
Seed System Governance and Its Impact on Sorghum and Cowpea Sectors in Burkina Faso

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Abstract: Since the beginning of 2008, Burkina Faso has been committed and has taken important actions in the seed sector. As such, various policy documents and strategic plans in the seed sector clearly state the importance of seed in the development of the agricultural sector and food security. This study addresses the issue of institutional, organizational and structural governance of the seed sector in order to understand the seed system and allow the various actors to fully play their specific roles, in a coordinated and coherent way. This paper provides a general view of the seed sector in Burkina Faso by taking into account the coherence of policies, orientations, interventions and actions more generally developed in order to respond to the challenges of the seed sector at the local, regional and national level. This qualitative research uses semi-directive interviews combine with the concept of governance to better understand the level of involvement of the actors, their influence, their roles and missions in the seed system. The results show the major element that impact the seed sector is the lack of coordination of actions on the ground between the different set of actors. This influences, the dynamics and the evolution of the sorghum and cowpea seed system in terms of structural organization of the actors.

Keywords: Agriculture, Seed System, Governance, Development

1. Introduction

Agriculture is one of the essential links in the economy of countries in the south of the Sahara and in particular Burkina Faso. According to [4, 5] agriculture remains the main source of livelihood for rural households in Burkina Faso, occupying 86% of the active population. According to the [2], agriculture represents and contributes up to 34% of the Gross Domestic Product (GDP) over the period from 2001 to 2015. However, this agriculture is characterized by low productivity and records low yields. This weakness is mainly explained by the precariousness of the climatic conditions, the natural poverty of the soil, the low level of training of farmers. According to [1, 2], the use of improved quality seeds constitutes one of the first factor of production and

contribute in optimal conditions up to 40% in the increase in productivity. For [36, 41], the seed producers in the cereal and leguminous sector are not well organized and do not participate effectively in the various phases of project development and implementation in a participatory way. Also, the lack of coordination of interventions, the shortcomings in quality control and certification or the lack of professionalism of the actors and finally the poverty and the monopoly of the government in terms of certified seed distribution hinder the seed system dynamism et effectiveness.

Faced with this highly dependent situation, increasing agricultural productivity and low yields have always been at

the heart of national strategic policies to ensure food security, in order to eradicate hunger and reduce poverty among the Burkinabe populations. Indeed, the increase in productivity and agricultural yields are based in part on the use of quality seed which, according to the references mobilized, constitute an important input and a first factor in increasing agricultural production. The access to quality seeds which have a high production potential remain limited for many farmers. In addition, the seed sector remains dominated by traditional seed which is the most common self-produced seed for many farmers let alone the breeder improved seed which is believed to be high yield and better off seed in terms of quality. As such breeder seed and farmer saved seeds are both differently governed and promoted. The breeder seed belong to a more formal system with organized regulations. However, farmers seed also known as part of an informal system is more open mainly governed by individual farmer at household level. Up to now, most farmers in Burkina Faso are part of the informal seed system. In fact, the lack of social, technical financial means hinders the access to improve seeds. Sometime, such seeds do not meet farmers' needs [42]. Seeds and seedlings being the first link in the food chain, their quality, access and control require better intervention strategies in order to boost food security. This is why the intervention of international institutions for bilateral and multilateral cooperation remains look for adequate response to the many failures that have characterized improved seeds' adoption and dissemination in developing countries over the past decades. It is in this logic that the government of Burkina Faso, since 2008, has defined more innovative agricultural development strategies, projects and programs with the help of technical and financial partners (PTF) on seed related. The policies of its partners are fundamentally based on the promotion of improved varieties at subsidized prices or through donations. These actions, although recent, already make it possible to structure actors of the seed system. Thus, [1, 2] underlines that Burkina Faso is one of the States where the seed sector appears well structured and dynamic. This dynamic of structuring actors has contributed to the creation of umbrella groups, associations, organizations and federations at local and national level. It has also contributed to the development and dynamics of seed sector activities by increasing agricultural productivity and the diversification of cultivated species, particularly in the leguminous and cereals sectors. Indeed, the institutional and organizational development and actions of the seed sector have led to a strong demand for improved seeds supported by the Government and financial bodies including development and recherche related projects. This led to a significant increase in the number of labeled seed producers, which rose from 1,116 producers in 2005 to approximately 4,000 producers in 2012, while seed production of improved varieties increased from 7,569.3 tons in 2008 to 10,292.9 tons in 2016. all speculations combined [33-35]. For instance, in 2020 Sorghum production goes up to 1 840 000 tons against 1 860 260 ha. Such boost in sorghum production has many reasons such as soil fertility that led many farmers to replace their

millet farms with sorghum and to some extent with cowpea which for long time was women crops.

As such, we focused our analysis on sorghum and cowpea sectors. They are both characterized by their values and their agronomic and economic importance. As stated earlier, in Burkina Faso, seed production is constantly growing in the agricultural sector: Seed production has developed strongly throughout the territory in response to climatic hazards (droughts, length of seasons) and the decline in productivity and agricultural yields. It is nowadays an important source of income and offers an opportunity for independent economic activity for companies and seed companies and actors.

The final goal of the work is to appreciate the action and the role of the governance of the seed system and how such governance impact on the agricultural. Seed dissemination and adoption are likely to positively change the lives of rural populations in Burkina. Faso. It is therefore important to unpack the seed system governance in order to contribute into this change.

The document is divided into two parts: the first illustrates the theoretical and methodological framework, by carrying out an inventory of seed sector governance. It also traces the context of the study area and the issue of governance of the seed sector for Sorghum and cowpea.

2. Theoretical and Methodological Approach

2.1. The Concept of Governance

The notion of governance according [3, 7, 8, 11, 13, 14, 15] is defined as an extension of collective decision-making procedures. For the authors; governance is the exercise of economic, political and administrative authority to manage the affairs of a country at all levels. Also, according to [6, 10, 12], governance is defined as the management of a system, a company or a society. It is characterized by power management, decision-making and the implementation of actions in a system or a company. This notion has been defined as a set of different processes and methods through which individuals and institutions, public and private, manage their common affairs, according to [16, 17]. For him, governance is like a set of organizational and institutional mechanisms that have the effect of delimiting powers and influencing the decisions of leaders. It is therefore the implementation of a set of devices (rules, standards, protocols, conventions, contracts, etc.) to ensure better coordination of the stakeholders of an organization, each holding a part of power, in order to take consensual decisions and to launch concerted actions [28, 29].

In the context of our study, governance can be summed up as the organizational and structural management of a set of actors or the network of actors having a specific and well-defined role in the seed system for the smooth running of activities. It helps to map, characterize and understand the relationship between two or more set of actors going from formal to informal governance and management.

2.2. Importance and Trend of Seed System Governance in Burkina Faso

Divergences in agricultural production have grown over the years facing challenges because of its governance. Good governance is at the heart and at the start of any successful agricultural production system with a seed system that is adapted and efficient in terms of quantity, quality and accessibility. In its report, [31, 33], characterizes the absence of governance in the sector through constraints such as: the inability to navigate between what is private and what is public, what is formal and what is informal seed system. As a result, the agriculture sector failed to achieve its goal. An established and a legislative framework to balance seed production with adequate inclusive rules and laws that integrate all type of farmers has been a challenge in Burkina Faso. As a results Farmers as well as NGOs, civil society organizations, research organization, regulatory agencies and financial bodies don't speak the same language leading sometime to a kind of 'fight' between actors who aim all at food sufficiency and security to some extent [25, 32].

How to improve coordination between actors for a seed production that meets societal expectations in relation to the management of crop diversity in a context of climate change? Arbitrary enforcement through laws and rules; priorities are inconsistent with development, leading to misallocation of resources; non-transparent decision-making according to some actors from the informal seed system; the absence of sufficient regulations or the existence of excessive regulations.

Other authors, [37, 39, 43] argue that the challenge of governance in agriculture is to ensure that adequate measures are implemented to guarantee sustainability. environment, without destroying entrepreneurial initiatives and social harmony is actually the challenge for the country as whole through its ministry of agricultural and environment. The implications of the resulting policies for the seed sector are clear but not applied in a way that make all actors feel inclusive. Inputs such as seeds of improved varieties and technical support such as technical production itineraries are necessary for agricultural development but are insufficient if the traditional/farmer seeds are neglected. Governance issues also need to be resolved. Institutions and the process of implementing governance policies and strategies matter much more than resource endowments or technical inputs in influencing agricultural production.

Thus, the studies of Adam Smith cited by [20, 40] confirm that all laws, institutions and government policies contribute to the development of a socio-economic environment. This economic environment favors agricultural production and productivity. As such, the impact of governance is to provide an environment favorable to agricultural development, policies favorable to business, entrepreneurship and investment. The analysis of the seed sector has shown its great heterogeneity and its modest economic dimension in the food chain, compared to the downstream sectors. The rapid growth and the weight of the. The rapid growth and

weight of leading seed companies should not make us forget the influence of other sectors in the agri-food system. Although some seed companies have grown rapidly, the economic weight of the seed industry should not be overestimated in the food chain compared to the downstream sectors.

In terms of practices, [38] in their case studies show that contact with other groups and other networks can be facilitated farmers options and choices of seeds specifically regarding sorghum and cowpea. If one of the farmers or producers of a group concerned plays the role of obligatory passage point (resource person or model person), it sometime calls on board other farmers. [38] explain that to ensure relevant and effective access to external networks, it is necessary and relevant that the key producer assuming this role has greater motivation and practical knowledge; to serve as a model for other producers wanting to adopt and implement improved varieties. [14, 24, 28] explains the need for a multi-institutional approach to seed system governance. According to the author, each actor in the system has its own agenda which is not necessarily compatible with the activities of other actors (this may concern farmers' seeds versus breeders' seed). For example, university researchers are evaluated mainly on their scientific publications, while development organizations (NGOs) are evaluated by their donors on the speed of dissemination of technologies that are sometimes not suitable, or are costly. Nowadays, the existing projects are research development [26, 27]. So far, farmers leaders, state extension agents and other intermediaries receive very few incentives are in between the two systems depending on the funding agencies that can lead them to greater effort and personal commitment despite favorable seed demand and supply conditions. [21, 23, 31, 44] carries out a sociological analysis to identify the determinants of the proper functioning of farmers' organizations and village groups, and show that the learning and effectiveness of a group is also subject to factors exogenous to the group. The membership of other groups and also the presence of other groups or organizations with which they maintain relations and partnerships; are factors contributing to the adoption and implementation of new improved seeds or farmers seeds. Dissemination of any seed depends on administrative and institutional frameworks which are illustrated as factors of governance, create a predictable environment for the system (formal or informal). The impact of better governance contributes to improving a virtuous, sustainable and harmonious framework throughout a system not systems. If the structural, institutional and organizational framework are necessary for the development of the seed sector, the governance issues must also be resolved in order to influence the evolution of the seed system in Burkina Faso.

According to [9, 18, 19, 21, 46, 47], seeds are recognized as a major lever for the transformation of agricultural systems and therefore occupy a place of choice for the agro-ecological transition of agriculture. So, new technologies

such as varietal creation or choices, the establishment of an innovative value chain, new technical knowledge, new organizational structures of actors contribute to the diversification of agriculture towards income-generating activities, the reduction of poverty in rural areas, and food security. For [42, 45], the innovation approach of the seed system lies in a participatory approach with collective learning approaches which allows the implementation, the culmination of shared knowledge between farmers, researchers and distributors in the seed system. In Burkina Faso, such macro and institutional landscape give shape to sorghum and cowpea seed governance that we this paper seek to shed light.

3. Results: Impact of Governance on the Seed Sector

3.1. Legal, Legislative and Institutional Framework for Sorghum and Cowpea Seed Governance

The institutional environment of the seed sector is characterized by co-management of the sector at two levels: The supranational or community level, sub-regional and the national level. Each level of intervention contributes or impacts the dynamic organization and governance of the seed sector. In Burkina Faso, the seed system is regulated by the West African Seed Committee (COASem) and the Regional Seed Committee (CRS). These two bodies are intended to ensure the management and governance of the seed sector in the ECOWAS zone. Given the importance of this sector in the development of agriculture in Burkina Faso, we will dwell on the institutional, legal and legislative framework of the sector which can impact and influence the actions and activities of the actors as well as their roles in the functioning of the seed sector and sorghum and cowpea productivities.

The interventions, activities and actions of the actors around the seed system contribute to the functioning, to the dynamism of the sector and the seed system at the national and local level in Burkina Faso. Indeed, all of the interventions and actions of the seed stakeholder system generate guidelines and strategies for certain sectors such as sorghum (cereal), cowpea (leguminous). Thus, these strategies contribute to a better structuring for more dynamism, coherent, sustainable and harmonious evolution of the seed system in Burkina Faso. However, analysis of the impact of governance on the seed sector influence the agricultural sector and the socio-economic development of the country. Thus, [39], stipulates that: without quality seeds adapted to changes in pedoclimatic contexts, the survival of rural societies would be compromised.

3.2. Institutional and Organizational Impact Analysis on Sorghum and Cowpea

The dynamism created by these actors of the seed sector generates orientations and also impacts the seed system. The

impact generated by the dynamism and the functioning of the actors is more accentuated under two axes namely: a first institutional and structural axis and a second axis which is operational and regulatory [22, 30]. The assessment shows that the institutional environment is well established and can support better functioning of the sector. However, within the system in general, there are platforms for consultation and dialogue with the other players in order to clearly identify the needs of each sector leguminous and or cereals. Today, the sorghum and cowpea seed sector, like any agricultural sector, has a large number of private organizations that impact and create on the initiative of actors or the State itself. The emergence of these numerous organizations is facilitated by a favorable legal environment.

In the Centre-Nord region, the intervention and actions of the actors have contributed to the structuring and organization of seed producers. Thus, seed producers are structured around the national union of seed producers and seed companies. There is also the Interprofessional Cereals Committee of Burkina (CICB) and the Cowpea Committee.

Analysis of survey data shows that the number of seed companies increased from six (06) in 2010 to twelve (12) in 2018, the workforce of seed companies is distributed as follows: the province of Kadiogo which registers more seed companies has a total of 03 seed companies out of 12; then the provinces of Bazèga and Nahouri have 02 seed companies each; The rest of the seed companies are spread over the country such as Houet, Sourou, Banzon, Sanmatenga and Tenkodogo. All the seed producers surveyed are all members of a group, organization or union of seed producers. Indeed, most sorghum and cowpea seed are part of government subsidized inputs. As such, each group and organization are all affiliated to the National Union of Seed Producers. Data on structuring around the National Union of Seed Producers show that in the Centre-Nord region, the number of groups, organizations and associations of seed producers has increased over the years for these two crops. Indeed, this increase in the number of organizations, groups and associations of seed producers has been effective thanks to actions, strategies and the implementation of subsidy policies supported by the State budget and its development partners. The data from the interviews estimate 4,000 seed producers who produce sorghum and cowpea around the National Union distributed in regional and municipal unions through their groups or associations. The data collected in the Center-North region counts a total of 277 seed producers affiliated with 29 groups and organizations of seed producers in the Center-North region. Indeed, the province of Bam records 12 or 41% of groups and associations at the regional level. Also, producers in the province of Nametenga are organized and structured around 02 producer groups, i.e. 7%. Finally, those of the province of Sanmatenga are structured around 15 groups and organizations, i.e. a percentage of 52%. The number of seed producer groups and organizations is shown in the table 1 below.

Table 1. On producers' groups enrolled in the study.

Province	Number	%
Bam	12	41
Namentenga	2	07
Sanmatenga	15	52
Total	29	100

Adapted from Compaoré, 2019.

With the COVID 19 and the insecurity in the Centre-North region, the number of seed producers has not increased, some of them are producing at small scale. The analysis shows that among the varieties studied, Sorghum records more number of approved varieties with a total of 27 varieties. Then, Cowpea which has a total of 19 approved varieties registered in the national seed catalogue.

It is important to note that for varietal selection, the government of Burkina Faso through the Institute for Environment and Agricultural research continuously

benefited from the accompaniment, technical-financial and material support through international and regional research institutes. These are, among others, ICRISAT and IRAT for the sorghum sector; IITA and SAFGRAD mostly for the cowpea sector. Also, it also benefits from the support of financial institutions such as Bill and Melinda Gate, European Union, World Bank, FAO, AGRA, UEMOA and ECOWAS etc. for varietal creation. In the context of Burkina Faso, agricultural production systems are increasingly part of activity systems characterized by a diversification of activities and decision-making centers and a fragmentation of production units. They help to impact the economy and the socio-economic conditions of producers and the system in general. In terms of strengths and weaknesses, the following table 2 shows that efforts still need to be made.

Table 2. On the main strength and weaknesses of the seed system in Burkina Faso.

Main Strengths	Main weaknesses
1) Existence of political (seed law);	1) Low involvement of seed companies in the production of basic seed;
2) Existence of technical competences in varieties creation;	2) Insufficient financial in governance related aspect;
3) Availability of necessary equipment and laboratories for varietal selection;	3) Low storage capacity of pre-basic, farmers and basic seeds;
4) Technical support (IITA, Africa Rice, IRAT, ICRISAT, ADRAO, SAFGRAD and CERCI);	4) The use of the improved seed is related to State subsidies;
5) Institutional support TFPs, NGOs (World Bank, FAO) and institutions (AGRA, Bill and Melinda Gates).	5) Seed production and agroecology moving toward sustainable development;
	6) The state as the main buyer of improved seed;
	7) Non recognition of farmers seeds.

One can see a great fragility of the official/formal seed sector regulated by the State and international funding. The certification system tends to exclude varieties improved by farmers, let alone the other actors in the system., Governance of the sector structured by: State public orders (more than 80%) related to projects. The concentration of private actors in the various functions of the system, the orientation of action strategies (UNPSB, ANPSB, etc.), see the capture of funding. Weak State capacity to regulate the price of improved seeds. These coordination's are oriented by the conjunction between the macro-economic environment, the support of donors who structure the development of a private sector. In Burkina Faso, the official seed sector is governed by the National Seed Service of the Ministry of Agriculture which validate or not the certified seeds as well as foundation seeds. Next to this more formalized seed system which seems to be dynamic, we have the farmer seed system which is less formalized and mostly neglected by the improved seed system actors. Such seed system is considered as the one with large number of farmers and therefore need to be supported at some point by ongoing national initiatives. For both systems, the most persisting challenges are from 4 folds:

- 1) Lack of systematic funding;
- 2) Lack or weak infrastructure capacity;
- 3) Incapacity to plan in terms of demand driven estimation according to each crop as it is the case for sorghum and cowpea;
- 4) Lack at coordinated governance that brings together formal and informal system.

4. Discussion

It is important highlight the fact that the adoption of new varieties shows that two institutions play a central role; these are research institution (INERA) and the quality control department (DGPV/SNS). In the first-place research through its interventions in terms of training, varietal creation and multiplication of foundation seeds of improved varieties. The second organization is the National Seed Service through quality control, field inspection and seed certification of improved varieties. These two are at the hart of the formal seed system.

In terms of organization of actors, the two main organizations that determine the adoption of new varieties are firstly the National Union of Seed Producers through its partnership with different structures, the union plays a key role in the adoption of new varieties. Then follows the National Association of Seed Companies of Burkina Faso (ANES-BF), the CICIB and the CPF.

Regarding the hypothesis that the actions and strategies of the actors influence the evolution of the Sorghum and Cowpea sectors. We highlight that the multiplication of seeds is characterized by projects and programs, access to investments, productivity, yield, resistance to diseases and taste. Added to this is the institutional, legislative and regulatory impact that contributes to the dynamics of the Sorghum and Cowpea sectors. The results of the study show that institutional factors influence the adoption of seed specifically improved one. These factors are, among other things, the impact of policies and orientations on the seed

system as a whole in Burkina Faso. Also, laws and regulations have an impact on the adoption. Finally, governance factors such as support, capacity building through the training received, impact the dynamics, the evolution of the Sorghum, Cowpea sectors more specifically.

5. Conclusion

This study analyzed the issue of seed sector governance in Burkina Faso and its impact on the sorghum and cowpea sectors in the Centre-Nord region. A global overview of the context of the agricultural innovation system has been presented. Thus, access to quality and quantity of seeds is one of the current policies adopted by the Burkinabe government to achieve food security in the country. According to the FAO, West Africa should have triple its crop yields by 2020 compared to 1985 to meet the food needs of its population. This remains up to now a big ongoing challenge.

There is different level of governance that goes from institutional to individual single actors. At institutional level, of varietal creation and official certification is governed by the national environment and agricultural research. In terms of business-related governance seed multiplication agencies such as NAFASO are the leading actors. The government regulatory agency (the national seed service) is in charge of regulation and certification of seeds (certified or foundation). These set of institutional actors at each level and according to its specificity is powerful or not. As such power depends on the issue that is raised on the seed related sector (regulation, research or business). In addition, this power distribution also depends on the formal or farmer-based systems (informal). When it comes to farmer seed, the power distribution is different with different approach. For a more coherent and integrated seed system that could generate more impact, it is important to talk about coexistence between institutionalized actors within public policies and non-institutionalized actors. Sector with strong governance by the official/formal sector. Sector with weak governance known as informal or farmer-based seed system need to be consider and articulated in the national seed governance, allowing different actors to connect and move toward the same goal.

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References

- [1] Almekinders, C. J. M., Louwaars, N. P., de Bruijn, G. H, 1994: Local seed systems and their importance for an improved seed supply in developing countries. 216 pages.
- [2] Anja. C et al, 2014: Innovations dans les systèmes semenciers, étude d'appui aux initiatives semencières gérées par les paysans au Mali, au Niger et au Burkina Faso. Rapport d'étude final de la Fondation McKnight. 78 pages.
- [3] Bachmann. R, 2001: Trust, power and control in trans-organizational relations. organization studies. 365 pages.
- [4] Belem. C, 1985: *Coton et système de production dans l'ouest du Burkina Faso [Cotton and the production system in western Burkina Faso]*; Thèse de 3ème Cycle en géographie de l'aménagement-Université Paul Valéry, IRCT/CIRAD. 344 pages.
- [5] Bergek A., Jacobson S., Carlsson B., Lindmark S., Rickne A., 2008: *Analyzing the functional dynamics of technological innovation systems: a scheme of analysis*, Research Policy. 429 pages.
- [6] Bikienga. I. M, 2002: Evaluation des secteurs de l'engrais et des semences au Burkina Faso, [*Evaluation of the fertilizer and seed sectors in Burkina Faso*] rapport d'étude ATRIP (the African Trade Investment Programme). 31 pages.
- [7] Bierstadt. R, 1950: *An analysis of social power*. Sociological Rev. 738 pages.
- [8] Bonneuil. C et Hochereau. F, 2008: Gouverner le progrès génétique. Biopolitique et métrologie de la construction d'un standard variétal dans la France Agricole d'après-guerre, [*Governing genetic progress. Biopolitics and metrology of the construction of a varietal standard in post-war agricultural France*]. Annales d'histoire en sciences sociales-1340 pages.
- [9] Bonneuil. C, Thomas. F (2009): Gènes, pouvoirs et profits. Recherche publique et régimes de production des savoirs de Mendel aux OGM, [*Genes, powers and profits. Public research and regimes of knowledge production from Mendel to GMOs*]. Editions FPH et Quae, 615 pages.
- [10] Callon. M, 1999: La sociologie peut-elle enrichir l'analyse économique des externalités? [*an sociology enrich the economic analysis of externalities? Essay on the notion of framing spillover. Innovation and performance.*] Essai sur la notion de cadrage débordement. Innovation et performance. Approches interdisciplinaires, éd. EHESS.
- [11] Carlsson. B et al, 2002: Innovation systems: analytical and methodological issues. Research Policy. 245 pages.
- [12] CEDEAO, 2008: Règlement C/REG.4/05/2008 portant harmonisation des règles régissant le contrôle de qualité, la certification et la commercialisation des semences végétales et plants dans l'espace CEDEAO [*Regulation C/REG.4/05/2008 harmonizing the rules governing quality control, certification and marketing of plant seeds and seedlings in the ECOWAS region*].
- [13] Charreaux. G, 1997: Le Gouvernement des entreprises: Corporate Governance, théories et faits, [*Corporate Governance: Corporate Governance, Theories and Facts*] Cahier du FARGO n° 1040101. 469 pages.
- [14] Charreaux. G, 2004: Les théories de la gouvernance de la gouvernance des entreprises à la gouvernance des systèmes nationaux Corporate Governance Theories: From Micro Theories to National Systems Theories [*Theories of governance: from corporate governance to the governance of national systems*]. Cahier du FARGO n° 1040101 113 pages.

- [15] Compaoré G Constantin 2019: Gouvernance du Secteur Semencier au Burkina Faso et Impacts sur les filières Sorgho, niébé et le Gombo [Governance of the Seed Sector in Burkina Faso and Impacts on the Sorghum, Cowpea and Okra sectors] dans la région du Centre-Nord., Master thesis, 78 Pages.
- [16] CORAF/WECARD, 2015: Plan d'action du Comité Ouest Africain des Semences (COASem) en charge du suivi de l'application du Règlement Semencier Régional Harmonisé CEDEAO-UEMOA-CILSS. CORAF/WECARD, Dakar (Sénégal). 39 pages.
- [17] Danielle. G; Magrini. M. B; Tardy. C; Triboulet. P: (2015) *Freins et leviers à la production et diffusion des éco-innovations variétales - le cas du secteur semencier du tournesol*. 9^{ème} Journées de recherches en sciences sociales (JRSS). Nancy du 10 au 11 décembre 2015. Version provisoire. 24 pages.
- [18] Davis. K. E; Franzel. S; Hildebrand. P; Irani. T; Place. N. T, 2004: *Extending technologies among small-scale farmers in Meru, Kenya: ingredients for success in farmer groups*. Journal of Agricultural Education and Extension. 62 pages.
- [19] Diarisso Tidiane, Corbeels Marc, Andrieu Nadine, Djamen Patrice, Douzet Jean-Marie, Tittonell Pablo (2016) Soil variability and crop yield gaps in two village landscapes of Burkina Faso. *Nutrient Cycling in Agroecosystems*, 105 (3): 199-216. <https://doi.org/10.1007/s10705-015-9705-6>
- [20] DGPV, WASA, CNFA. 2016: Manuel de procédure sur les conditions de certification des semences. semencier [Manual of procedure for the registration of seed producers,], rapport 7 pages.
- [21] Djamen. P et Ouattara. S, 2017: Secteur semencier au Burkina Faso: Recommandations pour une meilleure intégration des producteurs, [Seed sector in Burkina Faso: Recommendations for a better integration of producers]. <https://www.bioversityinternational.org/e-library/publications/detail/secteur-semencier-au-burkina-faso-recommandations-pour-une-meilleure-integration-des-producteurs>
- [22] Dorin. B; Cattin. M, 2013: Disponible alimentaire et productivité agricole en Afrique subsaharienne, [Food availability and agricultural productivity in sub-Saharan Africa]. Cahiers Agricultures-347 pages.
- [23] FAO, 2008: Catalogue Ouest Africain des espèces et variétés végétales, [West African Catalogue of Plant Species and Varieties] 113 pages.
- [24] FAO, 2013: Revue des politiques agricoles et alimentaires au Burkina Faso. Rapport d'étude, suivi des politiques agricoles et alimentaires en Afrique (SPAAA), [Review of agricultural and food policies in Burkina Faso. Study report, monitoring agricultural and food policies in Africa]. 234 pages.
- [25] FAO, 2018: Appui à la formulation du deuxième Programme National du Secteur Rural (PNSR 2) du Burkina Faso. Rapport final d'analyse des politiques. Rome 2018. 57 Pages.
- [26] FIA, 2018 Convergence Globale des Luites pour la Terre et l'Eau- Afrique de l'Ouest: Bénéfices des entreprises ou diversité des systèmes alimentaires? Les menaces pesant sur les semences paysannes et leurs implications en Afrique de l'Ouest, [Global Convergence of Struggles for Land and Water- West Africa: Corporate profits or diversity of food systems? Threats to farmers' seeds and their implications in West Africa]. Rapport final. 94 Pages.
- [27] Fugeray. S. A et Lemarié. S, 2013: Evolution de l'organisation de la recherche et du secteur des semences, [Evolution of the organization of research and the seed sector] Revue HAL, <https://hal.archives-ouvertes.fr/hal-01144529>, 64 pages.
- [28] Geels F. W, 2004: From sectoral systems of innovation to socio-technical systems - Insights about dynamics and change from sociology and institutional theory, Research Policy -920 pages.
- [29] Geels F. W. 2011: The multi-level perspective on sustainability transitions: Responses to seven criticisms, Environmental innovation and societal transitions, 40 pages.
- [30] Hall. A, Mytelka. I, Oyeyinka. B, 2006: Concepts and guidelines for diagnostic assessments of agricultural innovation capacity, Maastricht, 33 pages.
- [31] Kaboré. R et al, 2008: Innovation technique et organisation des acteurs: le cas des semences certifiées dans le Sanmatenga au Burkina Faso, retour sur une expérience d'une dizaine années de 1998 à 2008. [Technical innovation and organization of actors: the case of certified seeds in Sanmatenga in Burkina Faso, a review of a ten-year experience from 1998 to 2008, journal of Political Science, https://agritrop.cirad.fr/557969/1/document_557969.pdf
- [32] Lio. M. and Liu. M. C, 2008: Governance and agricultural productivity: A cross-national Analysis. Volume 33. 512 pges.
- [33] MAAH, DGESS; 2017: Plan Stratégique pour les Statistiques Agricoles et Rurales du Burkina Faso, 2016-2020, [Strategic Plan for Agricultural and Rural Statistics in Burkina Faso, 2016-2020] (PSSAR_BF 2016-2020). 81 Pages.
- [34] MAAHM), 2021: Annuaire des statistiques agricoles 2020 [Yearbook of Agricultural Statistics 2020], 437p.
- [35] MAHRH, 2010: Diagnostic du secteur semencier du Burkina Faso, [Diagnosis of the seed sector in Burkina Faso] rapport, Ouagadougou, Burkina Faso.
- [36] MAHRH, 2010: Stratégie de développement durable du secteur semencier du Burkina Faso 2011-2020 [Sustainable development strategy for the seed sector in Burkina Faso], document final, Ouagadougou 52 p.
- [37] MAHRH, MECV, 2006: Loi N° 010-2006/AN Portant règlementation des semences végétales au Burkina Faso [Law N° 010-2006/AN on the regulation of plant seeds in Burkina Faso].
- [38] MINEFID, 2015: Plan National de Développement Economique et Social 2016-2020, [National Economic and Social Development Plan 2016-2020]. Available online; 97 pages. http://www.cns.bf/IMG/pdf/pndes_2016-2020-4.pdf.
- [39] Nlend Nkott A. L., (2021). Les institutions et organisations de gouvernance de l'innovation variétale: Cas d'étude à Madagascar et au Burkina Faso. [Institutions and organizations for the governance of varietal innovation: Case studies in Madagascar and Burkina Faso] Montpellier SupAgro. Thèse de Doctorat en Sciences Economique, 213 pages.
- [40] North. D. C, (1990): Institutions, Institutional Change and Economic Performance, Cambridge University.
- [41] OCDE, 2018: Systèmes de l'OCDE pour la certification variétale ou le contrôle des semences destinées au commerce international. [OECD schemes for varietal certification or control of seed for international trade.] Rapport 177 pages.

- [42] Sawadogo/Compaore E. M. FW.; Yilla J. Ouedraogo Nofou 2022, International Journal of Sciences: Basic and Applied Research (IJSBAR) Volume 61 (No 1):pp 342- 354.
- [43] Tonde. W. H, 2017: Commercialisation des semences de variétés améliorées dans la région du centre: Opportunités et menaces [*Marketing of Improved Varieties of Seed in the Central Region: Opportunities and Threats*]. Mémoire de fin de cycle Université de Ouagadougou, SELCOSS. 40 pages.
- [44] Traore. S, 2014: Revue systématique des études sur la sécurité semencière au Burkina Faso, [*Systematic review of studies on seed security in Burkina Faso*,] [https://www.fao.org/fileadmin/user_upload/food-security-capacity-building/docs/Seeds/SR/FAO Systemic_Review_of_SSAs.pdf](https://www.fao.org/fileadmin/user_upload/food-security-capacity-building/docs/Seeds/SR/FAO_Systemic_Review_of_SSAs.pdf) Page 04.
- [45] Trust Africa, 2017: Effectivité et l'équité de l'accès aux financements et subvention publics agricoles au profit des petits producteurs au Burkina Faso. [*Effectiveness and equity of access to public agricultural financing and subsidies for small producers in Burkina Faso*] Rapport d'étude. 39 pages.
- [46] Van Den Ban, A. W.; Hawkins, H. S.; Brouwers, J. H. A. M. and Boon, C. A. M. (1994): *La Vulgarisation Rurale en Afrique*. Karthala, Paris. 373 Pages.
- [47] Weltzien E., Vom Brocke K., Touré A., Rattunde H. F. W., Chantereau J. 2008. Revues et tendances pour la recherche en sélection participative en Afrique de l'Ouest [*Reviews and trends for participatory breeding research in West Africa*], Cahiers Agricultures, 17 (2): p. 165-171.