at the local level, the diversity of demands in agricultural produce by the population, which has been growing for the last ten years. This was due to a set of constraints, including decrease in soil fertility, the use of rudimentary farm tools and application of non-adapted technical itineraries. To overcome these constraints, sustained attention was given to the development and dissemination of several technologies for improving agricultural productivity and making the sector competitive, in conformity with the global trend in quality and sustainable management of the natural resources. Thus, many technologies were developed and introduced by various research and/or development organizations, some of which have been implemented in many agro-ecological zones of the country.

Consequently in May 2015, a study was conducted under the aegis of Swiss Cooperation on the impact of the research-development process of technologies on the future of Benin agricultural sector (Adégbola et al., 2015). The results showed the interface played by extension services and the weaknesses that limited the scope of impact of the research-development interventions in the system.

The current study was sponsored by the Forum for Agricultural Research in Africa (FARA) as part of the project, titled “Innovation Centres for Agriculture and Food in Africa”. It aims at making an inventory and analysis of agricultural innovations developed and popularized in Benin from 1995 to 2015. This report, therefore, presents a description and in-depth analysis of the innovations developed, disseminated and popularized in the plant, animal and fish sectors, as well as the value chains of agricultural sectors. The value chains of sectors considered are mainly in the areas of institutional development and organizational capacity building, storage-conservation, processing and commercialization issues at the national or local, regional and international levels from 1995 to 2015.

General and Specific Objectives

The objective of this study is to characterize agricultural technologies developed and popularized in Benin from 1995 to 2015. More specifically, its aims at

1. making an inventory of technologies developed, disseminated and popularized;
2. describing the different agricultural technologies developed, promoted and integrated into agricultural exploitation systems;
3. describing the actors and beneficiaries involved in the research-development process of agricultural innovations;
4. assessing favourable factors, the advantages and constraints to the adoption of disseminated innovations;
5. analysing the impact of innovations in terms of socioeconomic transformation of agricultural exploitations per domain and level of value chains of the different agricultural sectors.

METHODOLOGY

The study covered the entire national territory. Four research teams, led by senior scientists, travelled simultaneously throughout the departments of Ouémé-Plateau, Atlantique and Littoral, Mono-Couffo, Zou-Collines, Borgou-Alibori and Atacora-Donga from Tuesday 13 to Sunday 25 October 2015. In each department, the communities covered by the different promoted innovations and hosting the headquarters of the apex organizations on the platforms were surveyed. In this frame, actors of the innovation platforms (IP), extension agents of the Regional Agricultural Centres for Rural Development (CARDER) and of the Communal Services of Agricultural Development (SCDA) were interviewed.

The areas investigated were plant production, animal production, fish production, storage-conservation, agro-food processing and commercialization. Institutional development, organizational capacity building, the input sub-sector, production,

storage-conservation, agro-food processing and commercialization were the levels of value chains of the different sectors considered. Individual and group semi-structured interviews with representatives of services, projects and research-development programs, literature review and field visits for direct participatory observations were used as instruments of data gathering. These instruments/approaches also afforded us the opportunity to access literature and electronic materials, such as articles, books, fact sheets, videos, etc from 1995 to 2015, so as to add value to research results.

Actors of the platforms including male and female producers and processors, representatives of Specialized Agricultural Professional Organizations (OPAS), and resource persons of the central and decentralized services of the Ministry of Agriculture, Animal Husbandry and Fisheries (MAEP) were interviewed. At the level of MAEP, the Directorate of Programming and Prospective (DPP) and the Directorate of Agricultural Counselling and Operational Training (DICAFO) were investigated to inquire about promoted innovations.

Extension and research-development NGOs were also investigated. Activity reports from the structures, supports for research and extension activities, such as training-the-trainers' modules, posters and factsheets of the Regional Agricultural Centres for Rural Development (CARDER) and their decentralized services, Communal Services of Agricultural Development (SCDA), served as useful information sources. Printed and electronic information was collected for use. The interventions of CARDERs and their structures, SCDA, NGOs and other projects and programmes were also documented. These structures and projects include ProCAD, WAAPP, PADA, PDAVV, PUASA, PAIAVO, PDRT, PSSA, PAFICOT, WACIP, PUASA, PPMB, PADEB, ONASA, ONS, UDOPER, PAFILAV, PPAO, DEDRAS, BUPDOS, FAO, INRAB and IITA. The data collected were related to:

- *Innovation*: name, description, domain, sector, stage, level of development, year of generation, first year and period of dissemination, the appropriate agro-ecological zone, spatial scale of dissemination and/or adoption/ utilization;
- *Characteristics of the Platforms*: name, social and economic innovations promoted, intervention zone, date of creation, facilitating or funding institution, technical facilitator, opportunities tackled, achievement, challenge, maturity level, strategies for sustainability, etc.;
- *Actors*: type and role of the structures which have developed the innovation, type and number of the beneficiaries;
- *Impact of an innovation*: yield generated, gender consideration, positive and/or negative effects;
- *Adoption of the innovation*: necessary labour force, cost of the investment, utilization cost, favourable factors, unfavourable factors, constraints.

These data were collected for a 20-year period, from 1995 to 2015, using a data collection form developed for the purpose. The analysis was done using chi-square test.

RESULTS

The results obtained were related to:

- the relative importance of the types of technologies developed;
- the relative importance of the technologies developed per agricultural domain;
- the relative importance of the technologies developed per value chain;
- the relative importance of the technologies developed per group of speculations;
- the relative importance of the innovations developed according to the type and spatial scale;
- evolution of the development of technologies during the major history period;
- the levels of development of the innovations;
- the effect of the developed innovations;
- the number of technologies developed per agricultural domain according to the stage/ level of the sector value chain;
- the number of industrial/export speculations and stages of the sectors tackled;
- the number of staple food crops and stages of the sectors tackled;
- the number of speculations tackled in animal production per level of sector;
- evolution of the number of technologies developed per group of speculations from 1990 to 2015;
- evolution of the number of technologies per stage of sector over time;
- evolution of the domains tackled over time;
- the level of development of the technologies per domain of speculation tackled;
- the sector stages per level of technologies;
- the sector stages per scale of technologies;
- the effect of technologies per agricultural domain; and
- the agricultural domains tackled by the technologies depending on their nature.

The results are presented successively for non-promising and promising innovations so that both groups of technologies can be compared.

Relative Importance of Innovations Developed depending on their Nature

The technological innovations developed were of various nature. Such nature relates to the following centres of interest: technical itinerary, input, equipment, new variety and/or race. The majority (78%) of the technologies developed concerned technical

itineraries. Agricultural equipment, utilization of improved varieties and/or races, and agricultural inputs followed, with 5%, 4% and 2% of the technologies, respectively (figure 1). This result is well in conformity with the level of agricultural development, characterized by an increase in the levels of cultivated areas and scale of processing, yield level and quality of raw and processed products.

In the northern region of the country, in general, and in the departments of Borgou, Alibori and Donga, in particular, industrial and export sectors, such as cotton, cashew, shea butter, soya; and food crop sectors, such as maize, yam, cassava, rice, market gardening, poultry and ruminants were very promising for the economy at the local and national levels (Allagbé et al., 2006; Baco and Bello, 2008; Bello and Baco, 2009; Bello and Lobotoé-Agodokpessi, 2009; Bello, 2011; MAEP, 2011).

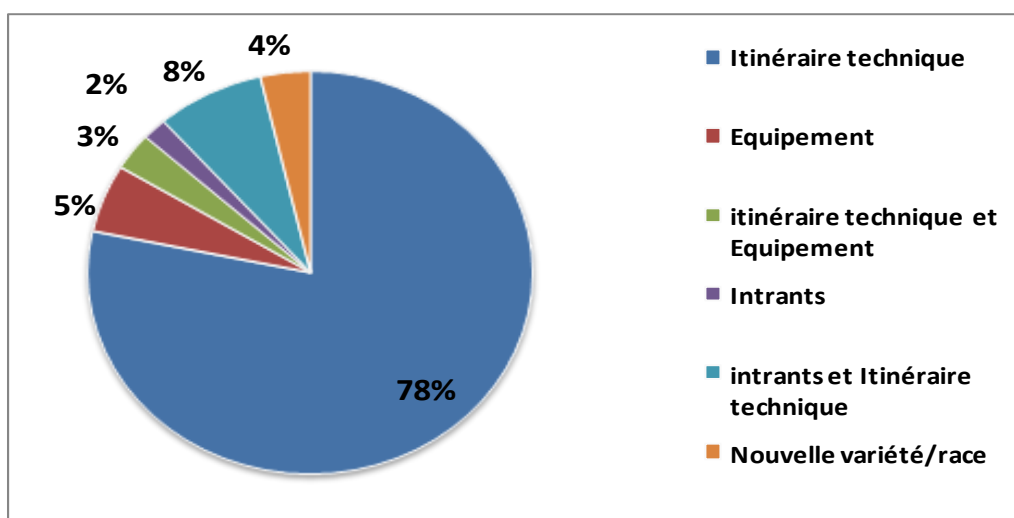


FIGURE 1: RELATIVE IMPORTANCE OF THE INNOVATIONS DEVELOPED DEPENDING ON THEIR NATURE

Agricultural Domains tackled by the Technologies

Technological innovations, depending on their nature, have tackled over time various domains of the agricultural sector (figure 2).

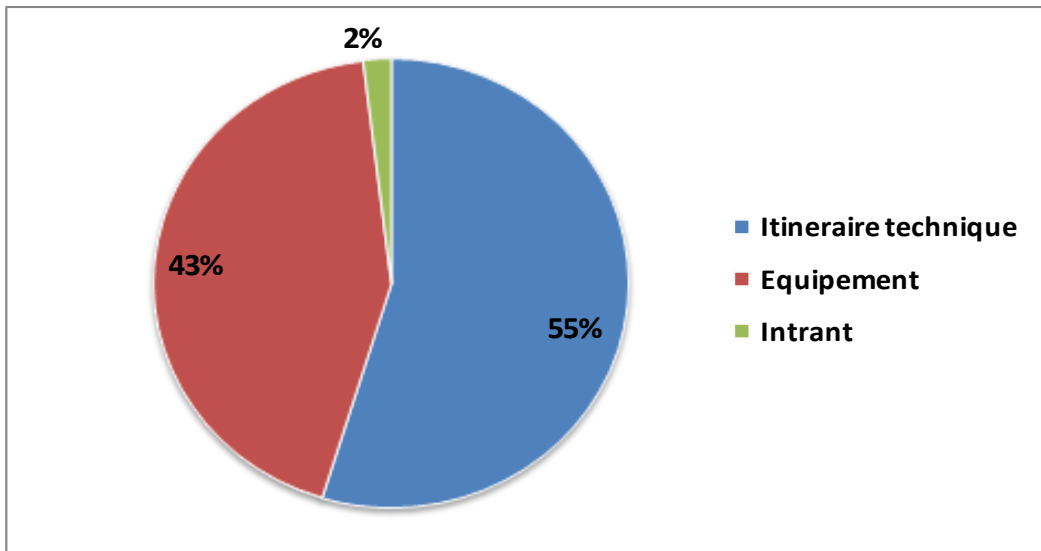


Figure 2. Relative importance of promising innovations developed depending on their nature

Plant production has been the most covered domain, with 102, 9, 4 and 4 technologies relating, respectively, to technical itineraries, equipment, input aspects, and improved varieties of crops or races of animal species. The technologies developed and promoted included:

- rhizobium inoculation techniques for good soya yield;
- mechanical weeding using the portable powered weeder;
- use of improved seeds of maize and NERICA rice varieties;
- use of planting cane for seeding under vegetation cover (SCV);
- use of biological pesticides and chemical insecticide (PACHA) in cowpea and market gardening cultivation;
- use of chemical and organic fertilizers;
- Intensive Rice System (IRS);
- use of herbicides;
- production of banana shoots;
- techniques of quick multiplication of cassava stems;
- foot-operated pump, Naguézé

The second domain tackled was **animal production**, which had promoted 15 technologies in the frame of species breeding and 3 other technologies in the frame of improved races. Among the developed innovations were the semi-modern techniques on fabricating salt block and food supplementation for local fowls.

The domain of **fish production** was tackled with only 12 technologies in the frame of improving itinerary techniques. Although the number of promoted technologies in this

domain was relatively lower than in other domains, the content of the technological packages was diversified. The innovations developed and promoted related to the techniques of:

- a. reproduction, farming, grow-out and fingerlings production of the African cat fish (*Clarias gariepinus*),
- b. grow-out and fingerlings production of Tilapia (*Oreochromis niloticus*),
- c. preparation of fish feed, and
- d. management of fish farm, as ponds and off-soil bacs have been promoted through technologies.

Relative Importance of Innovations Developed per Agricultural Domain

The different agricultural domains were not taken into account by the innovations at the same intensity. Plant production took 80% of the technological consideration, while animal and fish productions had 12% and 8% respectively. Besides these three domains, no other domain was tackled by the innovations (figure 3).

Generation Rhythm of Innovations Developed from 1995 to 2015

The number of technologies that were developed during the study period fluctuated, probably at the rhythm of needs and opportunities offered (figure 4). The period 2002 - 2011 showed the greatest instability in the number of development and dissemination of technologies. This period, which coincided with the two five-year terms of the government of General Mathieu Kérékou, following the historical Conference of the *Forces Vives* of February 1990, was marked by many startups in the agricultural sector, characterized by a lethargy of extension services and a relative determination of research professionals to carry out their official mission. It was during that period that many statutory documents and research programmes were elaborated under the PADSA and APRRA projects, with support from technical and financial partners from The Netherland, Denmark and Germany (Allagbé et al., 2006).

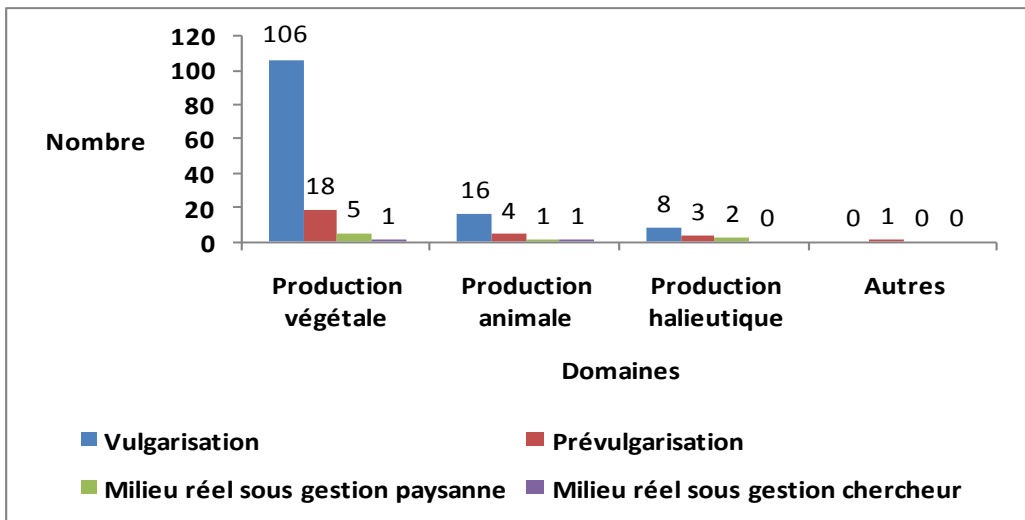


FIGURE 3: NUMBER OF TECHNOLOGIES DEVELOPED PER AGRICULTURAL DOMAIN DEPENDING ON THEIR NATURE

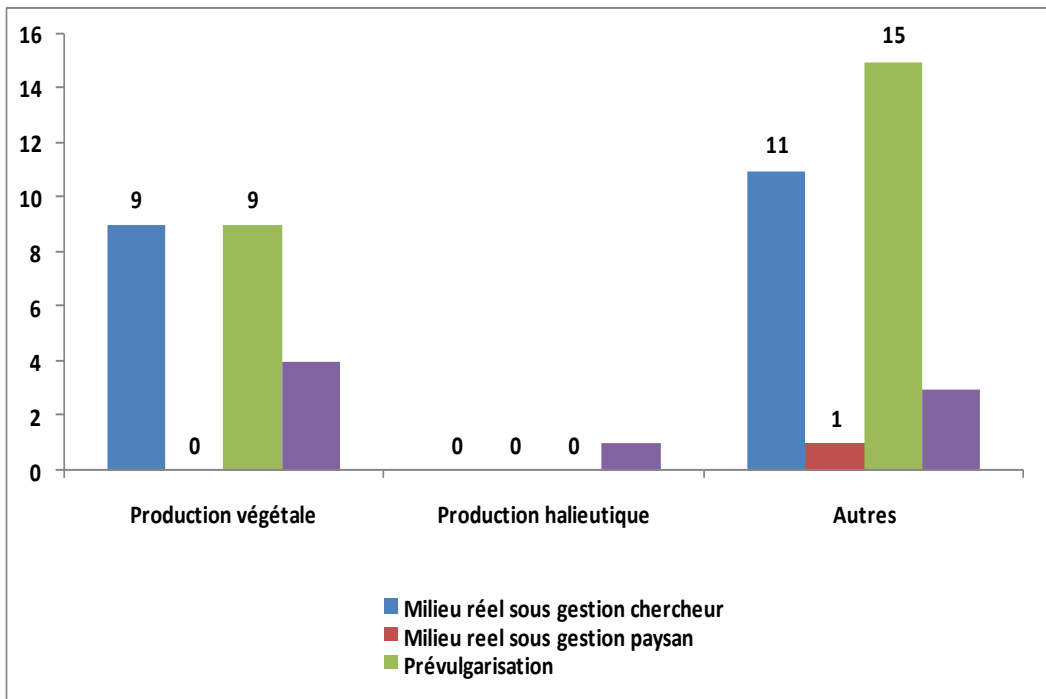


Figure 4. Number of promising technologies developed per level of development, depending on the agricultural domain

STUDY 02

Inventory and
Characterization of
Innovation Platforms

INTRODUCTION

The agricultural sector is of paramount importance in strengthening Benin economy because it contributes an average of 32% to the GDP, 75-90% to its export earnings, 15% to government revenues and accounts for about 70% of the employments. It is therefore considered as the sector with many potentials to be judiciously exploited in order to support the national economic growth and fight against rural poverty (MAEP, 2012). However, although climate and soil diversity could be favourable to agricultural production diversification and allow local production to cover basic food needs, Benin continues to import a good part of its market gardening and rice consumption, as well as frozen poultry meat, eggs, milk and fish to meet its animal proteins needs.

In fact, the productive agricultural sector is characterized by the predominance of smallholding and its vulnerability to the vagaries of the weather. The revenues and productivity are low and the labour force is only partially valued, making agricultural products less competitive. Most farmers resort to minimum use of fertilizers and do mining practices that degrade especially the soils. Thus, to achieve sustainable agricultural development, the sector must work towards productivity improvement, development of market sectors, and improvement of natural resource management through better use of lands and other resources. These do not depend only on technologies, but largely on institutions, markets and policies, which are evolving constantly. They also require innovations, a social process through which knowledge is created, disseminated, accessed, and adapted; they also critically require participation of several actors from the communities, government, NGOs, research and the private sector.

This study aimed at providing a general inventory of multi-stakeholder innovation platforms in Benin towards improving agricultural development, rural livelihood and national food security. The specific objectives were to:

- a. Define innovation platforms and their mode of operation;
- b. List innovation platforms created in Benin during the last 10 years;
- c. Describe innovation platforms created in Benin during the last 10 years through the modalities of their creation, funding and operation;
- d. Present and analyse some success stories and failures of innovation platforms created in Benin in the last 10 years; and
- e. Analyse the evolution of extension systems and technology transfer.

At the end of the study, therefore, it is expected that:

- a. Innovation platforms are defined and their mode of operation known;
- b. Innovation platforms created in Benin these last 10 years are listed;
- c. Innovation platforms created in Benin these last 10 years are described; and

- d. Some cases of success and failure of multi-stakeholder innovation platforms created in Benin these last 10 years are presented and analysed.
- e. The evolution of the extension systems and technology transfer are presented and analysed.

METHODOLOGY

This study covered the entire Benin territory and targeted especially the zones where multi-stakeholder innovation platforms had been created and innovations disseminated through innovation platforms. All secondary data that existed on multi-stakeholder innovation platforms developed in Benin during the last 10 years were used. The literature review was essentially conducted at the level of libraries and documentation centres of MAEP and structures under its supervision, such as IITA, INRAB, AfricaRice, FSA, universities and NGOs. Thus, the background documents of each project, activity reports, meeting minutes and monitoring and evaluation reports, data sheets and other essential documents were meticulously analysed. The Internet and other search engines were also used for effective literature review.

Qualitative and quantitative data were collected from public institutions, agricultural research centres of INRAB, universities, professional agricultural organizations, local and international NGOs, etc. through: semi-structured and structured interviews, focus groups discussions, interviews with key informants, and observation. Meetings and exchanges with key informants and actors of the innovation platforms were organized based on an interview guide and a questionnaire. Informants were mostly resource persons from agricultural research centres of INRAB and staff from communal sectors for agricultural development (SCDA). All other institutional actors who had intervened in the activities of innovation platforms were also utilized. The snowball approach was used during this phase to identify the various actors.

This phase helped in the documentation process of innovation platforms (IPs) in Benin for a ten-year period, to identify the actors who have intervened and interactions; to identify those involved in the creation process, the operations, facilitation, activities of IPs, perception of direct and indirect beneficiaries of the various initiatives on the economic and sociocultural impact already observed or anticipated, indicators to measure them and the factors explaining the impact. Specific successes and failures of innovation platforms were also documented. Content analysis (classification, tabulation, triangulation and systematic summary) was the major tool for analysing the qualitative data collected through reviews, focus group discussion and interview. Descriptive statistics (frequencies, averages, graphs, diagrams) were used for analysing the quantitative data collected using questionnaire.

RESULTS

Evolution of Agricultural Extension Systems and Counselling

Extension is the contribution of knowledge, technologies, innovation and new things, proven through facilitation, under the form of information in order to improve the technical performances (especially) of farmers' activities (Livre Blanc, 2007). It also consists of sharing research findings and farmers' know-how, but also in helping them to exploit a larger part of the value chain (Michael Hailu, 1992). Extension as a general neutral term designating all activities that provide information services and counselling required by farmers and other actors of the agro-food systems and rural development (FAO, 2011). During the colonial period, agricultural extension served to promote export crops and make, delineate and protect the forest land of the colony. Postcolonial period (1960-1971) was characterised by rural supervision and product speculation. During those years, agricultural extension and counselling services, funded and managed by the government, played a key role in agricultural productivity. The recent period (1972-1989) was marked by adoption of the training and visit approach, which takes into consideration the communication aspect. However, some structural adjustment programmes have led to the severe dwindling of funds to the agricultural sector (CTA, 2012).

Agricultural extension has evolved significantly during the 1990s, due to changes in rural development approaches and through structural, administrative and legislative reforms. Extension was seen to play an important role in improving access of farmers and entrepreneurs to knowledge, credit, input and markets (Otchoun, B and FAO 2010). It was thenceforth accepted that it was necessary to find a new model of service provision, which is pluralistic and private sector-driven. Ideally, innovation platforms are created to solve the problem of incoherence between the different actors of the value chain and facilitate the diversified technical support to these actors.

Agricultural counselling is a facilitation process that aims at improving production or farm management (Moumouni et al., 2011). Agricultural counselling excludes any idea of coercion or imposition; it gives farmers the decision to choose after having given an opinion that informs this choice. It is a 'decision aid' which takes into account technical, economic, social and, if possible, environmental aspects of farming activities (Dugué et al, 2001). To this effect, rural families are in the heart of extension counselling. It is based on learning decision aiding methods that add value to data collection but require minimal mastery of calculation and writing.

A technology is a set of techniques and knowledge available at a given time. We talk of a new technology when it is a technological change or an improvement of production, processing, storage, management techniques, etc. (SNCA, 2008). In order to improve the productivity, especially of smallholder farmers (improved seed,

fertilizers, pesticides, good agronomic practices, processing, storage techniques, etc.), promising technologies that stem from research findings are disseminated. This dissemination is done with support from decentralized structures of the Ministry of Agriculture, Animal Husbandry and Fisheries (MAEP), such as the Regional Action Centres for Rural Development (CARDER) and certain NGOs. The intervention of these structures (CARDER and NGOs) is more based on the principle of innovation platforms, from production to postharvest and quality improvement operations of products meant for consumption and commercialization. The platforms are used to disseminate promising technologies to improve agricultural productivity of small farmers (CTA, 2012). There are also postharvest management and processing technologies. The supervision and training of actors are done at all steps of the value chain and is based on information management on technical innovations that allows adaptation, modification and transfer of competences, technologies and approaches, in order to improve the efficiency and impacts through communicating and sharing lessons learnt as well as good practices for a timely fact-based decision making.

Innovation platforms and operation mode

Innovation platforms are coalitions of actors who meet to share their experiences, knowledge, competences, resources and ideas with the view to solving problems and grasping opportunities of common interest (CORAF/WECARD, 2012). It can be defined as a network of organizations, enterprises, and individuals concerned with bringing new products, processes, and new forms of organizations for economic use, together with institutions and policies that influence their behaviour and performance. An innovation platform embraces not only science providers but also all the interactions of actors involved in the innovation. It goes beyond knowledge creation to include factors that affect the demand and use of knowledge in new useful manners. The innovation platforms bring together different stakeholders to achieve a common objective. The platform adopts an innovation as a systemic and dynamic institutional learning process and recognizes that the innovation can stem from several sources, complex interactions and flux of knowledge.

The goal of creating an innovation platform is to endow local communities and government authorities with the capacities to analyse their constraints/weaknesses and the opportunities/forces and strengthen their capacity to innovate through better access to the use of existing and new knowledge and services for improving the performance of their enterprises. This is also to improve knowledge sharing and coordination between key actors in the implementation of project activities and to create institutions and support policies. The major principles of agricultural innovation platforms, according to CORAF/WECARD (2012) are:

1. To concentrate more on innovation than production
2. Interactions and learning
3. Links to have access to knowledge and training

4. There are new actors and new roles in the innovation process
5. Attitudes, practices and interactions of modes and behaviour determine the innovation appetite
6. Policies are important in the innovation
7. The demand aspect should be included in the innovation process
8. Change to adapt to change
9. Build on “sticky” information

Types of innovation platforms actors

Innovation platforms catalyse and facilitate collective actions through multi-stakeholder processes and value chains to improve sustainable living standards and impact of local and national development. Innovation platforms include five groups of stakeholders:

1. Small farmers;
2. Input suppliers, agro-food processors and traders;
3. Public and private suppliers (research and extension) and managerial services (business development);
4. Financial services (banking institutions and microfinances) and
5. Sets of regulations (that define norms and rules).

These comprise three groups of actors:

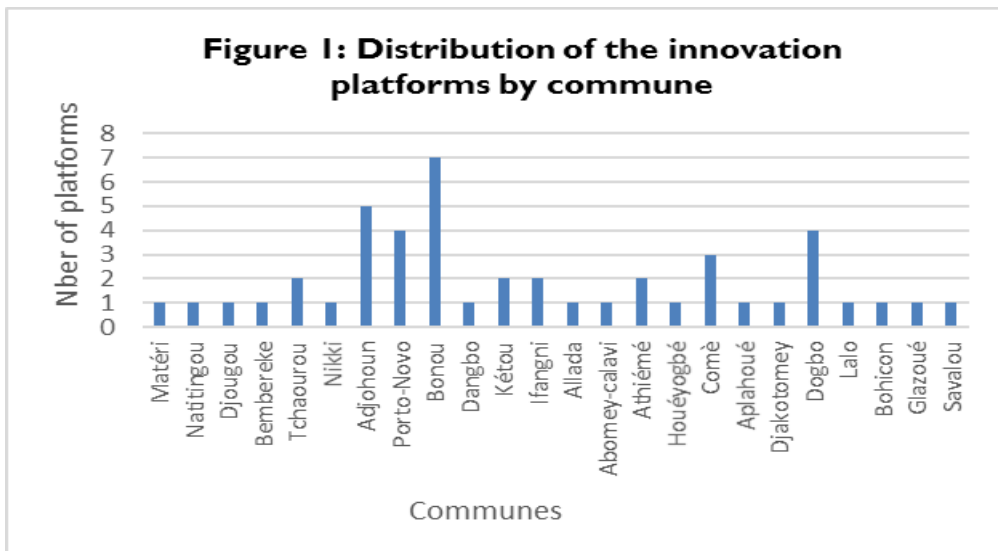
1. Actors in the value chain (producers, processors, small farmers, cooperatives...)
2. Service providers (research, extension, projects, communication, and microfinance)
3. Regulators (politics/unions/deputies/senators/communes/town councils)

Key factors of the operation of an innovation platform

An innovation platform is a tool to manage multi-stakeholder processes in a value chain. It uses a combination of common learning systems and approaches to trigger the commitment of stakeholders in each step of the process. In this regard, the specific complexes following participatory approaches, dissemination channels and functional learning tools and approaches are adopted. Participatory approaches and collective action tools, such as participatory development approaches, management of participatory development, participatory research and dissemination approach, participatory varietal selection, participatory analysis, gender approach, participatory learning and action research, agricultural participatory management, agricultural practical schools (school farm, farmer to farmer approach) and control plots. The dissemination path includes learning among agricultural producers, the collective action of agricultural producers, and adoption of technologies that take into account market evolution and participatory approach to marketing chain. Functional learning

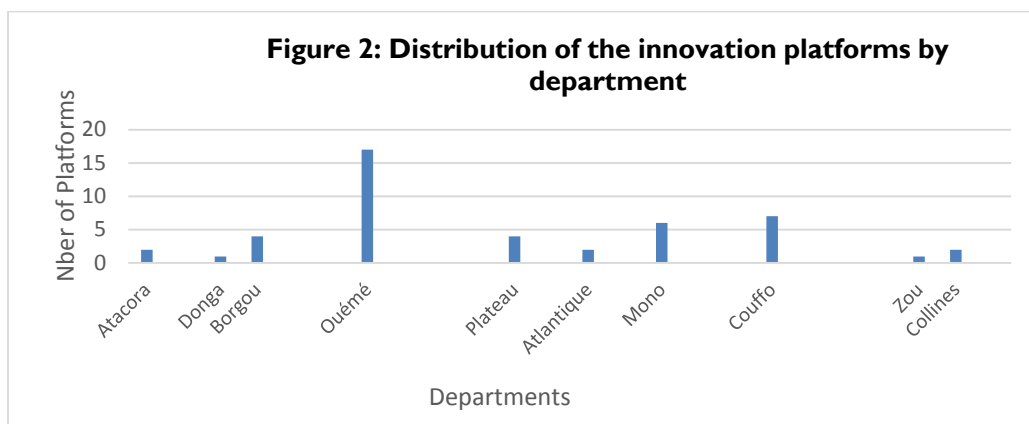
is through a joint systemic analysis, documentation, experimental learning and sharing of information/ knowledge among stakeholders of the platform.

A value chain in agriculture designates all actors and activities that take a staple product from the production phase in the farm to its final consumption, a process in which some value is added to the product in each step. An innovation platform is generally established around a value chain which is characterized by: a product, a market, functions (or technical operations), actors, forms of relationships/exchanges contracts between actors, a specific territory (local, national, and international).



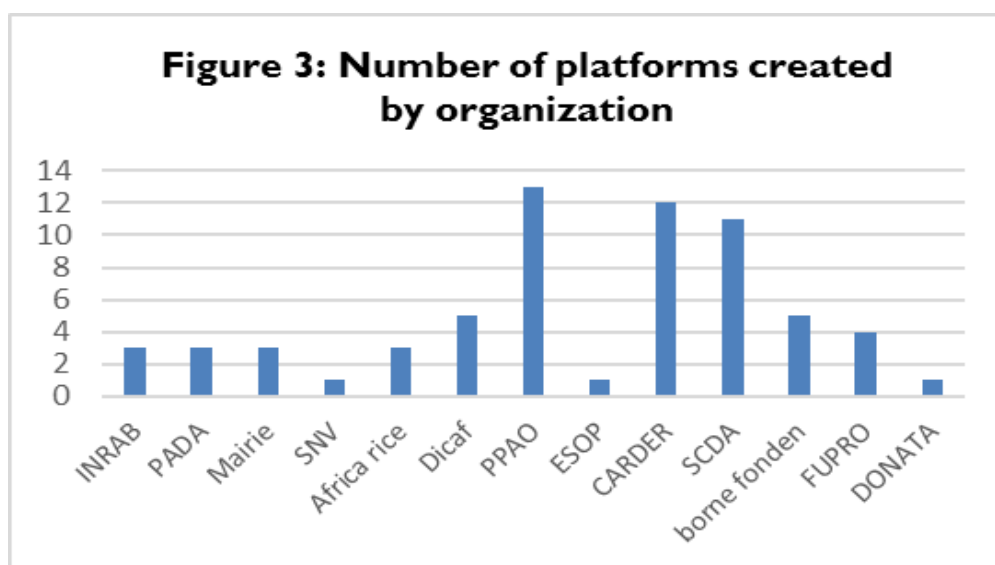
Inventory and Characterization of Innovation Platforms in Benin

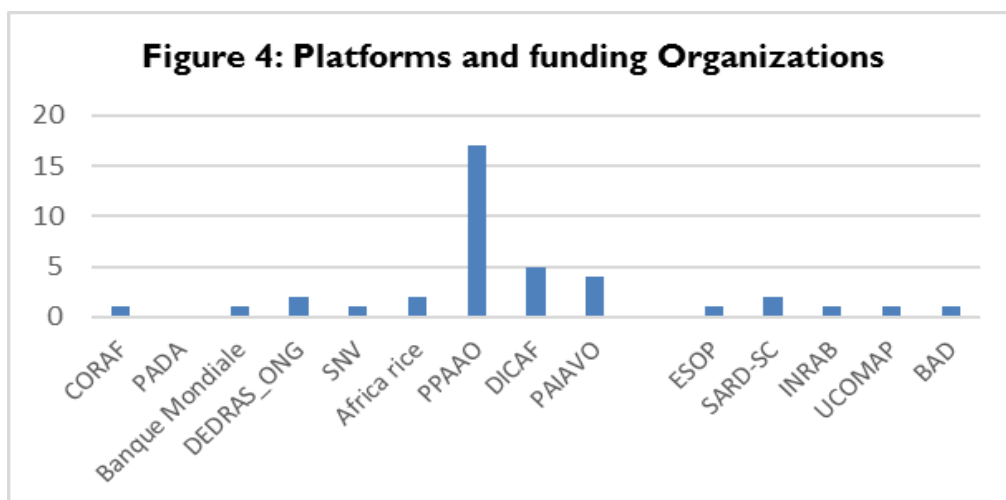
In total, forty six (46) innovation platforms were developed and deployed throughout Benin territory. They were distributed in 10 of 12 departments and 24 of 77 communes of Benin (figures 1 and 2). The Ouémé department alone had 37% of the platforms. The departments in the southern part of the country (Ouémé, Plateau, Atlantic, Mono and Couffo) accounted for 78.26% of the platforms, while they represent less than 20% of the cultivated acreages. Access to market could have explained the reason for such heavy presence of platforms in the area. In fact, the departments have the largest urban centres and the biggest markets to sell agricultural products. Moreover, these departments have exits to external markets through land borders with Nigeria (with a population of 170 million), Togo and maritime and air borders.



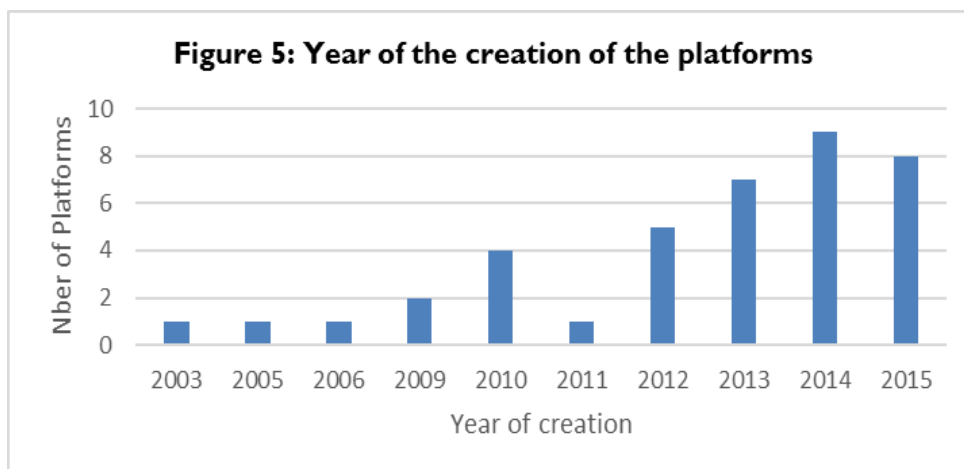
IP funding organizations

In terms of creation, public structures (CARDER and SCDA, INRAB, DICAF, town councils) and government development projects (PADA, WAAPP) were involved in the creation of 78.26% of the platforms. These organizations did not often intervene alone but in collaboration with other public or private organizations. Research institutions (INRAB, AfricaRice) were involved in the creation of 13% of the platforms.





Platform funding is assured through technical and financial partners (SNV, CORAF, World Bank, African Development Bank, etc.) who intervene directly or through government development projects (PADA, WAAPP, etc.) or NGOs. Moreover, 65.21% of the platforms were created during the last five years (2011 to 2015) by WAAPP. Thus, platform creation and development dynamics were accelerated these last five years at WAAPP's behest.

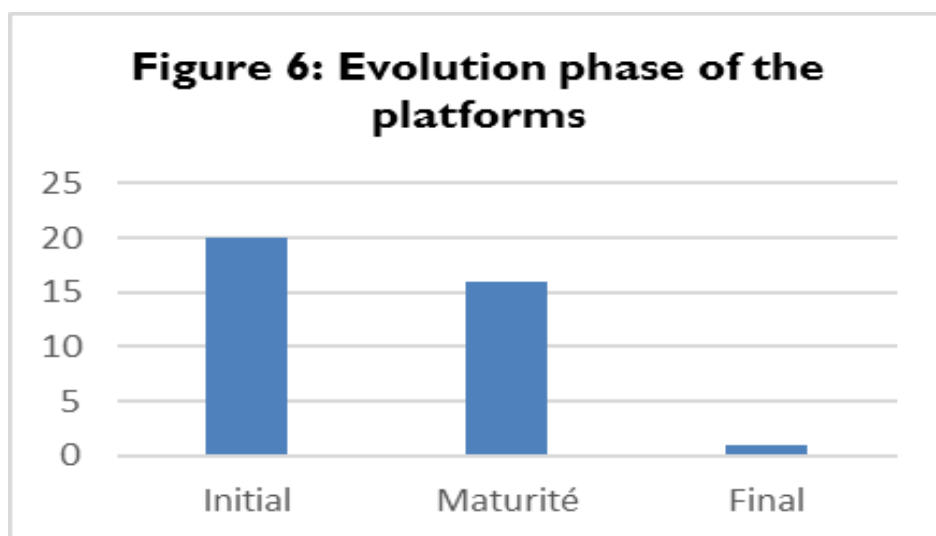


Evolution phases and duration of activities

Three phases were distinguished in the evolution of the platforms: the initial phase, the maturity phase and the independence phase; the results showed that 54.05% of the platforms were still in the initial phase of their development, while 43.24% were in the maturity phase. Only one platform was really independent. Members of the platforms documented were mainly producers, processors and traders. Moreover,

27.27% of the platforms (documented with regard to this parameter) were made essentially of producers; 40.9% were processors and 31.82% comprised producers, processors and traders. Transporters, who are essential actors in any value chain, were absent in the inventoried platforms.

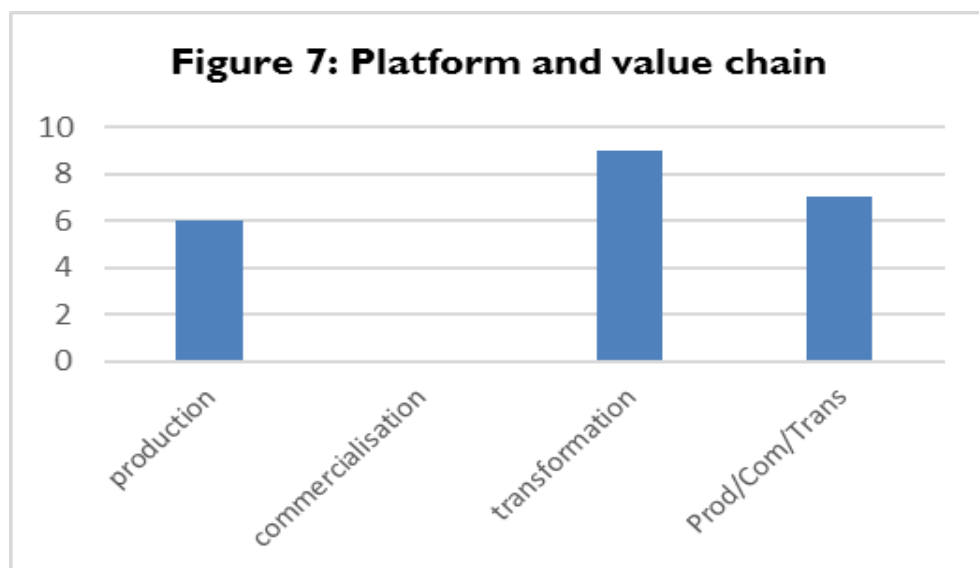
The inventoried platforms are mainly created thanks to the interventions of development or research projects/programs, NGOs or technical and financial partners. The main opportunity tackled is access to market to sell of agro-food products.



Achievements of the platforms

It is noteworthy that the achievements listed below were not without the strong and consistent support of financial and technical partners. These achievements include:

- Establishment of production and marketing infrastructures (irrigation schemes, storage warehouse, market shed, etc)
- Supply in agricultural inputs
- Capacity building
- Information on markets and prices



Sustainability

The inventoried platforms operated essentially on external funding, as they did not have their own sources of fund. Faced with this situation, certain platforms opted for the contribution of their members in order to sustain certain functions. This stop-gap solution did not, however, guarantee their sustainability. Just like the African proverb that ‘one finger cannot lift a rock’, the platforms must unify associated entities to achieve a common goal.

Success stories and failures of innovation platforms in Benin

The analysis of field information and literature review, as well as their cross-checking, showed that the success of an innovation platform depends on the harmonious interaction between several factors:

- Understanding, cohesion and functional relationships between the different members of the platform
- Equitable access to opportunities and resources
- Convergence of interests and abiding by operation principles
- The funding organization, its practices and intervention mode in the life of the platform
- The managerial and relational style of facilitators
- The competence and mode of integration/anchoring level of members of the platform
- Consensus between different groups of actors of the platform (producers, processors and traders).

The platforms were established by the institutions supporting the rural world or by rural-funding organizations to solve the problem of incoherence between different actors of a value chain of a given sector. However, certain platforms experienced failures and were unable to solve the problem or experience a sustainable evolution. Multiple factors accounted for these failures, among which were:

- Disregard for the attractive conditions promised at the beginning by the institution that created the platform
- Inadequate provision of information and training conditions for a better facilitation of the life of the platform
- Disregard for the main phases of the establishment of the platform
- The inability of the platforms to empower its end users
- Inadequate assistances from funding institutions

The development of agricultural extension in Benin has depended on the objectives of each development policy and period. Its legislative and regulatory foundations have changed and evolved depending on the options and reorientation of development strategies based on democratization, decentralization, and liberalization of the economy, poverty reduction and sustainable development. Thus, purely sectorial and closed systems have gradually given way to a unified extension system and then were gradually replaced by platforms. This study on the characterization of platforms showed that most of them were at the initial phase and that their operation was based on external funds. The analysis of their mode of operation showed that they were not all successful; Cases of failures existed. Hence, there are lessons to learn so as to evolve more stable and sustainable agricultural platforms in the country.

STUDY 03

Investments in Innovations
for Agricultural
Development and Food and
Nutrition Security

INTRODUCTION

The agricultural sector in Benin is the basis of the national economy. It is essential to the employment, income and food security of the population. It provides income to about 70% of the active population and contributes 32.7% to the gross domestic product (GDP). Likewise, agricultural exportations occupy a key place in Benin external exchanges. They represent about 75% of the internal export revenues (MAEP, 2014). Despite its importance in the national economy, the Benin agricultural sector is characterized by low productivity and faces strong environmental constraints. It also undergoes today the consequences of disinvestment from the government as well as from international institutions.

During the 1980 and 1990s, Benin, like most African countries, was subjected to the Structural Adjustment Plans (SAP) that were translated by a drastic reduction of public expenditure, an openness to international competition and a policy of privatization. Following these major reforms, public resources and development aid to the agricultural sector did not almost evolve anymore. Thus liberalized, the agricultural sector did not enjoy the support that should have allowed it to ensure the food security of the population and resist unfair international competition. Agricultural policy tools were mainly oriented towards financial profitability of cash productions without the accompanying measures necessary to achieve the objectives of agricultural policies (ECOWAS, 2008). The food crisis of 2008 has put agriculture back to the forefront and shown the necessity for African countries to find structural responses able to secure their food security, to face rural poverty and to secure employments for a population that is predominantly young. However, the major issue for Benin and African countries is to put in place concerted and coherent agricultural policies in relationship with the major development issues and opportunities of the continent, and be able to ensure food sovereignty of the countries.

Since 1960, Benin agricultural policy has experienced quite deep transformations in relationship with the political orientation changes of the country. Thus, in 25 years, Benin government, looking for the same objectives, has taken different options to deploy its plans of action in the rural area. Since its independence, Benin has taken many options, elaborated many strategies, and implemented many programmes and plans. But the results have not often turned out as well as they might have wanted, and were obviously below the expectations of the rural population.

Moreover, all these policies and strategies position agricultural research as the “spearhead” of agricultural growth. During these last two decades, agricultural research has created great hopes to contribute in finding solutions to improve agricultural productivity. However, these hopes keep on crumbling mainly because the impact of research on the productivity of small producers has not always met

expectations (Ghanem, 2009; Gaillard, 1989). These frustrations lead to poverty, hunger and malnutrition in the households of small producers. The National Agricultural Research System (NARS) is still weak and suffers from the chronic inadequacy of resources to conduct relevant and productive research activities.

This study evaluated the impact of investments in innovations for agricultural development and food and nutritional security in Benin. The main objective of this study is to evaluate the impact of investments in innovations for agricultural development and food and nutritional security in Benin. More specifically, it aims at:

1. Presenting and analyzing the evolution of agricultural development policies and agricultural research in Benin;
2. Presenting and analyzing the evolution of budgets and effective expenditures of the agricultural sector in general and agricultural research in particular;
3. Evaluating the impact of investments in the agricultural sector in general and in agricultural research in particular; and
4. Presenting the impact of the adoption of a few agricultural innovations.

At the end of the study, the following are expected to have been delivered

1. The evolution of agricultural development and agricultural research policies in Benin is presented and analyzed;
2. The evolution of budgets and effective expenditures of the agricultural sector in general and agricultural research in particular is presented and analyzed;
3. The impact of investments in the agricultural sector in general and in agricultural research in particular is evaluated; and
4. The impact of the adoption of a few agricultural innovations is presented.

METHODOLOGY

Information existing on agricultural development and agricultural research policies in Benin and investments in the agricultural sector were collected through literature search. This literature search was essentially done at the level of the National Institute of Agricultural Research of Benin (INRAB), the Central and Technical Directorates of the Ministry of Agriculture, Animal Husbandry and Fisheries (MAEP) and universities. Thus, the documents collected include: the documents of agricultural development and agricultural research policy and strategy in Benin, activity reports, performance reports and evaluation reports. The internet, through the main search engines, was also used. Moreover, interviews and exchanges with key informants and actors were conducted using an interview guide and data collection forms. These key actors were essentially resource persons from MAEP, INRAB and universities. The

interviews and exchanges allowed us to collect additional information and data, points of view and perceptions on the agricultural policies and investments made in the agricultural sector in Benin. The snowball approach was used to identify these key actors.

Content analysis (categorizing, tabulation, triangulation and systematic synthesis) is the main tool used to analyze qualitative data collected during literature search, focus groups discussions and interviews with key informants. Descriptive statistics (frequencies, means, graphs, diagrams) were the analysis tools of the quantitative data collected.

Characteristics of the Agricultural Sector

Agriculture in Benin occupies a very important place in the national economy. The production is highly diversified and includes food, industrial, fruit and market gardening crops. Food production is mainly rainfed and dominated by cereals (millet, sorghum, maize, rice, acha) and food vegetables (cowpea, groundnut, Bambara nut). Industrial crops is dominated by cotton. The agricultural sector is characterized by the predominance of small family farms of 2 ha on the average, oriented towards mixed farming, associated with small animal husbandry. About 34% of the exploitations cover less than one hectare. Only 5% of the exploitations in the south and 20% in the north of Benin cover more than 5 ha (MAEP, 2011).

Agriculture is also characterized by its vulnerability to the vagaries of the weather. It remains traditional with the use of rudimentary techniques and methods. It is becoming gradually mining and provokes the quasi irreversible degradation of lands and ecosystems (Floquet and Mongbo, 1998). Revenues and productivity are low and the labour force is only partially valued, a condition that makes agricultural products less competitive. Animal production represents 9% of the GDP and 25% of the production of the primary sector. It is practiced in an extensive and traditional manner, and includes several species: bovines, sheep-goats, pigs and poultry. Two animal production systems are practiced: (i) the extensive pastoral system (heavy livestock and small ruminants) located in the north, to a lesser extent in the centre and in the plateau, and (ii) peri-urban animal husbandry (poultry, small ruminants, rabbits) and the sedentary animal husbandry, with small numbers of 3 to 10 cows associated with small ruminants. The agro-pastoral system is more developed in northern Benin, with the use of animal-drawn cultivation and collection of manure for soil fertilization.

Benin has a coastal front of about 125 km and two river-lagoon complexes: the one in the south consists of the Ouémé, Mono and Couffo rivers, and the basin of the Niger River with its tributaries in the north. The major activity remains artisanal fishery (maritime and lagoon), characterized by fishing techniques leading to the depletion of the fishes. There are also some fish farming activities that are still less developed. The

contribution of the forest sub-sector to the GDP is 3%. The firewood component ensures most of this contribution (90%). The annual degradation rhythm of the national vegetal cover is estimated at 70,000 ha (MAEP, 2011).

Assets of the agricultural sector

At the physical level: Benin has about 70,000,000 hectares of useful agricultural land (outside protected zones), i.e., 58.7% of the national territory, distributed into eight agro-ecological zones. Benin also has about 320,000ha of irrigable lands, including the Niger valleys (Malanville and Karimama), the Oueme valleys (low valley), and the Mono valleys, of which 205,000 ha of lowlands are favourable to rice cultivation.

At the climate-hydrological level: The diversity of the agro-ecological zones allows quite a vast range of production. The bimodal regime of rains in the southern part of the country gives the possibility of two crop cycles per year. In general, the annual rainfall is 1,000 mm and is largely enough to favour the development of non-irrigated agriculture. There are also possibilities given by non-exploited surface waters, including 31,000 ha of lakes and lagoons available and favourable to irrigation.

At the regional environment level: The high demand in some food products by Nigeria that imports, for example, 1,500,000 tons of rice per year is an opportunity that the country can grasp to give a regional dimension to its agriculture. For example, certain cassava derivatives are also popular with the regional market and on which Benin can take options.

Constraints and weaknesses of the agricultural sector

Land constraints: Rural land system is characterized by a dualism, where the modern law land tenure system and the customary law regime (dominating) coexist. This dualism does not solve land insecurity problems facing farm operators and is a serious handicap to agricultural intensification. A new modern land tenure regime is being experimented with the introduction (still very marginal) of the rural land planning (PFR), written in the new law on rural land tenure adopted in 2007. But, this law, although considered today as a prerequisite to the promotion and securing of investments in the agricultural sector, still suffers from the non-functionality of the operationalization tools (regulations, management organs, etc.).

Weakness of technological innovations: One of the barriers to boosting agriculture in Benin is the low adoption of appropriate technologies by producers. Research results are not always adapted, are not well-known and less valued. Producers are always at a productivity level below technologies that stem from research.

Insufficiency and inadequate funding of agricultural activities: Not only are credits often not available, they have high interest rates. Because of this, the use of agricultural

inputs is still very limited due to their extremely high cost.

Degradation of natural resources: Lands are exploited without thinking about restoration, and production growth is obtained at the expense of degradation (often not reversible) of the natural resources. Animal and fish productions are generally the object of almost intensive systems of exploitation, with the same threat for the ecological environment. Filling up water bodies, overexploitation of coastal areas, and invasion of water bodies by floating plants lead to their continuous impoverishment.

Absence of a system to secure productions: It is evidenced by the inexistence of an agricultural assurance system, thus exposing producers to all kinds of risks.

Lack of infrastructures in rural area: Only 40 to 45% of the feeder roads are all-season roads. Because of that, many production zones are not accessible during a good period of the year, a consequence of the bad state of rural roads. Moreover, storage and commercialization infrastructures are lacking.

Evolution of Agricultural Development and Agricultural Research Policies

Since the colonial period, agricultural policy in Benin has experienced some quite deep transformations in relationship with policy orientation changes of the country. Globally, we can stake out four periods corresponding to quite different strategies. In the colonial era, the sector was dominated by private institutions called “intervention companies,” which were in charge of not only exploiting certain sectors, but were playing a coordinating role from upstream to downstream by integrating extension, production, commercialization, processing and exportation, and also research activities. Management actions of the agricultural sector by the colonial authorities during this period were marked by the creation of the Central Structure of Agriculture in 1905, the Central Structure of Animal Husbandry in 1908, the Centre for Fishery Studies in 1958 and the 1st Ministry of Agriculture and Cooperation of Dahomey in 1958. During this period, agriculture was much more concentrated on export crops for the benefit of metropolitan France.

Just after independence, during the 1960s to the 1970s, the country opted for modernizing its agriculture, with the double perspective to satisfy local food needs and to have sources of financial revenues to start building the country. Two major strategies were deployed: the promotion of irrigation schemes and the regionalization of development. The first strategy was targeted at the promotion of food crops, namely rice. The second was targeted at the promotion of two cash crops: palm oil then accounted for 60% of the export earnings and cotton was considered as an emerging speculation. At the institutional level, the production was supervised by trade economy organizations and by reorganizing local provident companies into cooperatives.

The Marxism-Leninism period (from 1975-1990) intervened from the second half of the 1970s consecutively with policy orientation changes in 1972. Despite the populist momentums deployed (collectivization attempt of agriculture), agricultural policy during this period had set itself objectives that were integrating clearly the regional dimension. It was developed to: i) meet local food need, ii) supply local processing industries already created or to be created, iii) accumulate security stocks, and iv) make Benin a source of supply of food crops to its neighbours: Niger and Nigeria. The results of this strategy remained mixed and the will to make agriculture the engine of economic development came up with the inadequacy between the deployed strategies and the means actually implemented.

The period of economic liberalism (from 1991 to date) is marked by the call to question the directive option on a background of the Structural Adjustment Plan. A set of reforms calls into question the government omnipresence, which is reflected through the famous Hugo formula in 1998 (cited by Soulé, 2003) of the “pro” government (promoter, producer, prospector and programmer). This period is backed up by a liberal orientation which, while privileging cash crops, attaches an important place to producers’ organizations. Thus, in the beginning of the 1990s, Benin defined the major orientations of its agricultural policy through the Letter of Declaration of Rural Development Policy (LDPDR) signed on 31 May 1991 in Washington. This Letter is therefore the first act of the agricultural policy of the era of Democratic Renewal in Benin. This letter was followed by the implementation of the Project to Restructure Agricultural Services (PRSA) and the organization of the Round Table of the Rural Sector in September 1995.

Taking into account these different evolutions MAEP undertook since the beginning of 1999, a process to adjust reflections on the development strategy of the rural sector to the new national and international context was undertaken with the elaboration and global formulation of a new agricultural policy contained in the following basic documents:

- In 1999/2000, the Declaration of the Rural Development Policy (DPDR) of 1999 completes the LDPDR, by specifying the content and the disengagement conditions of the state from production, processing and commercialization functions;
- In April 2000, the Master Plan for Agricultural and Rural Development (SDDAR) tackles the policy and the global strategy of agricultural sector development on the one hand, and the sub-sectorial strategies on the other hand;
- In July 2001, SDDAR is made operational with the elaboration of the Operational Strategic Plan (PSO), which specifies the public strategy for rural development and submits a set of actions to be implemented with regards to

government support to the sector;

- In July 2006, the Strategic Plan to Boost the Agricultural Sector (PSRSA) was elaborated after reflection meetings and workshops with all the actors. This plan, which was submitted for government approval in 2007, describes the implementation of the vision, which involves “*making Benin an agricultural power dynamic, competitive, environment-friendly, generating wealth and meeting the economic and social development needs of the population.*” In this vision, the government will continue to ensure the sovereign functions, implement the legislative and regulatory instruments, and will develop incentive measures especially at the tax level. For research and extension functions, the government will ensure the said functions in partnership with the other actors of the sector.

The analysis of the evolution of the agricultural development policy in Benin allows us to affirm that the strategic orientations were adopted in a political context of distrust and strong presence of the state, which has characterized for long the Marxist regime on the one hand, and owing to economic hopes in economic liberalism on the other hand. Let us point out that the LDPDR was signed about six months after the National Conference, a situation which shows the haste and the weak consultation that characterized its elaboration, according to the affirmations of many actors (MPDEPP-CAG, 2009). This first act of the development policy of the agricultural sector is the fruit of the guidelines laid down by the Structural Adjustment Programme (SAP) and the reforms of the Bretton Woods institutions. These justify the many strategic revisions throughout this period.

Moreover, agricultural research policy, deriving generally from agricultural policy as one of its strategies, has also experienced quite deep changes in relationship with the agricultural policy changes of the country. Thus, this can also be discussed under the four periods. During the colonial period, for example, the objective assigned to agricultural research was to ensure optimum production conditions of export crops for the benefit of metropolitan France. Thus, the 1940s saw the creation of several specialized research institutes like: the Research Institute for Cotton and Exotic Textiles (IRCT) created in 1946, the Technical Tropical Forest Centre (CTFT) created in 1947, the Institute of Animal Husbandry and Veterinary Medicine of Tropical Countries (IEMVT) created in 1948, and the Institute of Tropical Agronomic Research (IRAT) created in 1960.

The creation of these institutes was preceded or accompanied by the creation of several research stations in French West Africa (FWA), including three in Benin (former Dahomey): a research station on food crops in Niaouliin, in the south, created in 1904; a research station on food crop in Inain, in the north, created in 1930; and a research station on palm oil in Pobé, created in 1922. Research was then used in order to exploit

the available resources in the colony. Research and its institutions were led by French scientists, and little efforts were made to train local scientific capacities (Gaillard, 2008).

Benin accession to independence on 1 August 1960 did not totally change the relationship of the new independent country with France, namely in the field of organizing and governing research activities. Despite independence, research programmes were always conceived by France, and the former colonial power was more present than ever in all research structures. In the field of agricultural research, the research activities of French agricultural research institutes continued in Benin in the frame of the conventions signed with France up till 1977, the year when research institutes were nationalized. French research institutes (IRHO for palm oil, IRCT for cotton, IRAT for food crops, etc.) benefitted from important budgets from France, and have continued to carry out their research activities in conformity with the scientific policy elaborated for all French territories of the Africa. This was also the case with the Office de la Recherche Scientifique et Technique Outre-Mer (ORSTOM, now IRD) that drew, during the years following independence, the soil survey and utilization maps of the lands throughout the country.

The Marxism-Leninism period (from 1975 to 1990) was characterized mainly by nationalized research activities not well-funded and split up despite a previous coordination attempt. A seminar organized in 1976, the National Seminar to Revolutionize Technical and Higher Teaching Structures, contributed strongly to the renewal of the reflection on scientific and technical research, and worked out concrete propositions about its reorganization. In the field of agricultural research, all research structures have been put into Agricultural Research Directorate (DRA), under the ministry in charge of agriculture. From 1986, with the project, Applied Research in Rural Area (RAMR) of Benin-Netherlands Cooperation, a pilot experience in Research-Development (R-D) was started. This approach has allowed the participation of users (farmers) with the establishment of trials in the producer's conditions. Thus, several technologies have been developed with on-station trials and multi-location trials, in order to study varietal adaptability to the different agro-ecological zones.

During the period of economic liberalism (from 1991 to date), in favour of economic reforms engaged in the 1990s, Benin has undertaken the definition of a national agricultural policy. Research was not left aside by this global trend. The Directorate of Agricultural Research (DRA) became the National Agricultural Research Institute (INRAB) by Decree No. 92-182 of 06 July 1992. INRAB is a public scientific and technical establishment which has juridical personality and financial autonomy. This reiterates the importance of research as a "spearhead" of agricultural development. Thus, the Mater Plan of the National Agricultural Research (PDRA) was elaborated in 1996. It includes three volumes that contain the bases of structuring and programming

agricultural research at long-, medium- and short-terms.

From DPDR in 2000 to PSRSA in 2008, crucial objectives were assigned to agricultural research in order to boost agricultural production in Benin. In the PSRSA, the assigned objective to agricultural research is to put at the disposal of actors promoting target agricultural sectors, adapted and performing technological innovations in terms of productivity, adaptation to climatic risks, financial revenues and environmental conservation. More specifically, this is:

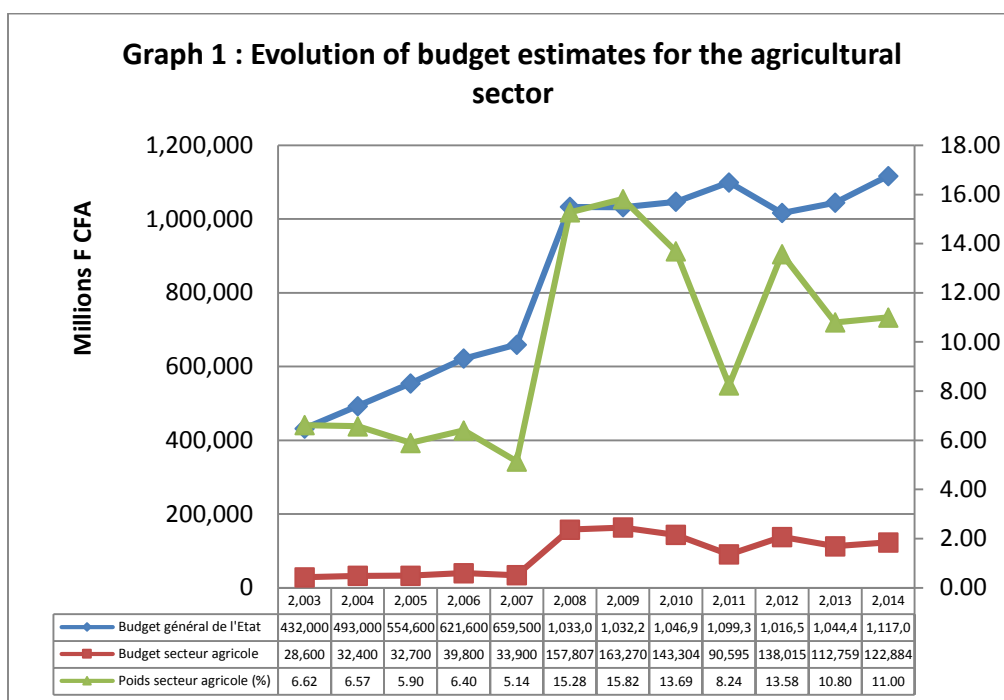
- a. to generate, capitalize and disseminate appropriate innovations for target sectors;
- b. to reinforce research scientific, administrative and financial management;
- c. to reinforce and make sustainable research funding; and
- d. to involve all NARS components in research actions.

To better target its intervention with regards to the concerns of PSRSA, INRAB has defined several research priorities which tackle namely: the availability of quality seeds, technical itineraries and good agricultural practices, post-harvest technologies, processing procedures and the quality of derivative products, the management of sectors, access to market, and predictions and agro-meteorological and climatic warnings. Agricultural research in Benin should therefore take a close interest in agricultural biotechnologies and bioenergy. It should also integrate aspects relating to effects of climate changes in order to help in developing adaptation responses. A special investment programme will be put in place for the renewal of agricultural research infrastructures and equipment, as well as for developing human resources, in order to make sure that the appropriate innovations for target sectors are generated and widely disseminated.

FUNDING OF AGRICULTURAL RESEARCH AND DEVELOPMENT

The agricultural sector is funded through public and private funds. Public funds include the resources of the national budget and external resources put in place with support from the technical and financial partners (TFPs). Private funds include investments made directly by or through non-state actors such as: professional agricultural organizations (OPA), non-governmental organizations (NGOs) and the private sector. Since its participation in the Maputo Declaration (2004), Benin, like the other signatory countries, committed to the implementation of the Comprehensive Africa Agriculture Development Programme (CAADP), has allocated at least 10% of its budget to the

agricultural sector. Graph 1 presents the evolution of budget estimates for the government and for the agricultural sector in the last twelve years (2003 to 2014).

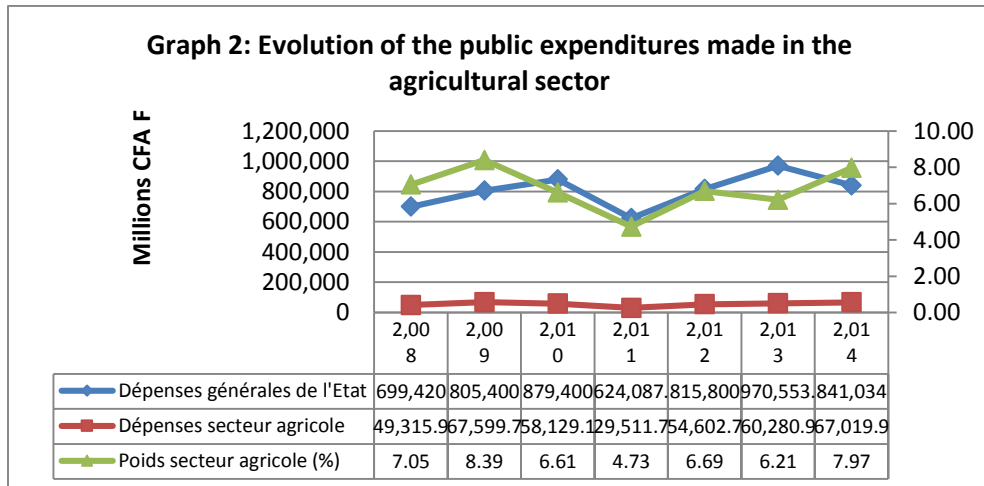


Source: MAEP (2007, 2012, 2013 and 2014)

Between 2003 and 2014, the evolution of public budget estimates for the agricultural sector can be subdivided into two periods. From 2003 to 2007, the initial budget allocated to MAEP has slightly increased, while the global budget of the government has experienced a net increase. The share of this budget allocated to MAEP has therefore decreased constantly from 6.6% in 2003 to 5.1% in 2007, with an average of 6.13%, which is lower than the 10% objective contained in the Maputo Declaration. Between 2008 and 2014, the public budget estimates for the agricultural sector experienced an upward and downward evolution, with their lowest level recorded in 2011. But thanks to the measures taken by the government to resolve the economic and financial recession that started since 2010, the level of public budget estimates for the agricultural sector kept increasing, from 90.595 billion CFA francs in 2011, to nearly 123 billion CFA francs in 2014. The weight of the agricultural sector in public budget estimates was estimated at 12.63% on the average during the period, a level higher than the Maputo target.

During the last seven years, public expenditure made in the sector has also experienced an upward and downward trend, with their lowest level recorded in 2011. But thanks to the measures taken by the government to resolve gradually the economic and financial recession that started since 2010, the level of the state expenditure in the

agricultural sector has kept increasing from 29.5 billion CFA francs in 2011 to nearly 70 billion CFA francs in 2014. Despite this improvement, the weight of the agricultural sector in public expenditure is estimated to be 6.81% on the average over the period of 2008-2014, a level still low compared to the Maputo target. Graph 2 presents an overview of the public expenditure made in the agricultural sector from 2008 to 2014.



Source: MAEP, 2012; MAEP, 2013; MAEP, 2014

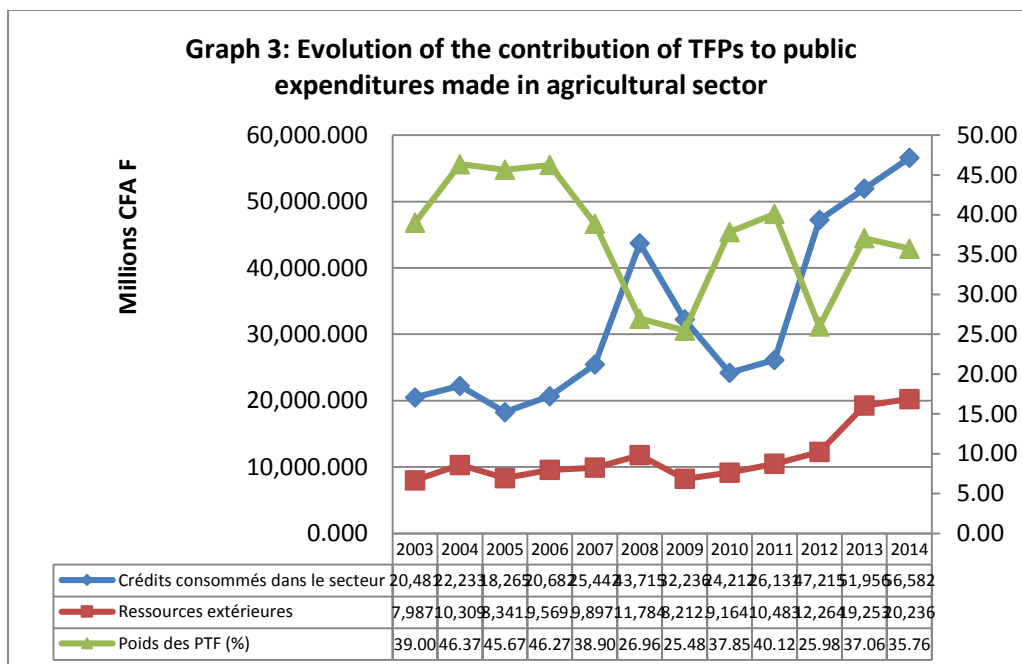
Contribution of TFPs to the public expenditures in the agricultural sector

The funding of the agricultural sector has experienced an upward and downward evolution over the years depending on the agricultural policies, interests and concerns of the TFPs, and the issues and challenges related to agriculture, which in turn depend on national and international situations in terms of food, energy, etc. However, the agricultural sector remains one of the concentration zones of TFPs' interventions in Benin. Out of a total of 23 TFPs intervening in the key sectors of Benin economy, 13 are in the agricultural sector (MAEP, 2014). The contribution of TFPs to public expenditure made in the agricultural sector has experienced an upward and downward evolution during the period of 2003-2014. Generally, between one quarter and a half of the public expenditure made in the sector are attributable to TFPs. They have contributed on the average, 37.12 % of the expenditure during the period. Graph 3 shows the contribution of the TFPs to the public expenditure made in the agricultural sector from 2003 to 2014.

General discussion on financing agricultural sector

With the advent of a new political regime in April 2006, characterized by an obvious will to make agriculture the vector of the national economic growth, efforts to increase the budget resources allocated to the agricultural sector, although very important, are still far from covering the necessary needs to make this sector the spearhead of economic emergence in Benin. In fact, if it is true that the rate of the government

budget resources allocated to the agricultural sector is on the average 12.63% since 2008, it appears that at the level of effective public expenditure, this rate falls drastically below 10% and is only 6.81% over the same period.



Source: Directorate of Financial and Material Resources of MAEP

This current level of allocation of financial resources to the agricultural sector, although commendable, shows that the efforts started towards increasing the said resources should be continued in order to allow the sector to be the engine of economic growth. However, it is necessary that actors in charge of implementing the budget currently allocated to the sector give the proof of efficient use of the said resources and the results that follow. Because, it is clear that despite the current low level of financial resources, they are still less consumed at the end of the financial year, a situation that does not push for an increase. This relative weakness of the budget allocated to the agricultural sector for its operation and investments to be made for the benefits of the population, takes place in an environment where important policy documents and development strategy of the agricultural sector have however specified actions and means to be implemented so that agriculture can play its major role in the national economy. The case of INRAB speaks for itself and translates the very limited nature of the resources put at its disposal compared to its mission.

The National Agricultural Research System (NARS) is made up of several entities, including the universities, NGOs and international organizations and INRAB (the focal point of this system and ensures the permanent secretariat). This rubric, which tackles

the funding sources and means of agricultural research in Benin, focuses mainly on INRAB.

INRAB budget estimates and funding sources

INRAB is funded by three (3) main sources: government, TFPs and own resources (coming from valuing for commercial purpose goods and services of the institute and its decentralized centres). In addition to the government, several TFPs have been supporting agricultural research in Benin for decades. We can cite among other TFPs, the Danish Cooperation, the German Cooperation, the World Bank and other multilateral and bilateral partners. Moreover, one of the important sources comes from valuing for commercial purpose goods and services of the institute and its decentralized centres. In some of these research centres, seed and plant production, and the commercialization of technical and economic guidelines are cash-generating activities that generate important revenues for the operation of the said centres. Table 1 shows the funding sources of INRAB activities from 2002 to 2014.

The data in table 1 shows that the Benin government, through MAEP, has contributed 47.57% to the technologies development, measures and research policies in favour of agricultural development, food and nutritional security and the improvement of agricultural export revenue. Technical and financial partners have brought a contribution of 27.07% to the total budget of INRAB over the same period. Own funds made from the commercialization of its various outputs represent 25.36% of the total budget of INRAB. The year 2008 was marked by an important increase in research funding by the government; a year that has also recorded the best capitalization of goods and services. On the contrary, during the year 2003, INRAB recorded quite low funding, with a low contribution of donors followed by a very modest contribution of revenues made from the commercialization of goods and services of its research centres. Despite these significant funding levels of agricultural research by the government, the global investments remain below the required levels to be able to keep viable programmes and targeting current and future priorities. In almost all the sub-Saharan African countries in general, and Benin in particular, funding from public budgets are insignificant compared to the huge needs of agricultural research.

Table1. Funding of INRAB from 2002 to2014 (in millions of CFA F)

Years	Budget(millions CFA F)	Contributions (millions CFA F)					Contributions (%)		
		States		Donors/ Research Proposals	Others		States	Donors/ Research Proposals	Others
		Grant	GDP		Selling of goods and services	Donation			
2002	3021.099	657.506	260	1446.558	657.035		30.37	47.88	21.75
2003	2126.675	657.506	210	826.184	432.985		40.79	38.85	20.36
2004	2506.525	657.506	380.539	655.645	812.835		41.41	26.16	32.43
2005	2187.21009	578.415588	260	774.644497	574.15		38.33	35.42	26.25
2006	3404.04661	862.224278	1026.47078	704.50999	810.84156		55.48	20.70	23.82
2007	3711.98958	1076.589	565.75	1320.675384	748.9752		44.24	35.58	20.18
2008	5820.12886	2216.997	950.756661	1626.940543	1025.434655		54.43	27.95	17.62
2009	5289.02173	1514.525	1343	1278.880227	1152.6165		54.03	24.18	21.79
2010	5020.91196	1628.452	981.715	1167.593511	1188.15145	55	51.99	23.25	24.76
2011	3836.69867	1294.79976	353.02	951.896113	1236.9828		42.95	24.81	32.24
2012	5690.70917	1808.99524	1073.25	1415.084678	1393.37925		50.65	24.87	24.49
2013	4673.12277	1346.63529	788.6	792.974211	1744.913275		45.69	16.97	37.34
2014	4810.12674	1329.58577	960	1139.935969	1380.605		47.60	23.70	28.70
TOTAL	52098.2652	15629.7369	9153.10144	14101.52212	13158.90469	55	47.57	27.07	25.36

Source: INRAB Financial Resources Service

Table2. Global expenditure of INRAB from2002to2014 (in millions CFA F)

Years	Actual expenditures(millions CFA F)	Expenditure by funding sources (millions CFA F)				Rate of budget execution
		Grant	GDP	Donors/ Research proposals	Selling of goods and services	
2002	1691.44836	202.866088	22.396925	404.00713	1062.178213	55.99
2003	1624.8573	789.398051	8.221848	226.005772	601.231629	76.40
2004	1662.13207	151.52836		953.144722	557.458988	66.31
2005	1551.30487	144.246102	71.572817	759.47049	576.015462	70.93
2006	1444.18537	150.138539	308.05153	401.858745	584.13656	42.43
2007	2437.4472	959.280305	122.55599	606.6357053	748.9752	65.66
2008	3056.55092	866.191725	415.30878	753.5524	1021.49802	52.52
2009	2557.73116	677.312968	300.02127	301.553944	1278.84298	48.36
2010	3152.97639	1634.50553	0	404.5412387	1113.929615	62.80
2011	3045.96761	1402.33864	262.12099	232.7291547	1148.778825	79.39
2012	3364.22486	1415.66443	388.72221	678.4269907	881.4112177	59.12
2013	3167.85564	1138.69982	185	967.982456	876.173368	67.79
2014	3280.79308	1147.67215	272.61285	908.282964	952.225114	68.21
TOTAL	32037.4748	10679.8427	2356.5852	7598.191712	11402.85519	61.49

Source: INRAB Financial Resources Service

INRAB global financial performance

The global financial performance is perceived here as the budget execution rate. Table 2 presents the global expenditure of INRAB from 2002 to 2014. This table shows that the budget execution rate recorded over the period (2002-2014) is 61.49%. This is a quite low consumption rate, which leaves enough unused financial resources during the period. The best performance was obtained during the year 2011, marked by a consumption rate of 79.39% of the total amount of the open credit. On the contrary, the lowest performance was recorded during the year 2006, where the budget execution rate was 42.43%, leaving a deficit of 1959.86124 million CFA F not consumed.

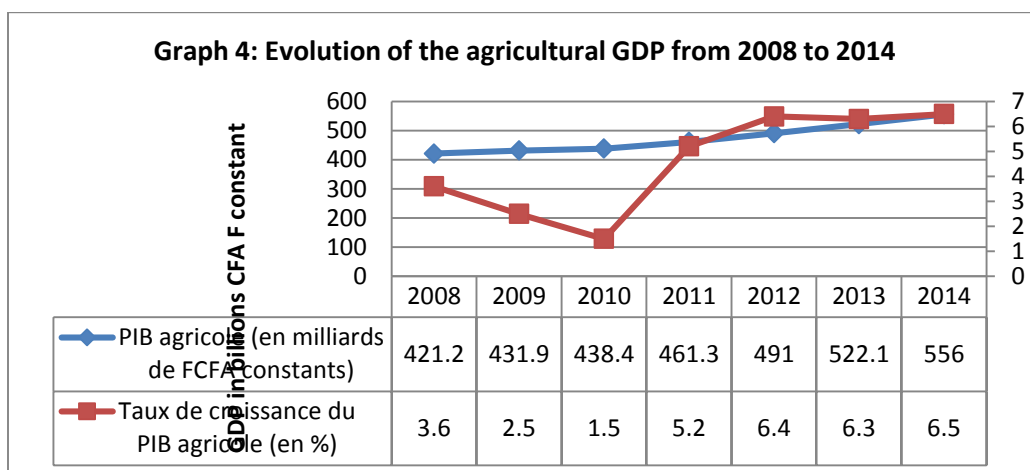
IMPACT OF INVESTMENTS IN THE AGRICULTURAL SECTOR

a. Impact of public agricultural expenditure on economic development

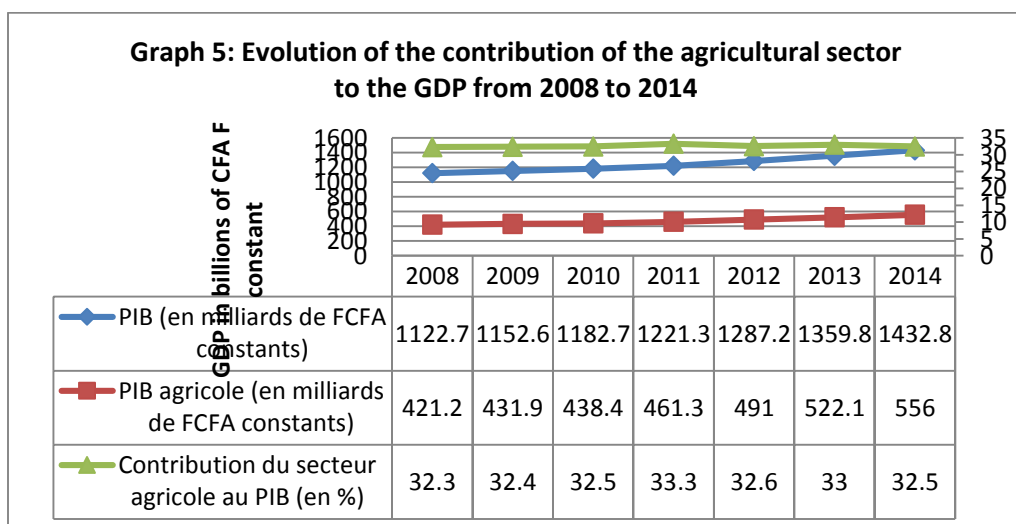
The impact of expenditure in the agricultural sector is shown through an increase in the contribution of the agricultural sector to global economic growth, to macroeconomic equilibrium and to the reduction of the deficit of the trade balance. The agricultural GDP has experienced sustained growth during the last seven years. In fact, following the decrease in the growth rate recorded during the period 2008 to 2010, there was an increase in the agricultural GDP from 1.5% in 2010 to 6.5% in 2014, i.e., an increase of 5 points. This performance is due to the gradual improvement in the

cotton production at the end of the agricultural campaigns of 2011-2012, 2012-2013 and 2013-2014, and to the efforts made by the government to resolve gradually the economic recession. However, these efforts should be sustained in order to improve the growth rhythm of the agricultural GDP in order to reach a two-digit national economic growth, a proof of success in poverty control. Graph 4 presents the evolution of the agricultural GDP from 2008 to 2014.

The contribution of the agricultural sector to the GDP has increased globally over the last seven years, with a mean rate of 0.11%. However, there was a decrease of 0.7 point between 2011 and 2012, and of 0.5 point between 2013 and 2014. Graph 5 presents the contribution of the agricultural sector to the GDP from 2008 to 2014.



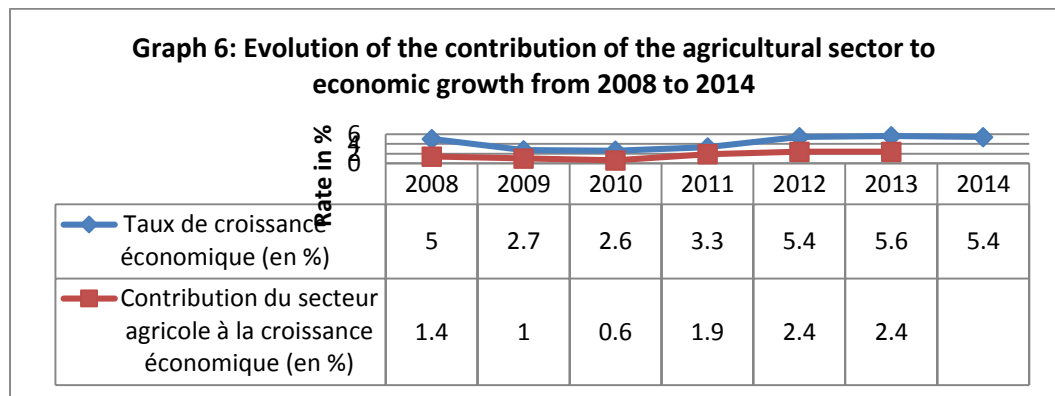
Source: MAEP (2012, 2013 and 2014)



Source: MAEP (2012, 2013 and 2014)

The contribution of agricultural sector to economic growth decreased from 2008 to

2010, then increased from 2010 to 2012 (when it reached its highest level: 2.4%, which was maintained in 2013). This situation is essentially due to the measures taken by the government to resolve gradually the food, economic and financial crises, and to increase agricultural production as a whole (and particularly the gradual improvement of cotton production). The agricultural sector remains therefore a preponderant sector in Benin economy, as in that of sub-Saharan African countries. It contributes considerably to economic growth and induces the performance of secondary and tertiary sectors by supplying them with the indispensable raw materials for their development. Graph 6 presents the contribution of the agricultural sector to economic growth from 2008 to 2014.



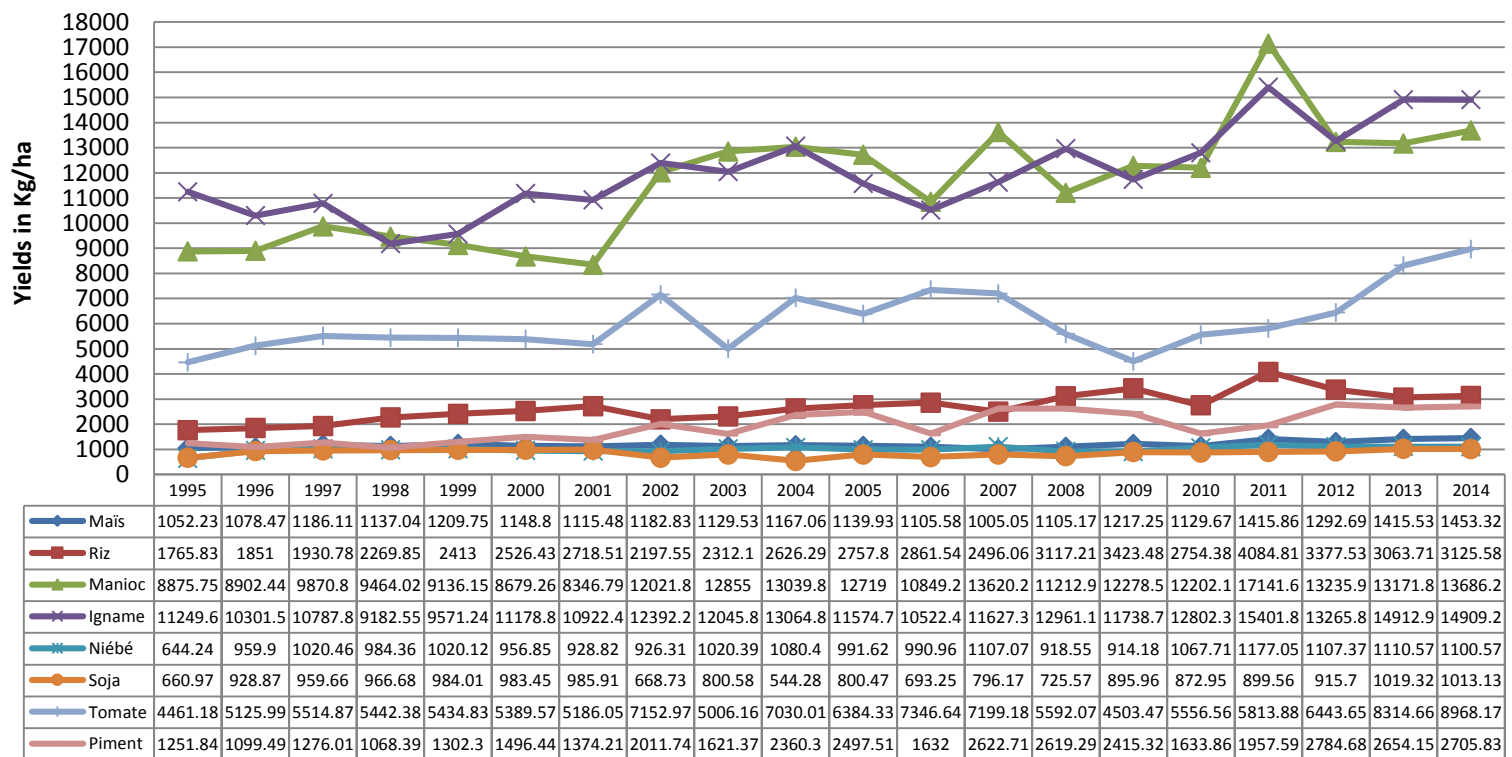
Source: MAEP (2012, 2013 and 2014)

Impact of research and extension expenditure on agricultural productivity

Investments in the agricultural sector had an impact on the agriculture, animal husbandry and fisheries sub-sectors. Thus, it can be noted globally an increase in the yields of major crops from 1995 to 2014. Table 3 presents the average yield increase rates of the major crops over the period 1995-2014. Soya experienced the lowest rate (9.07%), while pepper had the highest rate (146.10%). Generally, the average yield increase rates of legumes are the lowest, those of cereals, roots and tubers are medium, and those of market gardening crops are the highest.

This increase in agricultural productivity can be explained mainly by the development, the dissemination and adoption of new agricultural technologies (improved varieties, specific fertilizers, improved agricultural practices, etc.) and subsidized agricultural inputs (namely fertilizers by the government). However, problems to meet quantitatively and qualitatively (specific fertilizers adapted to agro-ecologic zones) the needs of producers, as well as the efficiency of the distribution channels are yet to be solved. Graph 7 presents the evolution of the yields of the major crops from 1995 to 2014.

Graph 7: Yield evolution of the major crops from 1995 to 2014



Source: Directorate of Agricultural Statistical (2015)

Table 3. Average yield increase rates of major crops over the period 1995-2014

<i>Crops</i>	<i>Average yield increase rates(%)</i>
Maize	34.76
Rice	68.86
Cassava	53.74
Yam	44.73
Cowpea	14.65
Soya	9.07
Tomato	74.95
Pepper	146.10

Source: Directorate of Agricultural Statistical (2015)

Impact of the adoption of a few agricultural innovations

a. Improved maize varieties

Thanks to the seed production policy implemented by the different Benin governments from 1978 till date, seed production and distribution mechanisms have been defined and followed. The role of INRAB is to supply breeder seeds to the seed farms of the Directorate of Plant Production (formerly Directorate of Agriculture). The latter produces foundation seeds and supervises the production of certified seeds by multiplying farmers at the national level who do the distribution (Sodjinou et al., 2008). Varieties produced, contrary to the traditional ones, have relatively short production cycles, are resistant to diseases, high yielding and have other interesting agronomic and eating characteristics. These are, among others: ACR06TZLComp4C4DT, Bag97TZ-Ecomp34, DTSR-W-CO, IWDC2-SynF1, TZEcomp3DT, TZLComp3-C3DT/TZLComp4-C4DT, FAABA/QPM, EVDT97-STR, maize resistant to striga (Aer94TZE cop.5-W), 200SynEE-W, DMR-ESR/QPM, TZLcomp1-W, AK94DMR-ESR-1, etc.

The results show that the adoption of improved maize varieties has increased soil productivity by 9.77 kg/ha. Moreover, this adoption has improved the revenue gained from this production by 2,427 CFA F per hectare on the one hand and, on the other hand, has increased investment expenditure in material goods, children schooling and health of members of the household by 54,012 CFA F, 2,307 CFA F per schoolchild and 10,216 CFA F per sick member.

b. Improved cowpea varieties

For more than two (2) decades, significant efforts have been made by research structures, namely the International Institute of Tropical Agriculture (IITA) and INRAB for the varietal improvement of several crops, including cowpea. In this context, several new high yielding, relatively short duration varieties, resistant to diseases and having other interesting agronomic and eating characteristics have been developed and introduced in the production systems. These include IT 82E 12, IT 81D 1137, IT 84D 513, TVX 1999 01 F, IT 83D 326-3, K VX 313-2, VITA 3, VITA 4,

VITA 5, TvU57, K VX 396-18, IT 83 4D 374-57, IT 84 S2246-4, etc. (Agli, 2001; Djègui et al., 2009).

The adoption of the improved cowpea varieties has increased the yield of cowpea by 235 kg/ha. This yield increase has allowed producers to improve their revenue, which has been used to improve their living conditions. Thus, the improved cowpea varieties has allowed potential adopters to increase the expenditure of household and agricultural goods by about 21,000 CFA F and to invest on the average 5,385 CFA F per schoolchild every year. The adoption of these improved cowpea varieties has also allowed producers to improve their food security by increasing the food consumption score (FCS) of potential adopters by 22.89.

c. Improved cassava varieties

Over the last decades, significant efforts have been made by research structures, namely IITA and INRAB, to improve cassava yield per hectare. To this effect, several new high yielding, relatively short duration varieties, resistant to diseases and having other interesting agronomic and eating characteristics have been developed and introduced in the production systems. These include 92/0057, 92B/00068, 91/02319, 91/02327, 92B/0057, 91/02324, 98/0510, BEN 86054, BEN 86052, 98/2101, 98/0406, MIP/99/0621, MIP/98/0581, MIP/99/0558, MIP/99/7558, RB 89509 and TMS 30572.

The results show that the adoption rate of these new varieties is 88%. The highest rate is observed in the villages of the north (96%), compared to the villages of the two other zones (87 and 85% for the south and centre, respectively). Factors that influence cassava yield obtained by the producers are: household education level, being or not being a member of a cassava producers' association, use of chemical fertilizers, previous revenue earned from cassava production and production zone.

The average impact of the adoption of improved cassava varieties on the adopters' production is evaluated to be 4.45 tons per hectare. This impact varies significantly depending on the production zone. The impact of the new improved varieties is higher in the south (5.37 tons per hectare), compared to the other zones (2.13 and 1.89 tons per hectare in the centre and in the north, respectively). The results of the descriptive analyses show that the yield obtained by producers in the north is significantly higher (15,681.89 kg/ha) than those obtained by producers in the other zones (12,050.23 and 11,817.71 kg/ha in the south and in the centre, respectively). The average impact of the new varieties on current adopters equals about 144,310 CFA F per hectare. However, this impact varies significantly depending on the production zone. It is higher in the south (about 168,860 CFA F/ha) compared to the other zones (61,590 and 98,640 CFA F/ha in the centre and in the north, respectively). Producers in the south have therefore more advantage to produce the new improved cassava varieties than those in the centre and the north.

d. Improved small ruminants feeding technologies

The research conducted by research institutions (INRAB and the universities) have allowed us to test and popularize several improved small ruminants' feeding techniques in Benin. These technologies include, on the one hand, shrubby legumes (*Gliricidia sepium*, *Khaya senegalensis*, *Leucaena leucocephala*, *Stylosanthes cabraseca*, *Moringa oléifera*, *Cajanuscajan*) and herbaceous legumes (*Mucuna pruriens*, *Aeschynomene histrix*), grasses like *Panicum maximum* C1 and *Pennisetum purpurum* and, on the other hand, agricultural by-products such as cassava peelings, leaves and stems of fresh maize, groundnut haulms and cakes of cotton grains. Moreover, the salt block has also been popularized as being one of the food supplements for small ruminants.

The adoption rate of at least one of the improved small ruminant feeding technologies popularized is estimated to be 53%; that of legumes and grasses is 78%. The lowest adoption rate of the improved small ruminant feeding technologies was seen in the utilization of the cassava peelings. Only 38% of the breeders adopted them in 2007.

The results show that the adoption of improved small ruminants feeding technologies has a positive impact on the animal performance and on the wellbeing of the breeders. It has induced a weight gain in the animals by 6.92 kg per animal, and of their size (with height) by 4 cm per animal. The adoption of improved small ruminants feeding technologies has also contributed to improving the revenues of animal breeders (4,730 CFA francs per animal) and their wellbeing. Investment in human capital and the acquisition of sustainable goods take the big share of these revenues, followed to a lesser extent by the consumption of luxury goods and the other expenditure. The adoption of improved small ruminants feeding technologies reduces the treatment expenditure on the animals by 245 CFA F.

CONCLUSION

From this study, it appears that agricultural research policy has experienced quite deep transformations in relationship with agricultural policy changes of the country. However, it has not been able to really bring about the dynamism necessary for the agricultural sector development in Benin. The major cause is the lack and inadequacy of investments for agricultural research. Agricultural research policy should lay emphasis on the way an increase in funding should be made available through non-fragmented mechanisms different from those known so far. Thus, harmonizing Benin's own resources with those of the development partners should be high on the agenda.

The implementation of a coherent and well-defined agricultural research policy will bring a notable change in the paradigm that consists mainly of generating technological packages and adopting a true integrated agricultural research approach. This way, agricultural research policy will bring an important orientation necessary in the improvement of agricultural productivity in Benin.

References

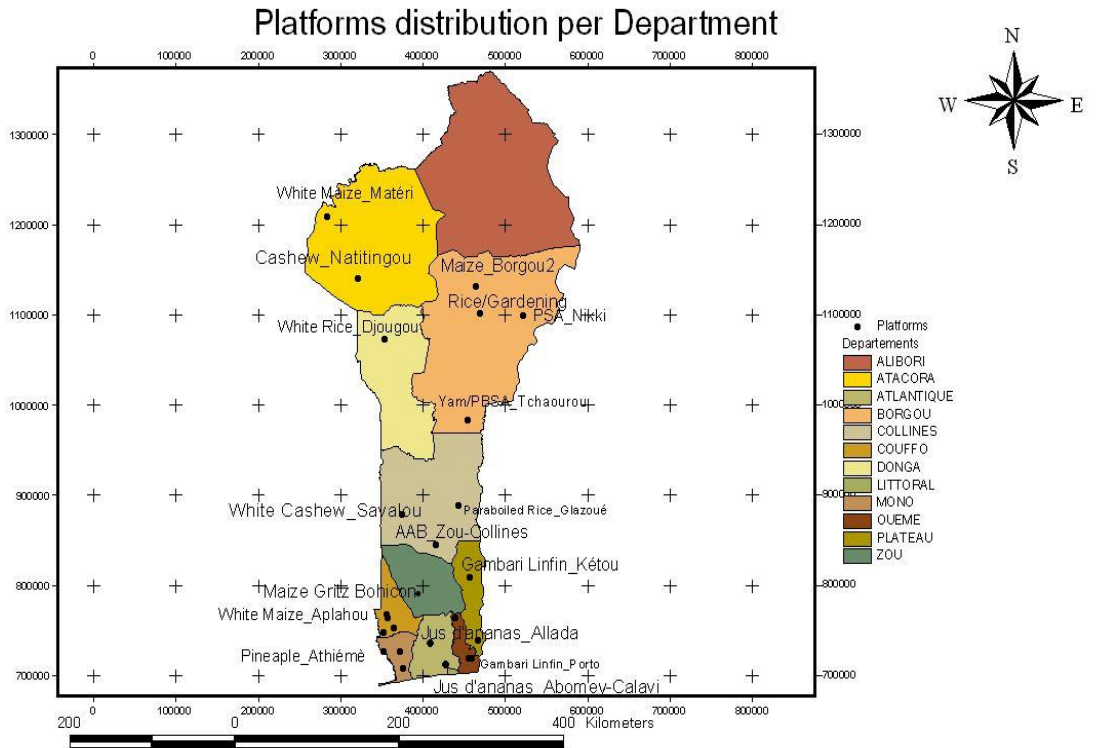
- AGRIDAPE, Vulgarisation et conseil agricoles. Volume 29 n°3 Septembre 2013
- ALLAGBE C, M. Rapport de mise en place des plateformes d'innovations multi-acteurs sur différentes chaînes de valeur ajoutée de maïs au Bénin, 12p
- Alohou, E. et Hounyovi, A. Étude sur la vulgarisation et l'adoption des technologies de gestion de la fertilité des sols. 51p
- Anonyme. Synthèse bibliographique sur les options stratégiques de diffusion et d'adoption des technologies au Bénin. 33p
- CEDEAO (2008). La politique agricole régionale de l'Afrique de l'Ouest : l'ECOWAP, p. 12.
- CORAF/WECARD Recherche Agricole Intégrée pour le Développement (IAR4D) — Système d'Innovation: Plateformes d'Innovation (PI) de la Chaîne de Valeur Agricole ; 21p.
- CORAF/WECARD, Atelier de renforcement des capacités des leaders des plateformes d'innovation DONATA ; 11p.
- Floquet, A., Mongbo, R. L., 1998 : Les producteurs en mal d'alternatives. Dégradation des terres, restructuration de l'espace agricole et urbanisation au bas Bénin, Gaimersheim :Margraf, p. 189.
- Gaillard, J. (1989). Les chercheurs des pays en développement. Origines, formations, pratiques et production scientifique, Paris, ORSTOM éditions, 220 p.
- Gaillard, J. (2008). Etat des lieux du système national de recherche scientifique et technique du Bénin, Paris, UNESCO, 73 p.
- Ghanem, H. (2009). Document non publié préparé pour le forum sur les stratégies de "Comment nourrir le monde en 2050". FAO, Rome du 12 au 13 Octobre, p. 12.
- ILRI, Directives pour les Plateformes d'Innovation: Facilitation, Suivi et Évaluation Manuel 8 40p. MAEP, 2010 : Rapport annuel d'activités; Bénin ; 106 p.
- Initiative Prospective Agricole et Rurale (IPAR), (2010), Instruments de politique agricole : Quels choix en Afrique de l'Ouest ? 20 p.
- MAEP (2007). Rapport de performance du budget programme 2007, p. 98.
- MAEP (2011). Plan Stratégique de Relance du Secteur Agricole, p. 117.
- MAEP (2012). Rapport de performance du secteur agricole, gestion 2012, p. 48.
- MAEP (2014). Rapport de performance du secteur agricole, gestion 2014, p. 92.
- MAEP, 2013 Aide-mémoire de la revue conjointe du 20 au 28 juin 2013 ; 9 p.
- MPDEPP-CAG (2009). Evaluation de la politique de développement du secteur agricole au Bénin,
- Nederlof, S, M. Wongtschowski, F. and van der Lee (eds.) 2011: Putting heads together: agricultural innovation platforms in practice. Bulletin 396, KIT publishers.
- Qama M, K. Moderniser les systèmes nationaux de vulgarisation agricole : guide pratique à l'intention des décideurs politiques des pays en développement ; 86 p.
- Ribier, (2008). L'agriculture en quête de politiques, in Grain de sel n°41-42 décembre 2007-mai 2008.

Sonehekpon, E, S. Hounvenou, B, S. Adégbola, P, Y. Fiamohe, H, M. Djinadou, R, E., K. A. et Gotoéchan-Hodonou, H. Rôles des plateformes multi-acteurs dans l'amélioration des rendements du maïs grain chez les producteurs et productrices installés dans le Sud-Est-Bénin ;16 p.

Soulé, G. (2003). Politique agricole de la CEDEAO : la monographie du Bénin, p. 24.

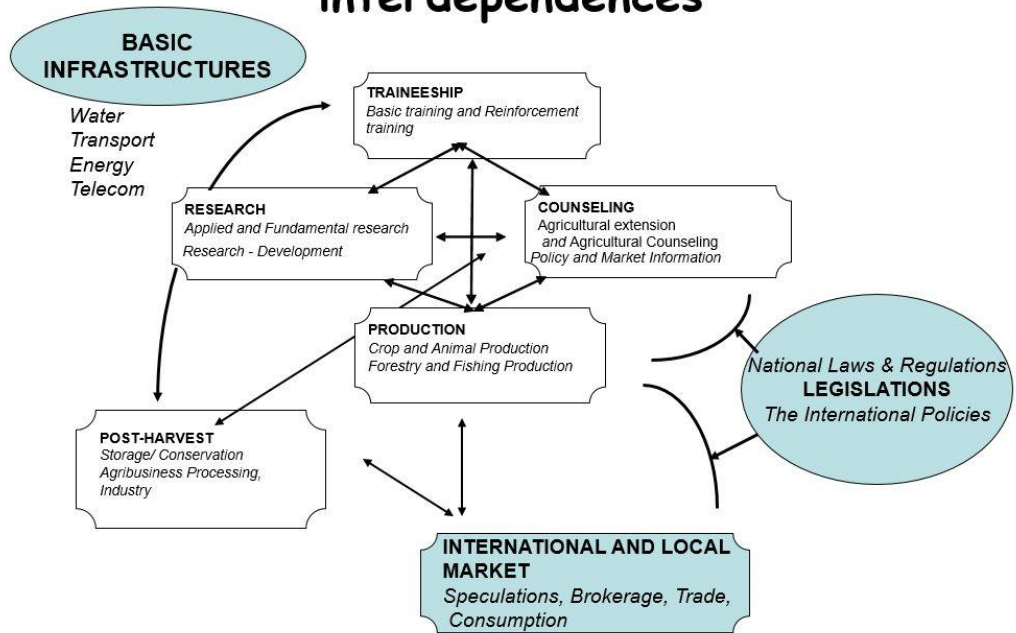
APPENDICES

Annex 1: Platforms distribution per Department



Annex 2: Agricultural Sector: links, actors and interdependences

Agricultural Sector : links, actors and interdependences



Annex 3: List of the inventoried platforms

N°	Name	Product	Location	Creation Date	Founding Organization	Funding Source
1	White Maize	Maize Grains For Consumption	Materi	February 2014	RD INRAB (NATI), SCDA MATERI, ILWAC PROJECT	CORAF/ILWAC
2	Table Cashew Sector Ad	White Almond Or Almond Paste	Natitingou		PADA	PADA
3	White Maize	Maize Grains For Consumption	Djougou	13/05/2015		
4	Yam IP		Tchaourou	2012	INRAB	WORLD BANK
5	PBSA/Tchaourou (Benin Platform For Food Security/Concertation Frame Of The Commune Of Tchaourou)	Foodcrops For Consumption	Tchaourou	2013	DEDRAS ONG, MAIRIE	DEDRAS ONG
6	PBSA/Nikki (Benin Platform For Food Security/Concertation Frame Of The Commune Of Commune Of Nikki)	Foodcrops For Consumption	Nikki	2013	DEDRAS ONG, MAIRIE	DEDRAS ONG
7	Borgou Maize 2	Maize Grains For Consumption	Bembereke, Kalale, Nikki Et Sinende	Juin-15	SNV, GIRED ONG	SNV
8	Rice IP	Production, Processing And Marketing (White Rice)	Dogbo	2010	RAP2 PROJECT AFRICARICE, RAD NGO	RAP2 PROJECT AFRICARICE, RAD NGO
9	Market Gardening IP	Production, Processing And Marketing (Tomato, Leafy Vegetables)	Dogbo	2010	RAP2 PROJECT AFRICARICE, RAD NGO	RAP2 PROJECT AFRICARICE, RAD NGO
10	White Maize IP	Production, Processing And Marketing (White Maize)	Aplahoue; Djakotomey; Dogbo	2012	WAAPP, DICAF	WAAPP; DICAF
11	White Rice IP	Production, Processing And Marketing (White Rice)	Lalo	2012	ESOP	ESOP

12	White Rice IP	Production, Processing And Marketing (White Rice)	Dogbo	2015	WAAPP, DICAF	WAAPP, DICAF
13	Pineapple IP	Production, Processing And Marketing (Pineapple Juice)	Bopa	2015	WAAPP, DICAF	WAAPP, DICAF
14	Fish IP	Production, Processing And Marketing (Tilapia On The Local Market)	Bopa	2015	WAAPP, DICAF	WAAPP, DICAF
15	White Rice IP	Production, Processing And Marketing (White Rice)	Mono	2015	WAAPP, DICAF	WAAPP, DICAF
16	Pire (Parboiled Rice Innovation Platform)	Parboiled Rice	Glazoue	February 2015	CARDER Z-C, WAAPP, INRAB, AFRICARICE	OWN FUNDS
17	Piaaab/ Z-C White Cashew Almond IP	White Almond	Savalou	Jul-14	WAAPP ONG. INRAB. CARDER	UCOMAP, PAIAVO
18	Maize Grits IP	Maize Grits	Bohicon	Nov-14	CARDER. FUPRO	ADB
19	Bread-Making Maise Flour (Gambari-Linfin) For Benin Market	Processing	Porto Novo	2014	PPEAO	
20	Pineapple	Processing	Porto Novo	2012	CARDER	
21	Market Gardening	Production	Porto Novo		CARDER	PPEAO,
22	Red Oil For Nigerian Market	Processing	Porto Novo	2005	CARDER	WAAPP
23	White Maize For Nigerian Market	Processing	Ketou	2011	CARDER, ONG DONATA	WAAPP
24	Yellow Maize For Local And Nigerian Market	Processing	Upland	2013	CARDER, TOWN COUNCIL	
25	Pineapple Juice Ira		Allada		WAAPP	PADA
26	Pineapple Juice		Abomey-Calavi		WAAPP	PAIAVO
27	Sri		Bonou	2013	WAAPP	PADA
28	Sri		Bonou			PADA
29	Alowanou			2010	SCDA, CISV, BORNE FORDEN	WAAPP
30	Nowadokpo					WAAPP
31	Groupement Fifonsi		Bonou	2013	FUPRO, ONG BORNE FORDEN, CARDER	WAAPP

32	Groupement Kpondehou		Bonou	2013	SCDA	
33	Nouwagnon		Atchonsa	2009	UCP (FUPRO), BORNE FORDEN, UCR, CARDER, PADA	WAAPP
34	Adodeme		Bonou	2009	UCP (FUPRO), BORNE FORDEN, UCR, CARDER, PADA	
35	Groupement Mignonmide Wete		Bonou	2013	BORNEFORDEN, CARDER	PAIAVO
36	Sohenou Noel		Adjohoun	2010	WAAPP/ SCDA	PADA
37	Houdenou		Adjohoun	2006	WAAPP/ SCDA	WAAPP
38	Groupement Tohami Riz		Adjohoun	2014	WAAPP/ SCDA	WAAPP
39	Kodjo Victorin		Adjohoun	2014	WAAPP/ SCDA	WAAPP
40	Groupement Kplidokpo		Adjohoun	2014	WAAPP/ SCDA	
41	Naturally Perfumed White Rice		Dangbo	2014	WAAPP	WAAPP
42	Producers' Concentration Committee		Sakete	2012	SCDA	WAAPP
43	Groupement Wasyinan		Sakete	2003	SCDA	
44	Yellow Maize Grain Platform		Ifangni	2015	WAAPP	
45	"Gambali Lifin" Platform		Ketou	2014	SCDA, WAAPP	

Annex 4

Crosscutting Actions and Specific Support Measures of PSRSA: Agricultural Research

National agricultural research, in partnership with the major actors in the rural area, should bring its contribution to the development of the sectors and the diversification of agricultural products, as well as the constant improvement of productivity levels of the different agricultural speculations. But it is still highly dependent on external funding. The challenge is therefore to mobilize more national resources in order to develop adapted technologies for the sectors to be promoted, that are always high-performing in terms of productivity, cash revenues, maintenance of environmental balance and conservation. The recent decision by the government to allocate more resources to agricultural research should allow all components of the National Agricultural Research System (NARS) to take up this challenge.

To better target its intervention with regard to the concerns of the Strategic Plan to Boost the Agricultural Sector, INRAB has defined several research lines that tackle, namely: the availability of quality seeds, technical itineraries and good agricultural practices, post-harvest technologies, processing procedures and the quality of derivative products, the management of sectors and access to market. Agricultural research in Benin should also take a close interest in agricultural biotechnologies and in bioenergy. It should also integrate aspects relating to the effects of climate changes in order to help in developing adaptation responses.

Objective

The objective is to put at the disposal of actors promoting target agricultural sectors, adapted and performing technological innovations in terms of productivity, cash revenues and environmental conservation.

Results

Result 1: Appropriate innovations for target sectors are generated, capitalized and widely disseminated

The major actions will be:

- a. to organize meetings on the different events of the management cycle of agricultural research that should be extended to all the structures concerned;
- b. to integrate in the concerns of these meetings the new directions relating to boosting the agricultural sector (promotion of promising sectors, mechanization, irrigation, etc.);
- c. to produce breeder seeds and foundation seeds of the different speculations adapted to the needs of the users;
- d. to implement research proposals and projects on target sectors including agricultural biotechnology and bioenergy;
- e. to develop technical and economic reference documents and forms on technologies to be popularized;
- f. to conduct performance tests of agricultural production, processing, irrigation and mechanization equipment made locally or imported;

- g. to capitalize research assets on the target sectors.

Result 2: Scientific, administrative and financial capacities of research are strengthened.

To do this, the following actions will be required:

- a. implement a training plan for scientists and research auxiliaries on the short-, medium- and long-term;
- b. develop and implement a recruitment plan for senior staffs with the appropriate profiles and skills to manage human resources;
- c. build scientific facilitation and archiving capacities of INRAB, as well as capacities in result-based monitoring evaluation;
- d. network all INRAB structures and initiate its extension to the entire NARS;
- e. elaborate and implement a manual of administrative, financial and accounting procedures adapted to the specificities of research activities.

Result 3: INRAB has a sustainable research funding

This will be to implement strategies to diversify funding sources for INRAB activities, and to create and make operational the National Agricultural Research Fund (FNRA).

Result 4: All components of NARS are involved in the research actions of the strategic plan to boost agricultural Research

In this frame, everything will be done to mobilize all scientific competences that favour the necessary synergy to develop adapted technologies to promote development in the agricultural sector. To this effect, an updated directory of scientists and relevant technological innovations will be put in place.