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New Challenges for Innovation Support Services to Improve Cocoa Quality and Sustainability in Cameroon

Nouveaux défis pour les services support à l'innovation en vue d'améliorer la qualité et la durabilité du cacao au Cameroun

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ABSTRACT. With an output of 250,000T, Cameroun is the fifth cocoa producer in the African continent. The provision of support services for cocoa sectors experienced a transformation at the beginning of the 90's. In fact, with liberalization, the cocoa sector suffered from the effects of the disengagement of the State when it came to production and post-harvest support, and in the regulation of the cocoa market and prices. A decline in cocoa quality and production volumes has resulted from this situation. In this paper, we focus on the emergence of innovation support services dedicated to supporting the improvement of cocoa quality and sustainability. We conclude by identifying the main challenges and opportunities for the development of these new services, with a holistic and systemic approach that includes social, technical and organizational dimensions.

RÉSUMÉ. Le Cameroun est le cinquième producteur de cacao du continent Africain avec 250.000T. L'offre de services d'appui aux filières cacaoyères a connu des transformations au début des années 90. En effet, avec la libéralisation, la filière cacao a subi les effets du désengagement de l'Etat dans l'appui à la production et aux activités post-récolte, ainsi que la régulation du marché et des prix du cacao. Une baisse de la qualité du cacao et des volumes de production a résulté de cette situation. Dans cet article, nous nous concentrons sur l'émergence de services support à l'innovation dédiés à l'amélioration de la qualité et de la durabilité du cacao. Nous concluons en identifiant les principaux défis et opportunités pour le développement de ces nouveaux services avec une approche holistique et systémique qui inclut les dimensions sociales, techniques et organisationnelles.

KEYWORDS. Agricultural innovation system, Quality, Sustainability, Cocoa, Cameroon.

MOTS-CLÉS. Système d'innovation agricole, Qualité, Durabilité, Cacao, Cameroun.

1. Introduction

With 241,000 tons produced, Cameroun is the fifth cocoa producer in the African continent. The provision of support services for cocoa sectors experienced transformation since the beginning of the 90's. In fact, with liberalization, the cocoa sector suffered from the effects of the disengagement of the State in production and post-harvest support, and in regulation of the cocoa market and prices. A decline in cocoa quality production volumes has resulted from this situation. In a context of competitive cocoa world market, the strategy of increase quality and thus reputation of Cameroonian cocoa provides lucrative opportunities in terms of development of niche markets. In fact, cocoa quality and sustainability are major issues for Cameroon in particular due to the discount of Cameroonian cocoa on international markets. The inadequacy of phytosanitary treatments coupled with poor fermentation, drying and storage conditions have led to a drop of the quality of Cameroonian cocoa, which was rejected from European ports in 2013 because it contained traces of polycyclic aromatic hydrocarbons (PAHs) [BAG 13].

Unlike Cote d'Ivoire and Ghana, which set a guaranteed price for cocoa producers, Cameroon's cocoa marketing system is liberalized. The National Office of Coffee and Cocoa (ONCC) each day publishes an indicative price, based on the London Stock Exchange's cocoa price, that is used as reference for negotiations. These negotiations of cocoa prices occur at various levels and conduct to consider various national prices : (1) farm-gate price (which is the price received by the cocoa farmer), (2) the Free-on-Board price (FoB) which is the term of sale under which the price invoiced or quoted by a seller includes all charges up to placing the goods on board a ship at the port of departure specified by the buyer [LAV 16]. Other prices are negotiated at national level based on the transactions among intermediaries involved in cocoa value chain (Coaxers and Licensed buyers). Even if Cameroonian farmers and farmer's organizations have a generally low bargaining power and are consequently mostly price-takers [LAV 16]. Two important variables also play in negotiation of farm-gate cocoa price: the quantity and quality of cocoa [LAV 16]. The higher the quantity, the higher the price; the better the quality, the higher the price. Additionally, sustainability issues could be an argument in the future due to Global warming issues on deforestation. [LAV 16] identify also the location of the community as a variable that affect the price due to accessibility issues. In this paper, we are focusing on the question of quality and sustainability of cocoa beans production and particularly on the support of innovations oriented into the improvement of both areas. The quality of the cocoa beans influences the final chocolate flavor. The attributes of cocoa beans quality has been defined by the World Cocoa economy: *well fermented, thoroughly dry and free from smoky or broken beans abnormal or foreign odors and any evidence of adulteration, reasonably uniform in size, reasonably free from broken beans, fragments and pieces of shell, and be virtually free from foreign matter* [LEV 16]. At farm level these attributes are guaranteed by appropriate and adequate post-harvest processing [LEV 16].

Our focus is oriented on the existence of the innovation services dedicated to support improvement of cocoa quality and sustainability through the identification and characterization of providers and services provided, environment in which these services are provided and the beneficiaries of these services. In a first part, we present our framework based on Agricultural Innovation System [WOR 06], which has guided our research. In the second part, we present the specific characteristics of Cameroon cocoa innovation sub-

system. We finish by discussing the challenges to support cocoa quality and sustainability-based innovations.

2. Conceptual framework based on innovation sub-system analysis

2.1. Composition of an agricultural innovation sub-system

We adopt the widely recognised concept of Agricultural Innovation Systems (AIS); which is a network of actors, organizations or individuals together with supporting institutions and policies in the agricultural and related sectors that bring existing or new products, processes, and forms of organization into social and economic use, including policies and institutions (formal and informal) which shape the way these actors interact, generate, share and use knowledge as well as jointly learn [WOR 06]. While AIS has mostly been recognised as national systems from a normative perspective, innovation processes do occur at multiple levels and within specific fields of the agricultural sector so that not necessarily all AIS components are mobilised in each case. Within our work, we intend to identify the relevant scale and related/interconnected actors where AIS is operationalised in order to support agricultural and agrofood innovations. Various approaches are developed to define the relevant level that fit to address problem with agriculture and agrofoods systems, especially through approaches based on sub-system of AIS [KLE 17; LAB 18; PIG 18]. Scholars suggest to perform structural approach at the sub-system level (e.g. research and education, agricultural advisory services, private firms) to obtain an in-depth understanding of one or more sub-systems [KLE 17]. In cases where an AIS is targeted a regional, sectoral and value chain, it is best regarded as “an innovation sub-system” (IsubS). We therefore define an IsubS as a partial view of the broader AIS operating at a regional (province, district), (sub) sectoral or commodity level (cocoa, horticulture, organic sector etc.), while at the same time, recognizing the whole AIS actors and their interactions occurring within this subsystem boundary. Adapting the framework developed by [TAP 16], we define the sub-system through three main components: (1) innovation support service providers, (2) the actors of the value chain who are mainly beneficiaries/clients of the innovation support services and in some cases also service providers and (3) the enabling environment which includes socio-economic and institutional aspects (Figure 1).

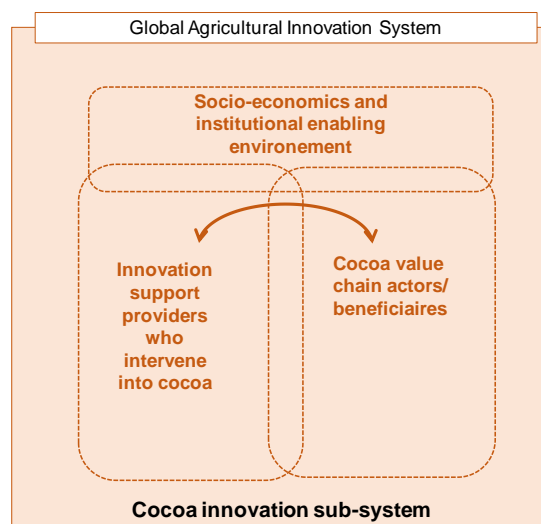


Figure 1. Cocoa innovation sub-system

2.2. Typology of services and service providers

Within the context of increasing services in economy, targeted literature on service provision is developed to better characterize and address services. Various categories of services exist in parallel with the classification of goods. Services can be characterized as natural/free (e.g. ecosystem services) or economic which mean produced by human activities. In our context, we are interested in innovation support services (ISS) which are economic services dedicated to support innovation particularly in agriculture and agrofoods systems. An innovation support service, as discussed in the economic and agricultural extension literature [FAU 12; LAB 13], is “by its nature, an ISS is immaterial and intangible and involves one or several support service providers (ISP) and one or several beneficiaries in activities in which they interact to address a more or less explicit demand emerging from a problematic situation and formulated by the beneficiaries, and to co-produce the services aimed at solving the problem. The interactions aim at achieving one or several beneficiaries’ objectives based on the willingness to enhance an innovation process, i.e. fostering technical and social design, enabling the appropriation and use of innovations, facilitating access to resources, helping transform the environment and strengthening the capacities to innovate” [MAT 16]. Based on this definition, seven categories of services have been identified with examples of tools related to each category (Table 1).

| ISS category | Brief description of activities that make up the ISS category | Tools and methods which form the basis of service activities |
|---|--|--|
| Knowledge awareness and exchange | Activities contributing to knowledge awareness, dissemination of scientific knowledge or technical information | posters, official documents, databases, brochures, banners, fairs, field visits, policy briefs, guidelines, technical reports, thesis report etc. to share and exchange knowledge |
| Advisory, consultancy and backstopping | Advisory, consultancy and backstopping activities aimed at solving problems and co-construction of solutions on actors’ demand | A case of visit and advisory, guidance on the job, support to problem-solving |
| Demand articulation | Services targeted to connect actors to market | price organized to award specific product, support to establishing project exposé |
| Networking, facilitation and brokerage | Services to organize networks; improve relationships between actors, to align services, all activities aimed at strengthening collaborative and collective action. | innovation fair with round tables to allow people to discuss together (not just disseminating information), establishing contacts, maintaining platforms and social media devices, acting as a mediator to solve a conflict/ to solve problems |
| Capacity building | The services comprise the provision of classical training and of experiential learning processes. | training on leadership, on management and planning, on how to manage a cooperative, how to work collectively, technical training etc. |
| Enhancing access to resources | Services enhancing the acquisition of resources for the innovation process (access to inputs facilities and equipment and funding) | Examples of resources acquired as a result of the enhancing services may include inputs (fertilizers, seeds), funds, access to market and acquisition of certification status |

| | | |
|---|---|---|
| Institutional support for niche innovation, and scaling mechanisms | institutional support (incubators, experimental infrastructures, etc.), support for the design and enforcement of norms, rules, funding mechanisms, taxes, and subsidies etc. | A survey to check if laws are followed, support actors to comply with the procedures/process, deliver certification, provide new authorization to implement new activities that were forbidden before |
|---|---|---|

Table 1. *Generic ISS categories, description of activities and examples of tools and methods per category (adapted from [FAU 19])*

Various actors who are involved into innovation accompanying provide these services. Table 2 presents the generic typology of the actors identify into the literature.

| Generic type | Specific types |
|--|---|
| Public organisations | Ministries and parastatal (e.g., national and or regional authorities), public universities and education bodies, Research institutions |
| Private organisations | Consultancy companies, Commercial companies, Banks and insurance companies, Co-operatives etc. |
| Third sector farmer-based organisations | Farmer based groups, Professional sector associations, Inter-professional organisations |
| Third sector civil society-based organisations | Civil society organisations, charity groups; denominational institutions, etc. |
| Informal service providers | Family members, friends, colleagues, Local authorities, Neighbours etc. |

Table 2. *Generic types of service providers (adapted from [MAT 16; KNI 15; LAB 13; BIR 09])*

2.3. Service beneficiaries or clients of ISS

Within the literature, several terms are used to name the recipient of a service provision: [LAB 13] report that the following ‘agent A and B’, ‘beneficiary and supplier’ and ‘user’ are the most conventional expressions from the economic theory. All the terms have some connotations, be it economical (client = customer), psychological (client = patient) or sociological (beneficiary = dependent person) ones etc. which may induce assumptions about the relationship between the two parties. In our case, we use mostly the term of beneficiaries who are actors receiving services to support the inception, the development or the dissemination of their innovative initiative.

2.4. Data collection

We have collected two main types of data. Firstly, we made a review of grey and scientific literature on cocoa quality associated with a collect of secondary data on cocoa production and quality into national and FAOSTAT databases. The second type of that are primary data collected from May to August 2018 and May to August 2019 through semi-directive interviews of services providers and beneficiaries of services in the Center and the Littoral Region of Cameroon. For the service provider, we use a purposing sampling approach based on the typology of providers previously identify in the literature. For the

beneficiaries, we identify them through snowballing approach starting from information on the web and information coming from providers.

3. Quality as an innovation for Cameroonian cocoa

3.1. Liberalisation and jeopardization of cocoa quality

In Cameroon, the cocoa and coffee sectors (robusta and arabica) were closely controlled by the State until 1991 through the National Commodity Marketing Board (ONCPB), the Cocoa Development Corporation (SODECAO), large "parastatal" Agricultural Cooperative Unions (UCA) and "notable farmers" [FON 08]. Following the fall in world cocoa prices in the late 1980s, the year 1993 marked the effective start of the liberalisation of these sectors with the abolition of the price stabilisation system [ALA 96]. This liberalisation has deeply changed the economic environment, particularly for small producers [JAN 99]. [LAV 16] explained that market reforms have had an impact on price mechanisms and price development in different ways. Firstly, the price stabilization mechanism was abandoned which initially resulted in an increase of farm-gate price. In parallel, it results subsequently to an increase in price fluctuations. Secondly, [LAV 16] noted the loss in farm-gate quality and reliability affected price development and the reputation of Cameroonian cocoa. Thirdly, export become dominated by a small number of foreign firms, creating a situation of oligopsony where exporters set the quality standards and the price, using the world market price as a benchmark. Fourthly, Coxers who informal and non-professionalized intermediate buyers have emerged. Coxers often operate in areas where it is difficult for farmers to transport the cocoa themselves. They are more interested in quick availability of cocoa than quality issues [TOL 03]. They generally work on behalf of Licenced Buying Agents (LBA) who are buyers committed by exporters. Fifthly, farmers find themselves in a weak bargaining position vis-à-vis of coaxers and LBA, which are the both main market channels they use a part of the Farmer Organizations. High quality cocoa is highly related to both the fermentation and drying processes. In fact Cocoa *quality* is used the broadest sense including flavour, purity and physical characteristics that have a direct bearing on manufacturing performance. The Model Ordinance of the International Cocoa Standards defines that cocoa of merchantable quality must be: "(a) *Fermented, thoroughly dry, free from smoky beans, free from abnormal or foreign odours and free from any evidence of adulteration. (b) Reasonably uniform in size, reasonably free from broken beans, fragments and pieces of shell, and be virtually free from foreign matter*". Quality issues are also related to safety with the absence of substance such *Hydrocarbures aromatiques polycycliques* (HAP) which can be detected when coco have been drying on the ground on bitumen road. Based on these definitions no matter what the genetic origin, the flavour potential of each marketed fine or flavour and bulk variety can only be expressed by appropriate and adequate post-harvest processing. These principles are true for whatever germplasm is being processed.

3.2. Improving quality as future strategy for Cameroonian cocoa production

Cocoa production in Cameroon is 85% to export [ONC 18]. The cocoa production is a central crop for Cameroon. It represents an exported production of more than 200,000 tons and an entry of currency of more than half billion of USD per year (Figure 2).

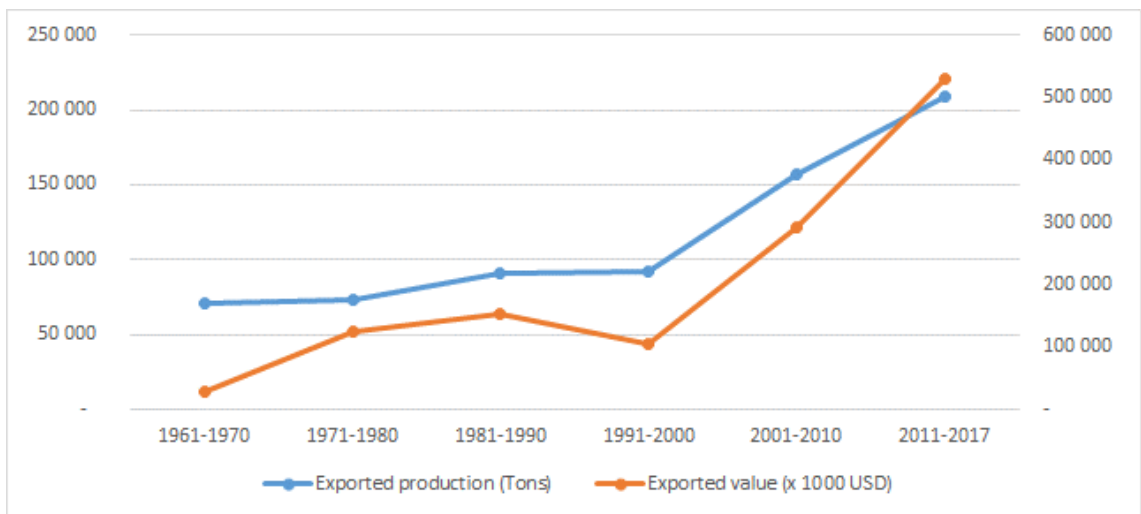


Figure 2. Evolution of production and value of cocoa exported from Cameroon (compiled from FAOSATA)

The Cameroonian National Cocoa a Coffee Board, which governs the quality of cocoa traded globally, grades cocoa as I, II, or substandard. All cocoa traded must be thoroughly dry and free from foreign matter. The three grades are based on percentage of moldy and otherwise defective beans. Cocoa is supposed to be classified “Grade I” if the number of beans which deviate by more than one third from the average weight of the beans, is not higher than 20 %, a maximum of 6 percent of the beans having mold, a maximum of 8 % of the beans is slate-grey, and a maximum of 6 % of the beans having any other deficiencies. For Grade II cocoa, the maximum percentage for mold is 8 %, for slate-grey beans is 15 % and the maximum of any other deficiencies is 12 % [REP 05].

In the periods from 2014 to 2017, almost 98 % of the cocoa exported is in grade 2 (Table 3). Our interviews revealed that this do not means that all cocoa produce in Cameroon is in grade 2. Sometimes, as there are no real differentiation of channels, cocoa in grade 1 are mixing with cocoa in grade 2 and thus are evaluate as grade 2.

| Periods | Grade 1 | Grade 2 | Non-Standard | Non-Compliant | Broken cocoa beans |
|---------|---------|---------|--------------|---------------|--------------------|
| 2014/15 | 0,50% | 97,42% | 1,78% | 0,11% | 0,18% |
| 2015/16 | 0,28% | 98,23% | 0,54% | 0,70% | 0,24% |
| 2016/17 | 0,91% | 97,59% | 0,89% | 0,06% | 0,59% |

Table 3. Evolution of exported cocoa quality from 2014 to 2017 [ONC 18]

Improving quality of cocoa is strategic for Cameroon cocoa for various reasons. Firstly, the global convergence to standardisation of cocoa offer will increase the pressures on the cocoa price on international markets. As cocoa market is liberalised in Cameroon this situation may directly affect cocoa farmers. Quality, *terroir*, and sustainability will be the criteria for differentiation within the global cocoa market. Secondly, the increasing demand for cocoa quality and sustainability from consumers and lobbies. The latter increase the

pressure on the cocoa industry to buy sustainable and quality cocoa. This situation conducts to prioritize cocoa with respect to environment (zero deforestation) and using good agricultural and postharvest practices as certified cocoa. With a cocoa production mainly based on agroforestry system [JAG 18], Cameroon has a comparative advantage to build on that for developing high quality and sustainable cocoa production, even with a terroir approach. The production of quality cocoa is an opportunity for Cameroonian cocoa farming and in this sense the breeding ground for the development of innovative initiatives that must be supported [NLE 20].

4. Cameroon cocoa innovation sub-system: providers, services, institutional environment and demand dynamics

4.1. Diversity of service providers

A diversity of actors intervenes actually in the support of innovation in cocoa value chain. This mapping of providers in table 4, is not exhaustive as we use purposive sampling approach, but allow to appreciate the diversity of providers with cocoa innovation system. The mapping also brought to light the existence of a new category of providers, which are international organizations, involved into research or cooperation fields. Additionally, we note the nature of informal services providers is different with the one met in the literature. In our case, they are represented by informal actor of the value chain (coaxers) [LEN 20].

| Category of actors | Name of organisations | Acronym |
|--|---|-------------------|
| Public organisations | National cocoa and coffee board | ONCC |
| | Cocoa Development Corporation | SODECAO |
| | Institute of Agricultural Research for Development | IRAD |
| | Ministry of Agriculture and Rural Development | MINADER |
| | Cocoa and Coffee Development Fund | FODECC |
| Private organisations (exporters) | NEALICO | NEALICO |
| | TELCAR COCOA | TELCAR COCOA |
| | United Trading International | UTI |
| | AMS | AMS |
| | Entreprise AGRIBUSSINESS S.A | AGRIBUSSINESS S.A |
| Third sector farmer-based organisations | Cooperative Society of Mefou et Akono Cocoa Producers | SOCAMAK |
| | Interprofessional Council for Cocoa and Coffee | CICC |
| | Cooperative Society of Nyong and So'o Cocoa Producers | SOCOPROCAON |
| Third sector from | Rainforest Alliance/Tropical Forest | RA |

| | | |
|---|---|-------|
| civil society-based organisations | | |
| Informal service providers | Coaxeurs | // |
| International research and development organisations | International Institut of Tropical Agriculture | IITA |
| | World agroforestry Center | Icraf |
| | Netherlands Development Organization | SNV |
| | Deutsche Gesellschaft für Internationale Zusammenarbeit | GIZ |

Table 4. Providers involved into cocoa innovation system

4.2. *Recommitment of the State concomitant with the emergence of new actors*

In Southern countries, different actors such as Farmers’ Organisations (FO), input suppliers, public and private institutions etc. can provide services [FAU 11]. In parallel with the liberalisation process, the Cameroonian State is encouraging the establishment of Farmers’ Organisations (FO) based on the legislative reforms of 1990 and 1992 relating to associations, cooperative societies and Joint Initiative Groups (GIC) [FON 10]. These include services such as input supply, production financing, producer training and product marketing [FON 10]. The real capacity of FO to provide these services is not effective. This situation contributes to the emergence of coaxers who facilitate accessibility to financial and material resources to farmers. Since the beginning of 2010’, we note a recommitment of state on cocoa production support through the programme of revitalisation of cocoa value chain (PRDFCC) [REP 14] and the development of a specific fund named FODECC (*Cocoa and Coffee Development Fund*) to implement projects such as the PAGQ2C (*Projet d’Appui à la Gestion de la Qualité dans la production du Cacao et des Cafés*). This project aims at enhancing the quality of cocoa through improvement of agricultural practices. Nevertheless, according to [LAV 16] estimations in Cameroon less than 20% of the farmers is reached by public sector services (primarily extensions and training). These are generally the farmers that are close to the administrative units where governmental support is supplied. In parallel, we note the development of the role of the private sector particularly exporters into supporting cocoa value chain. According to [LAV 16] around 30% of farmers are reached by services from the private sector (like credit, inputs and training). In addition, the ONCC has a department in charge of Marketing and Quality Control (DCCQ). It carries out activities such as packaging control, quality analysis, certification and standardization of raw products. Tableau 5 shows a qualitative estimation of the involvement of the services providers in the various type of services based on the analysis of our interviews. Capacity building, advisory and resources access are the main services provided as primarily or secondary activities. Services of Knowledge production, demand articulation and institutional support for niches are less developed. The intensity of service provided doesn’t reflect the effective accessibility for potential beneficiaries.

| Type of services | Knowledge | Advisory | Demand articulation | Networking | Capacity building | Resource access | Institutional support |
|--|-----------|----------|---------------------|------------|-------------------|-----------------|-----------------------|
| Public organisations | ++ | +++ | + | +++ | +++ | +++ | +++ |
| Private organisations (exporters) | 0 | ++ | +++ | ++ | +++ | +++ | + |
| Third sector farmer-based organisations | + | +++ | ++ | + | +++ | ++ | ++ |
| Third sector civil society-based Organisations | 0 | ++ | ++ | ++ | +++ | ++ | + |
| Informal service providers | 0 | + | + | 0 | ++ | +++ | 0 |
| International research and development organisations | +++ | ++ | + | + | +++ | + | + |

+++ : Service provided as primary activity; ++ : Service provided as secondary activity; + : Service provided occasionally; 0 : Service not provided at all

Table 5. Intensity of service provided per category of providers

4.3. A national strategy mainly oriented towards cocoa production

Through the plan for the revitalization of the development for the cocoa value chain 2015-2020 [REP 14], Cameroon government puts in place various programmes to support cocoa value chain. The PRDFCC plans interventions in: research and development, at the production level, regarding the quality of the product and in the commercialisation. In order to increase competitiveness of Cameroonian cocoa, it is envisaged to improve the quantity (up to 600,000 tons by 2020) and quality of the cocoa predominantly through the encouragement of the use of the Good Agricultural Practices (GAP). We identify that approximately 77 % of the budget was intended to improve the production practices, for which a major emphasis on improving the productivity and the volumes of cocoa produced as well as post-harvest practices (Figure 3). The other major interventions focus on making more easily available the necessary inputs to the producers, improve the organisation of the market and promote the demand for Cameroonian cocoa in the country and abroad. The amount of the budget clearly identified to support quality is less than 2%.

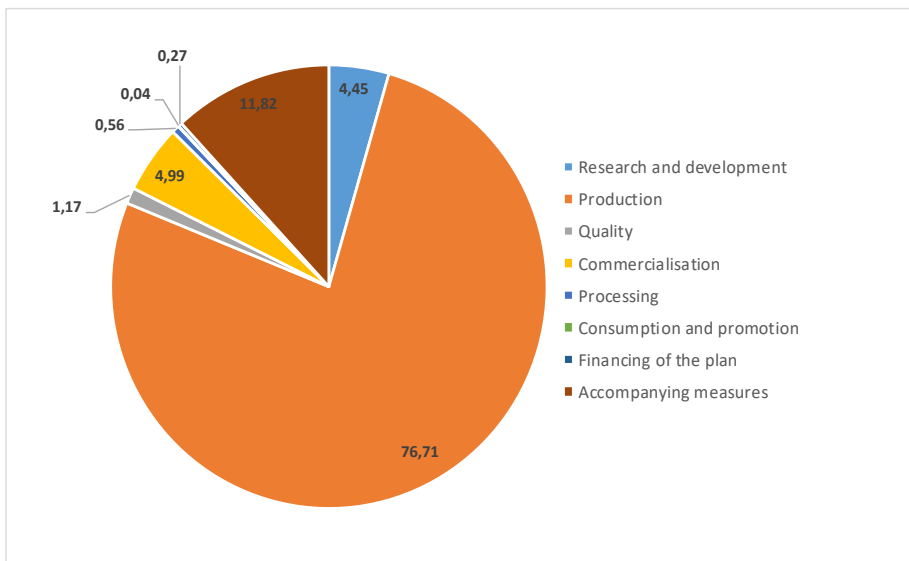


Figure 3. Planned budget for PRDFCC [REP 14]

4.4. A Emergence of scattered niche innovation based on improved cocoa quality and sustainability

In the meantime, we identify the existence of scattered niche innovations based on cocoa quality and sustainability improvement. We observe four types of dynamics mainly driven by service providers. These dynamics of innovation service provision benefit directly to farmers and FO:

(1) Dynamics driven by certification agencies as Rainforest alliance with their partner the local NGO Tropical Forest. This agency is involved in the development of certified cocoa. Certified cocoa represents less than 3% of the cocoa produced in 2012 [POT 17].

(2) Dynamics driven by national and international development agencies that aiming at developping labels based on flavor, production practices or “terroir”. This dynamic is mainly driven by GIZ and SNV which are deeply involved into development of what they called “Cameroon Golden Cocoa” and “organic by default”.

(3) Dynamics driven by FO such as CONAPROCAM initiative, which aims at developing direct market channels with foreign chocolate factories, which are looking for particular flavor.

(4) Dynamics driven by partnership between private and Third sector such as the partnership between Telcar Cacao and CICC to implement Centers of Excellence within which the quality of post-harvest produced cocoa is measured. A measure whereby premium of excellence are offered to the most promising farmers in order to encourage them and encourage the other ones to produce good quality cocoa. This initiative mainly target young cocoa farmers.

These various dynamics are organized as small, scattered and independent networks driven by various actors. These innovative initiatives tend to multiply but they remain at the

niche level (Figure 4). The predominant question here is how the quality can be improved on a large scale by a transition towards a cocoa quality and sustainability dominant regime.

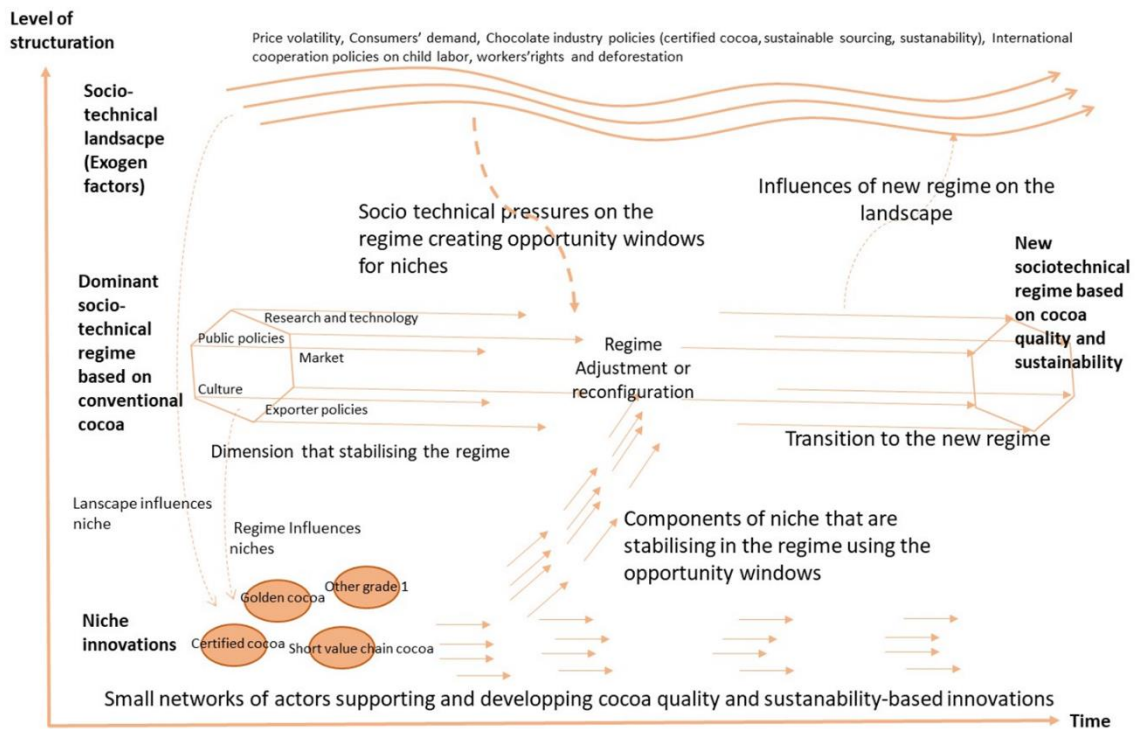


Figure 4. Towards a transition to a cocoa quality and sustainability dominant regime (adapted from [GEE 07] and [NUI 13])

5. Discussion: what are the main challenges for cocoa quality

5.1. Embeddedness of cocoa innovation services into intensive production models

Capacity building on good agricultural practices for production are the most provided services. The main beneficiaries of these services are both FO and individual farmers. In almost all the cases, they do not apply to gain access to services. These services are mainly based on intensive models of cocoa production, which aims at increasing yield. These models seem inappropriate for smallholders due to cocoa price volatility and inputs supply difficulties [JAG 18]. However, farmgate quality is getting lower due to pressure of coxers on price negotiation. One of the effects of liberalisation is that some processing functions previously undertaken by farmers are taken illegally by intermediaries [TOL 03; JAG 18]. These results bring out reflections on the consistency between the actual offer of innovation support services and the transformations that should be supported to increase cocoa quality. The services delivered are based on models of development, which do not align with the development of cocoa quality and the context of cocoa farmers. The main challenge for cocoa quality development will be the change in the mindsets and policies to orient innovation services in the cocoa value chain. The new phase of the PRDFCC for the next five years promised to involve these aspects. Furthermore, some interviewees hinted that the cocoa quality in some areas is better than in other regions, so instead of only focussing on global quality, it may be an option to start by using geographical labels. The latter is one of

the current task force of African organization of Intellectual property for “red cocoa” in the Center Region (OAPI).

5.2. *Shifting in processing from farmers to intermediaries*

Despite its central position in Cameroonian economics, cocoa is not yet a fully controlled and traceable value chain. Since liberalization, producers have had the opportunity to sell cocoa to any intermediaries who buys it. This raises two main problems. On the one hand in setting the prices granted to producers and on the other hand decrease the capacity for cocoa traceability and quality control. The cocoa beans are sold to intermediate agents who do not necessarily respect the standards on cocoa quality. Quality control was one of the key functions performed by the commodity board (ONPCB) that was abandoned in market reforms of the 1990s. ONCC is actually in charge of the quality control not at the farm-gate but directly at ports. These results lead us to identify ways to professionalize intermediaries of developing the availability of facilities to farmers. We identified five entrepreneurial models of post-harvest activities management: (i) Specialized unit not producing but purchasing cocoa pods to break, ferment and dry; (ii) Unit producing cocoa but purchasing additional pods to complete its production before fermenting and drying; (iii) Producers/cooperatives that make their unit available (rent-out model); (iv) Jointly managed fermentation and drying unit (associated producers or cooperators) for use restricted to associated producers or cooperators; (v) Autonomous mobile unit providing specialized labor and equipment for fermentation and/or drying. The first two cases are prohibited by Decree No. 2005/1212/PM of 27 April 2005 on the regulation, packaging and marketing of cocoa beans, but these practices are still ongoing [REP 05]. The third and fourth entrepreneurial models are close to those practiced by the Centre's cooperatives with processing units. The fifth model, although observed for other crops such as cassava, has not yet been observed in cocoa in Cameroon. These various models need underline research investigations to determine their efficiency regarding farmer capacity of price negotiation and the level of cocoa quality.

5.3. *Drivers of transition to quality and sustainability cocoa regime*

Quality issues is not only a matter of technical improvement. External factors can play a role into developing innovations to improve quality and sustainability in Cameroonian agriculture [BAY 19]. Various external factors play in favor of the development of cocoa quality in Cameroun. Figure 4 show the actual situation of the high quality and sustainability cocoa niches regarding the whole dominant regime [GEE 07; BAY 19]. These analyses based on transition approach framework raised various challenges. Firstly, the need for an exhaustive inventory of the innovative initiatives based on cocoa quality and sustainability [BIS 21]. This inventory will permit to better analysis the strength and weakness of those initiatives and their scalability. Secondly, the need to improve and adapt the service offer particularly around the production of knowledge to improve cocoa quality and sustainability, the market articulation and services to support niche development and scaling. Consequently, this transformation of the innovation service offer underlines the integration of new services such as coaching more than training [OST 16], creativity capacity building [FAU 19] and funding dedicated to innovation. Thirdly, we emphasize the need to develop a specific market channel dedicated to quality and sustainable cocoa so that the Cameroonian cocoa quality an sustainability can be visible abroad.

6. Conclusion

Our results show a multiplicity of actors, both formal and informal, involved in provision of cocoa quality and sustainability support service. A particularity of the sub-system is the role played by international research and development organizations, which are involved into providing various services at small scale. Innovation support service providers have instead focused their service offerings on capacity building, advisory and resources access services. These services are those traditionally provided prior to liberalisation and at the time of state reinvestment in supporting increased cocoa production in the overall context of the green revolution. There have been reconfigurations of these service offerings to include dimensions related to sustainability and more recently to product quality. Other services related to networking, marketing or scaling up of niches are still poorly provided. The production of knowledge to improve the quality and sustainability of services remains a key issue. Research efforts in the cocoa sector over the past thirty years have gradually shifted from upstream to downstream of the value chain on processed products. It is therefore essential to reinvest this service downstream in order to produce the knowledge needed for the transition to sustainability and quality. The emergence and multiplication of niches dedicated to quality and sustainability associated with the demands of civil society, consumers, and governments may help to pave the way towards the transition. At the national level some challenges are remaining. The first challenge is related to productive model in with the cocoa innovation sub-system is embedded. The cocoa sector must now respond to schizophrenic development objectives including the challenges of food security, production intensification, climate change and zero deforestation. Sustainability and quality lead to the exploration of new fields both in terms of new knowledge and approaches to production and marketing beyond the production models focused on increasing yield performance. The second challenge is consequently the need to transform and adapt the offer of innovation support services to better support innovations that are dedicated to quality and sustainability. The last challenge identified is related to the capacity to build on innovative initiatives which already exist in order to develop strategy of research and development towards a quality cocoa regime. Our results suggest that the multiplication of niches dedicated to quality and sustainability is a key driver of transition, especially in a context of changing socio-economic and institutional landscape of the sector. These niche multiplications should be accompanied by the development of services for institutional support of niche innovation, and scaling mechanisms. We envisage further research on three dimensions that have not been taken into account in this study. Firstly, on the dimension of accessibility of innovation support services both financially (economic model of service provider) and geographically in order to have a good understanding of which services actually reach the beneficiaries. The second dimension is related to the first and concerns the volumes of services provided. Our study does not give a clear picture of what the different services provided represent in relation to each other and also globally. We only have the relative positioning of these activities for the providers. The third dimension is a more in-depth study of the niches by describing their trajectory and the coordination between these niches.

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