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Does participation of agricultural entrepreneurs in knowledge networks improve firm performance in Benin?

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Knowledge network is a key element of the entrepreneurship environment. It is claimed to provide entrepreneurs with information, resources, and knowledge likely to positively impact the performance of their firms. In the African context, where agricultural entrepreneurship is rapidly evolving in adverse conditions, knowledge networks are presumed to be critical for entrepreneurs. However, it is still unclear if and how knowledge networks can improve the performance of firms. This study empirically investigated that question in Benin where 819 agricultural entrepreneurs were interviewed. Descriptive statistics were used to evidence the participation in knowledge networks, and an ordinal logistic regression to assess the effect of participation on the firm's performance. Findings showed that agricultural entrepreneurs use both formal and informal knowledge networks with more intensity towards the informal ones. Participation in these knowledge networks is influenced by age, gender, education level, and sector of activities. Moreover, entrepreneurs who can access advice or information on resources from organizations in their networks or actively participate in professional events displayed higher performance. This study provides critical information for institutions that are active in encouraging or crowding out the involvement of the private sector in agricultural and rural development.

Keywords: private sector; knowledge networks; agricultural development; entrepreneurs; Benin

Introduction

The private sector has been increasingly called upon to play a more active role in agriculture and food systems, in a context where at the global level, more than 820 million people have insufficient food for a healthy life and 2 billion facing malnutrition in its different forms (Willett et al. 2019, Scott 2017). Among other strategies, small and medium agribusinesses are expected to participate in knowledge networks (KN) by connecting with more stakeholders active in creating and supporting a conducive environment for the development of agricultural and food systems for better food and nutrition security. KN refers to any

collaborative activity involving the sharing of information between humans, either formal or informal. Its mandate is to generate and disseminate information, either based on research, opinions, or experiences. KN as a key vehicle for knowledge transfer and diffusion affects the innovative performance of firms (Boschma and Ter Wal 2007) and is widely recognized to provide entrepreneurs with assets and *in fine* to affect their business (Greve and Salaff 2003).

Indeed, entrepreneurs can use KN to obtain or co-create knowledge about anything of importance to their economic activity including capital, advice, markets, capacity building, and technologies (Hartwich et al. 2007). Thus, KN are expected to provide entrepreneurs with information and knowledge likely to make a difference in their daily business decisions. However, beyond the generic added values of KN, it is still unclear how and in what contexts the expected outcomes of connecting to KN are delivered. Such questions are particularly relevant in developing countries and especially in Africa for two reasons. First, because Africa is with no doubt in need of strong and effective KN. Indeed, while the entrepreneurial dynamic in Africa is rapidly evolving (Jones et al. 2018) with the continent having the highest entrepreneurship rate in the world (AfDB 2017), it also has the highest small business discontinuance. Second, because Africa offers a socio-political context that may vampire and alter the efficiency of KN. Indeed, entrepreneurship in Africa is evolving in an extremely fragile environment (i.e. high unemployment rate, distrusts of actors, corruption, predominance of informality, unclear fiscal policies, etc.). Thus, the benefits that may result from the participation of African entrepreneurs in KN are unclear. Agricultural entrepreneurs do not know if and how multi-stakeholders' collaboration can improve the performance of their businesses. This paper aims to bridge that knowledge gap and advance the debate on the effect of knowledge networks on entrepreneurship in Africa, with a focus on the agricultural sector. Using a case study of the Republic of Benin (West Africa), the paper investigated how the participation of agricultural entrepreneurs in knowledge networks can improve the performance of their businesses.

In the first step of this study, we are interested in exploring the participation of agricultural entrepreneurs in KN. In the search of knowledge, agricultural entrepreneurs may refer either to formal or informal networks. Formal networks are well-codified networking channels that have established structures and formal procedures of access. These can include organizations that provide advice, knowledge, capacity building opportunities, and information on resources such as capital and markets. To access these networks, entrepreneurs are required to follow formal procedures. In contrast, the entrepreneur also can develop an informal network that can provide the same knowledge and resources as the formal ones. These networks are mainly made of individuals that the entrepreneur has access to (Maas et al. 2013), either family members or non-family members (Arregle et al. 2015). Each entrepreneur is free to decide on which combination of informal and formal knowledge networks to establish to achieve its objectives. Because of the easiness of access to informal knowledge networks in Africa, we hypothesized that entrepreneurs may participate more in informal KN. Also, we are interested

in analyzing the entrepreneur and its business (as a node) within its environment where other actors influence its access to knowledge and resources. The value created by the social network to a node is referred to as 'social capital' which is the set of tangible or virtual resources that accrue to actors through the social structure, facilitating the attainment of the actor's goal (Greve and Salaff 2003). Social capital is used in this research as the outcome of the relationship between the agricultural entrepreneur and its knowledge network. The nature of this relationship may be affected by the characteristics of the individual and its businesses. For example, younger and less educated entrepreneurs may have limited networking capabilities than older and more educated. The gender of the entrepreneur may also affect its social capital. Therefore, we expected that participation in KN is influenced by the socioeconomic characteristics of agricultural entrepreneurs.

Second, we take an additional step to investigate the effectiveness of KN in improving firm performance. In this research, firm performance is estimated through revenue growth. The social capital generated by the entrepreneur through its relationship with its knowledge networks can provide information, capital, skills, and market opportunities to start and expand business activities. By way of example, agricultural entrepreneurs need information about agricultural technologies and capital to identify and pursue business opportunities. They also need advice on the management of their businesses that their knowledge networks can provide. As such, the presence of knowledge networks can be a comparative advantage as information pulled from it can positively impact firm performance (Pratono 2018). Therefore, we expected that an increased degree of participation in KN has a positive impact on firm performance.

The paper is structured into five sections. Section 2 presents the methodology through the study area, the sampling method, and data collection and analysis. Section 3 presents the results through the participation of agricultural entrepreneurs in knowledge networks, the socioeconomic factors that influence such participation, and the influence of knowledge networks on firm performance. Section 4 discusses the findings in light of academic literature and provides implications for policy and practice. Finally, the limitation of the study, avenues for future researches, and general conclusions are provided.

Methodology

Study area

Although its contribution to the country's gross domestic product (GDP) has been falling in the past years, agriculture is still an important sector for Benin's economy. Its contribution to GDP moved from 25.23% to 22.64% from 2006 to 2018 whilst in nominal terms, it has increased from $US 1.44 to $US 2.18 billion during the same period (World Bank 2019). The agricultural sector is dominated by smallholder farmers who conduct their agricultural

activities mainly in a family context. However, in the last decade, there has been a surge in what is coined as "agricultural entrepreneurship" to denote the risk-taking behavior to launch firms in the agricultural sector with the central aim to satisfy a perceived demand and generate revenue. Different programs driven by governments or development partners have established initiatives that create incentives for people especially the youth to start a business in the agricultural sector. The main objective pursued is the reduction of youth unemployment.

To succeed, the entrepreneurs make use of the available resources they can access. Some of these resources are accessed through the networks that the entrepreneur has access to. In the national context, there are public and private organizations that offer different kinds of resources to entrepreneurs. These can include advice and coaching for business management, information on different resources such as capital and markers, knowledge, and capacity building on various thematic of interest for the entrepreneurs. There are also professional events of different nature that entrepreneurs can attend to expand their network and knowledge about their business sector. Informally, entrepreneurs also refer to individuals within their network to access the same resources. Finally, agricultural entrepreneurs are also actively motivated to join professional associations that are either thematic- or region- based. Many of these professional associations are structured to be connected to an apex national platform that defends their interests mainly with policymakers.

Sampling method and data collection

To ensure the representativeness of all segments of the agricultural entrepreneurship phenomenon, a stratified random sampling approach was adopted. The strata were the three agricultural sub-sectors namely: primary production, processing, and services. Within each stratum, a random sample was selected. In total, out of a sample frame of 2,029 agricultural entrepreneurs from southern Benin where the agricultural entrepreneurship ecosystem is more vibrant, 819 agricultural entrepreneurs were surveyed between October and December 2019. Data were electronically collected using Kobo Toolbox. The questionnaire was made of sections to assess the level of networking of agricultural entrepreneurs mainly in terms of knowledge acquisition (information about capacity building and resources such as capital and markets) and to estimate the performance of their firms.

At a first step, data were collected about the structure of the networks of entrepreneurs and the intensity of their networking activity. Specifically, entrepreneurs indicated which of the following networking activities they undertake: *Membership in a professional association, Relationship with organizations for advice, Relationship with organizations for information on resources, Relationship with organizations for knowledge and capacity building, Relationship with individuals for advice, Relationship with individuals for information on resources, and Participation in professional events*. For each of these activities, data were collected on their intensity. Specifically, the number of memberships in professional associations was indicated; the number of organizations and individuals with whom the

entrepreneurs had had contacts in the past 6 months and the number of professional events attended in the past 12 months was collected. Thus, we have seven independent variables: number of memberships in professional associations, number of relationships with organizations for advice, number of relationships with organizations for information on resources, number of relationships with organizations for knowledge and capacity building, number of relationship with individuals for advice, number of relationships with individuals for information on resources, and number of professional events attended.

Second, data were collected on the performance of the firms. Firm performance is commonly assessed with revenue (sales) growth (Arregle et al. 2015, Brüderl and Preisendörfer 1998). In the national context, entrepreneurs tend to be reluctant in disclosing their exact annual sales either because they do not keep accurate records of their revenue or they do so to avoid taxes. Therefore, we asked entrepreneurs to indicate in which interval their annual sales may fall. These data were collected for the last 4 years (2018, 2017, 2016, and 2015). Five intervals were proposed (in XOF): less than 2,000,000; 2,000,001 – 5,000,000; 5,000,001 – 10,000,000; 10,000,001 – 20,000,000; and more than 20,000,000 (USD/XOF = 604 as of May 1st, 2020). Movements between intervals were taken as an indication of positive or negative firm performance. To calculate an overall comparable growth over the four years, the multi-year growth rate was computed (Equation 1).

Equation 1: $Average\ annual\ growth\ (\%) = 100\ x\ (\sum \frac{Revenue\ in\ year\ t - Revenue\ in\ year\ t-1}{Revenue\ in\ year\ t})/T$

where T is the duration (years) between initial and final years.

Entrepreneurs were classified in three ordinal categories: “Decline of revenue” for those with a negative growth rate, “Stable revenue” for those with a growth rate that equals to 0, and “Growth of revenue” for those with a positive rate.

Since firm performance is affected by other factors beyond networking activity, data collection was extended to other variables (control variables) known to influence the performance of the firms. These variables include:

- gender as the sex of the entrepreneur (Lee and Marvel 2014);
- human capital (Arregle et al. 2015), comprising of the age of the entrepreneur (in years), and his/her education level (no education, primary, secondary and university);
- the firm age (in years) (Arregle et al. 2015);
- the firm size operationalized in terms of the number of full-time employees (Arregle et al. 2015);
- the agricultural sub-sector in which the firm operates (primary production, processing, and services); and

– the entrepreneurship environment assessed by the level of access to finance as capital (Fowowe 2017)

Table 1: General characteristics of agricultural entrepreneurs

		%			%
Gender	Female	25.15	**Formal**	Yes	48.35
	Male	74.85		No	51.65
Age	Young (≤ 35years)	43.83	**Business size (Revenue 2018 in XOF)**	Less than 2,000,000	37.14%
	Adult (35-60years)	49.45		2,000,001 – 5,000,000	28.11%
	Old (> 60years)	6.72		5,000,001 – 10,000,000	17.69%
Education	No education	9.04		10,000,001 – 20,000,000	7.65%
	Primary	12.33		More than 20,000,000	9.41%
	Secondary	33.21	**Growth-oriented**	Yes	95.60
	University	45.42		No	4.40
Employment status before starting the business	Not employed	76.07	**Business location**	Urban	55.19
	Employed	23.93		Rural	44.81
Agricultural professional training	No	51.16	**Sector**	Primary production	44.69
	Yes	48.84		Agricultural processing	39.93
Experience in entrepreneurship	No	87.55		Agricultural services	15.38
	Yes	12.45	**Sample size**		819
			Number of municipalities covered		40

Interviewed agricultural entrepreneurs were dominated by men; only 1 out of 4 entrepreneurs was a woman (Table 1). Individuals who were less than 60 years old made more than 90% of agricultural entrepreneurs with almost half of them being young (below 35). As for the education level, agricultural entrepreneurs had a relatively higher level as almost half of them had a university level. Only 9 percent did not attend any formal education. Before starting

their business, agricultural entrepreneurs were mostly unemployed (76%). In terms of background, almost half of agricultural entrepreneurs attended agricultural professional training but only 12% have had experience in entrepreneurship before starting their business.

Regarding the agricultural businesses, half of them were not formal; formalization in this context referred to registration with GUFE (*Guichet Unique de Formalisation des Entreprises*), a one-stop-shop for formalization. In terms of business size, the survey focused on small and medium enterprises as 90% had annual revenue of less than XOF 20,000,000 (USD 33,085) in the year before the survey. More than 95% of agricultural businesses are growth-oriented. Regarding the geographical location of the businesses, there were more businesses located in urban areas (55%) than in rural areas. As for the sub-sector of operations, most businesses operated in primary production (44%) and processing (40%) sub-sectors. Few businesses were operating in the services sub-sector (15%). In short, this study focused on the for-profit private sector in the agricultural sector and especially on small- and medium-sized businesses.

Data analysis

Participation of agricultural entrepreneurs in knowledge networks

The proportions of agricultural entrepreneurs engaged in each type of networking activity were calculated. Through a Venn diagram, the different combinations of networking activities were displayed. To analyze the profiles of agricultural entrepreneurs about their networking activities, we computed the frequencies of each type of networking activity in the function of the socioeconomic characteristics of the entrepreneurs, and we used the Pearson chi-squared to test any significant relationship. Finally, percentiles were calculated to analyze the intensity of networking activities by agricultural entrepreneurs.

Effect of an increased degree of participation in knowledge networks on firm performance.

At a first stage, we calculated the frequencies of the presence/absence of each type of networking activity by the growth category. This was instrumental in displaying a general trend about how each type of networking activity univariately influences the performance of the businesses. Thereafter, we analyzed the combined effect of the networking activities by fitting an ordinal logistic regression as the dependent variable "firm performance" is ordinal. Ordinal regression is used to predict an ordinal dependent variable (in our case the 'firm performance') given one or more independent variables.

Results

Participation of agricultural entrepreneurs in knowledge networks

Agricultural entrepreneurs mentioned seven networking channels which could be assumed to be related to KN (Figure 1). The most cited networking channels include professional

associations, organizations, individuals, and professional events (Figure 1). Agricultural entrepreneurs collaborated with organizations and individuals mainly to get advice on managing their businesses and information on resources such as market and capital. In addition to that, they also looked for capacity building opportunities from organizations.

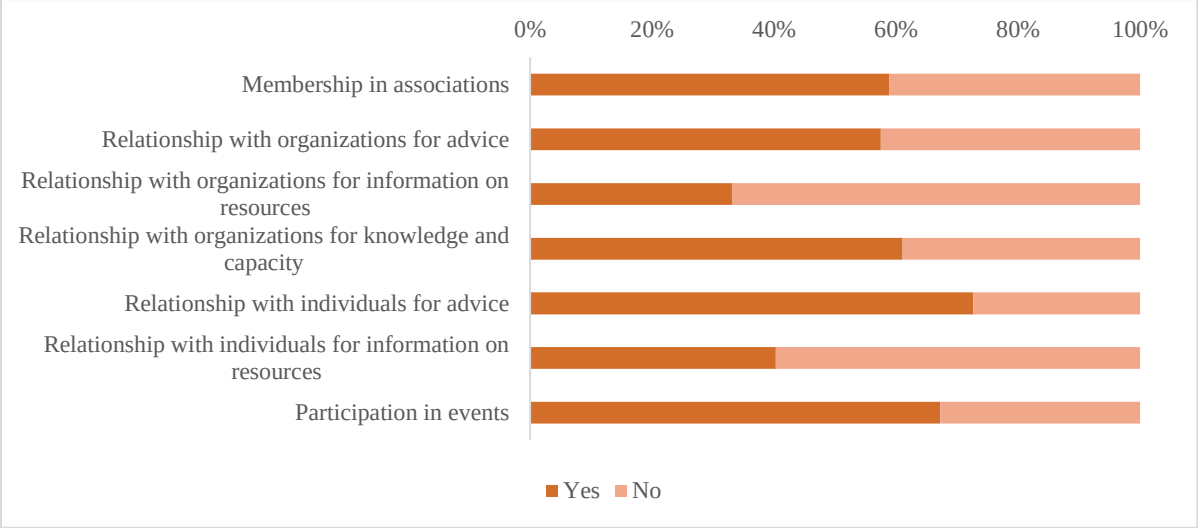

Figure 1: Networking activity of entrepreneurs

Entrepreneurs undertook specific combinations of these networking channels to form their KN (Figure 2). The largest combinations made by entrepreneurs is “Organizations + Individuals” (set by 63% of entrepreneurs), and “ Organizations + Events” (set by 59% of entrepreneurs) meaning that more than half of agricultural entrepreneurs not only referred to organizations to access knowledge but also actively participated in professional events or refer to individuals. It is important to highlight that 40% of surveyed entrepreneurs include the four elements in their network.

The identified KN can be grouped in two broad categories based on the level of formality namely formal and informal channels. The formal KN includes professional associations and organizations. The basic KN was through professional associations (60% of entrepreneurs are members of associations). These associations are formalized groups of agribusiness owners operating in the same geographical area or along the same agricultural value chains. Professional associations can be either solely or connected to a larger association that covers a larger geographical area or operates at a higher level of the value chains. In addition to their membership in professional associations, agricultural entrepreneurs also created functional linkages with organizations for different purposes. Most entrepreneurs collaborated with organizations to get knowledge and capacity building (61%), advice (58%), information on resources - capital and markets for example – (33%). Beyond formal channels, agricultural entrepreneurs also integrated informal KN mainly made of individuals that provide either advice or information on resources. Of the 819 entrepreneurs surveyed, 70% and 40% had

reported the presence of individuals in their KN to get advice and information on resources, respectively. Based on this univariate analysis, there is evidence that agricultural entrepreneurs establish more informal networking activities (with individuals) than they do formally (with organizations).

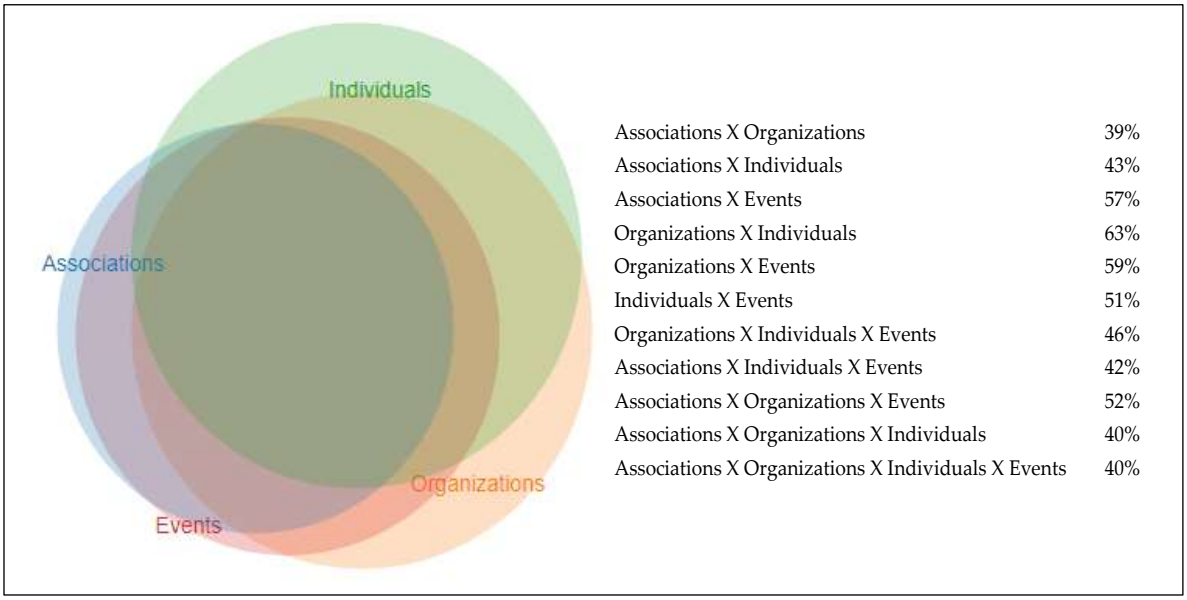

Figure 2: Diversity of networking activities among agricultural entrepreneurs

In addition to the networking channels discussed above, agricultural entrepreneurs also participated in professional events to extend their networks. Two out of three entrepreneurs have reported that they attended on average at least one professional event in a year. Beyond participating in a KN, the intensity of activities among those who were engaged in at least one form of networking varies within the interviewed agricultural entrepreneurs (Table 2). Three out of four agricultural entrepreneurs who were a member of a professional association, registered with only one association, while the rest was a member of more than one association. Agricultural entrepreneurs had in their network more organizations for advice than for information on resources. Indeed, 75% of agricultural entrepreneurs had three or fewer organizations in their KN for advice and two or less for information on resources. For the same purpose, entrepreneurs engaged more with individuals than with organizations. Regarding events attendance, half of the agricultural entrepreneurs who were engaged in such KN attended at most six events a year, which represents two events every two months showing a high intensity of networking. About 20% were engaged in an even higher intensity of networking, having attended between 12 and 24 professional events a year.

Effect of socio-economic characteristics of entrepreneurs on their participation in knowledge networks

The knowledge networking activities of agricultural entrepreneurs were observed along with their socioeconomic characteristics. Participating in “professional associations” varied

significantly with age (p=0.001), level of education (p=0.002), sector (p=0.017) and gender (p=0.030). Indeed, as the age of the entrepreneur increases, there was a greater likelihood for the entrepreneur to be a member of a professional association. For example, 69% of old entrepreneurs (>60 years) were a member of a professional against 64% and 52% for adults (35-60 years) and young entrepreneurs (<35 years) respectively. As for education, 80% of those who had a membership with a professional association had either secondary (37%) or university level (43%). Regarding the sector, entrepreneurs who operate in primary production were the most represented in professional associations (63%) and those in the services sector were the least represented (49%). As for gender, male entrepreneurs were more represented in professional associations (61%) than women (52%).

Table 2: Intensity of networking activities among agricultural entrepreneurs

Variable	Obs.	Mean	Std. Dev.	Min	Max	Percentile (%)			
						25	50	75	95
Associations	445	1.31	0.62	1	5	1	1	1	3
Organizations for advice	471	2.15	1.66	1	15	1	2	3	5
Organizations for information on resources	271	1.76	1.27	1	10	1	1	2	4
Organizations for knowledge and capacity	478	1.74	0.99	1	7	1	1	2	4
Individuals for advice	588	3.82	3.50	1	25	2	3	5	10
Individuals for information on resources	329	3.18	3.32	1	30	1	2	4	8
Events	531	7.83	5.96	1	24	3	6	12	24

Collaboration with organizations was shown to be influenced neither by the gender of the agricultural entrepreneur nor by the sector of activity. However, for education, it was observed that, compared to agricultural entrepreneurs with higher levels of education, entrepreneurs with no education or primary level made more use of their connections with organizations to get information on resources (p=0.003). For example, only 28% of entrepreneurs with university-level reported having received information on resources from organizations in the semester before the survey. Regarding age, young entrepreneurs are the group of entrepreneurs who made the most use of organizations in their network to get advice (62%). Adult and old entrepreneurs referred to organizations in their network to access knowledge and capacity building. Regardless of their age, few entrepreneurs made use of organizations in their network to access information on resources (p=0.007).

Participating in individual-based KN for advice varied significantly with age (p=0.000) and gender (p=0.040). Young people (80%) were the ones who referred the most to individuals for advice, followed by adults (68%) and old (55%). As for gender, women utilized their relationships with individuals to get advice more than men do. The utilization of connections

with individuals to get information on resources varied significantly only with the level of education (p=0.011). Entrepreneurs with secondary and university levels are the ones who referred the least to their connections with individuals to get information on resources.

Finally, attending professional events as a form of participation in KN varied by level of education (p=0.041) as entrepreneurs with higher education levels seemed to be more active in professional events.

Effect of participation in knowledge networks on firm performance

An analysis of the revenue of firms from the last 4 years before the survey indicated that 5.71% of firms were declared in a declining trend, while 58% were declared as stable, and 36% were declared in a growing trend. The firm performance varied with membership in professional associations (p=0.075), relationship with organizations for information on resources (p=0.000), and relationship with organizations for advice (p=0.000). Indeed, entrepreneurs who were a member of a professional association were more represented in the "Growth of revenue" group than others (Figure 3a). Similarly, entrepreneurs who had a functional relationship with organizations for advice or information on resources were less represented in the "Decline of revenue" group than in the "Stable revenue" and "Growth of revenue" group (Figures 3b and 3c).

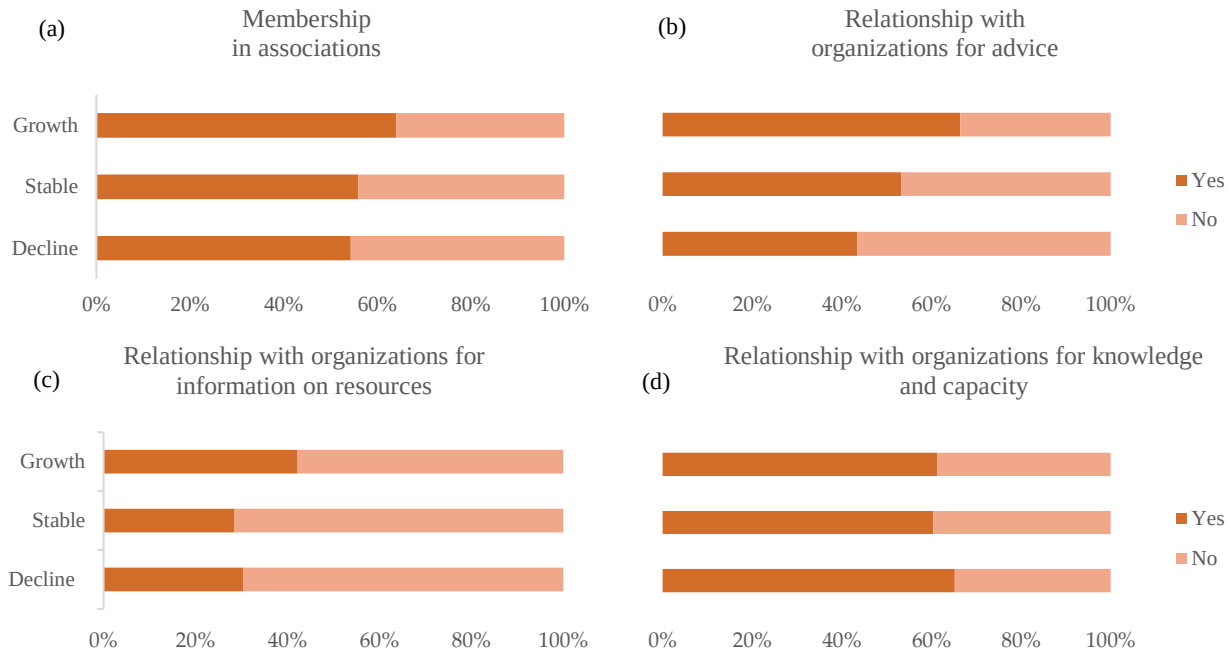

Figure 1: Formal networking activities among agricultural entrepreneurs

It is similarly the case that the entrepreneurs' relationship with individuals and participation in professional events have some bearing on the performance of the firm. The performance of the firm seemed to be influenced by the existing relationships with individuals for advice

(p=0.002) and for information on resources (p=0.025). Entrepreneurs who had a functional relationship with individuals for advice or information on resources were less represented in the "Decline of revenue" group than in the "Growth of revenue" group (figures 4a and 4b). The same trend is observed for participation in professional events.

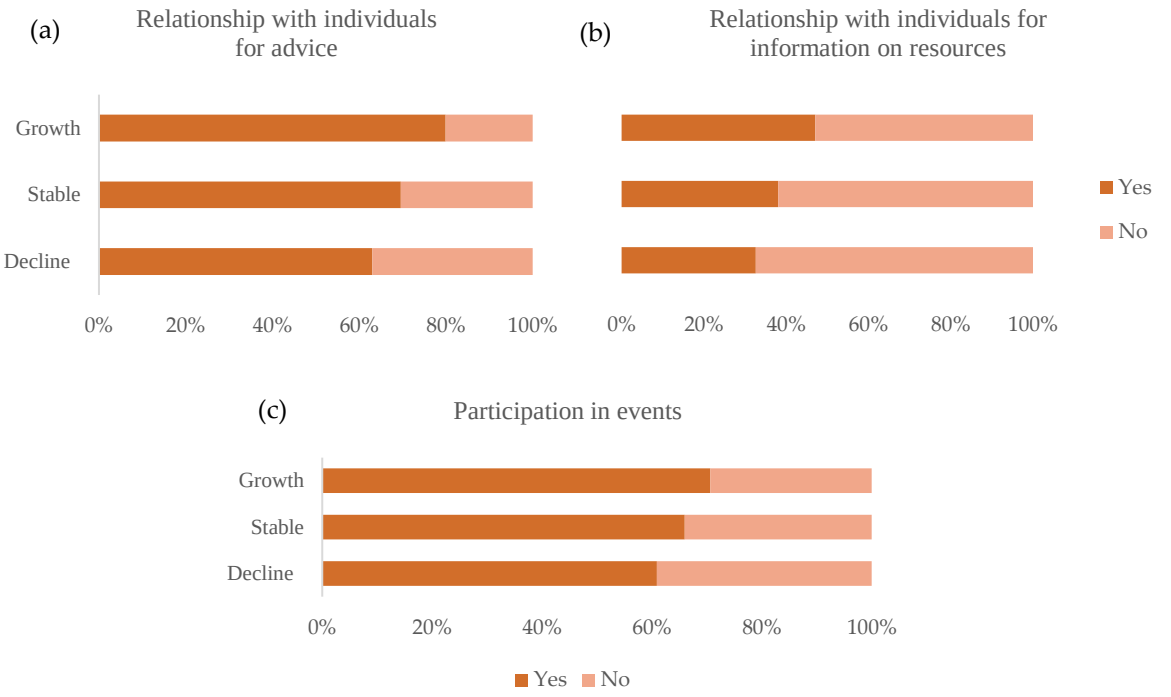

Figure 2: Informal networking activities among agricultural entrepreneurs

The ordinal logistic regression performed to analyze the combined effect of the networking activities of the entrepreneurs on the firm performance (Table 3), suggested that the intensity of activities in professional associations did not significantly affect the firm performance. However, the intensity of networking activities with organizations significantly influenced the performance of the firm. Indeed, the firms whose owners engaged in increased networking activities with organizations for advice and information on resources performed better than those who have lower networking activities. Surprisingly, we observed a significant negative coefficient for the relationship with organizations for knowledge and capacity building. In other words, the more entrepreneurs participate in networking activities that encompass elements such as training, the less their firms perform. Although the collaboration of entrepreneurs with individuals for advice and information on resources was high, the model did not show it as a significant contributing factor to firm performance. Regarding the participation in professional events, the results showed that the more entrepreneurs were engaged in such networking activities, the better their business performed.

Table 3: Effect of networking activities on firm performance

	Coef.	P>z		Coef.	P>z
Associations	0.082	0.489	**Age. Adult (35-60years)**	-0.782***	0.000
Organizations for advice	0.129**	0.035	**Age. Old (> 60years)**	-1.556***	0.000
Organizations for information on resources	0.210***	0.007	**Education. Primary**	-0.221	0.508
Organizations for knowledge and capacity	-0.213***	0.005	**Education. Secondary**	-0.279	0.349
Individuals for advice	0.016	0.544	**Education. University**	-0.160	0.606
Individuals for information on resources	-0.019	0.583	**Firm age**	-0.024**	0.013
Events	0.052***	0.001	**Firm size**	-0.004	0.694
Gender. Male	0.320	0.100	**Access to finance**	0.058	0.422
			Sector. Processing	0.042**	0.022
			Sector. Services	0.298	0.199

*** $p < 0.01$, ** $p < 0.05$ and * $p < 0.10$

Discussion

Knowledge networks are important assets for firms. They complement internal human capital by extending firm's access to additional knowledge and resources that may form a comparative advantage. In this research, we analyzed the participation of agricultural entrepreneurs in knowledge networks and how this affects the performance of their firms. The study revealed that agricultural entrepreneurs have access to about seven knowledge network channels used to acquire information, knowledge, and capacities, combining both formal and informal networks. Thus, beyond the internal knowledge network generated by the business owner and its human resources (Caloghirou et al. 2004) and extension services (Gbêhi and Leeuwis 2012) that might be considered as important sources of knowledge, agricultural entrepreneurs in Benin have access to additional external knowledge. Knowledge networking activities are mainly pursued through professional associations, organizations, individuals, and events. Participating and valuing knowledge networks are of critical importance in the African context where entrepreneurship rate is the highest in the world (AfDB 2017). Indeed, enterprises especially at the nascent phase resort less on the use of human capital investments as a source of skills and much more on self-taught skills and people in their social networks (Mamabolo et al. 2017). Therefore, institutions supporting startups in Africa should invest and facilitate access of nascent firms to knowledge network channels. They can do so by

reinforcing the capacities of those channels in the provision of knowledge services and by promoting collaboration among them.

All agricultural entrepreneurs regardless of their profiles were engaged at least in one form of KN. Entrepreneurs included in their networks both organizations and individuals to get advice, information on resources, and capacity building opportunities. Many of them also belong to a professional association. However, we found that participation in KN varies with the socioeconomic characteristics of agricultural entrepreneurs. For example, male, old, and more educated entrepreneurs who are active in the primary sector were more likely to have active memberships with a professional association. This is a clear indication that professional associations are not well inclusive in the agricultural entrepreneurship ecosystem in Benin. Beyond the visibility issue (lack of information), this low engagement of professional associations in the agricultural entrepreneurship ecosystem may be related to the geographic location and the restricted scope of these associations. For instance, professional associations are concentrated on primary production and less on processing and services. By way of example, PNOPPA-Benin (*Plateforme Nationale des Organisations Paysannes et de Producteurs Agricoles du Bénin*), the largest and most active association is mainly made of entrepreneurs in the primary sector. Also, at the national level, the primary production is the most developed segment. The services sector is still embryonic which explains the fact that they just represented 10% of the sample. Nevertheless, the processing and services sectors must increase their membership in professional associations. This will help increase collaboration among the three segments to ultimately create more added value in the sector and voice their concerns more systemically.

Beyond professional associations, entrepreneurs also actively engaged with different organizations to get advice, and information on resources such as capital and markets. The study found that the utilization of these knowledge networks varies along by type of entrepreneurs. For example, young entrepreneurs made more use of their relationships to get advice; certainly, because they have little knowledge about the management of their agribusiness activities and also several organizations like incubators and entrepreneurship programs targeting youth are offering such services. Similarly, the study found that young people were the ones who referred the most to individuals for advice. Therefore, we can conclude that advice on business management is the most preferred outcome of KN for young people. The implication is that KN that seek active participation of young entrepreneurs should make sure that they can get advice on their businesses.

Agricultural entrepreneurs made more use of their informal networks of individuals than they do formally with organizations; this is more pronounced among women. Such a finding can be explained by two factors. First, it may be an emanation of African culture that is more community-based; people have more tendency to look for information, knowledge, and support in their immediate community and network of individuals. This is even more

pronounced in contexts like the Benin one where it is generally believed that "you need to know someone to succeed. Second, it could also be explained by the fact that entrepreneurs found it more difficult to interact with formal nodes such as government organizations or entrepreneurship programs run by development agencies because of the requirements and procedures that they may have put in place. For example, admission to a mentoring program may be on a competitive basis to select just a few. This is not bad, but organizations should be cognizant of the fact that established requirements and procedures may be a barrier for agricultural entrepreneurs, especially women; so they should proactively attract them to reduce the gender gap and mainstream the concerns and perspectives of women. The participation of agricultural entrepreneurs in informal networks also implies that programs for knowledge co-creation and brokering could also consider integrating the informal networks into their processes and find innovative ways through which they can work with formal networks to increase the outcome for entrepreneurs. In practice, those individuals could be included in formal capacity building programs for entrepreneurs as mentors or resource persons.

Moreover, the study found that participation in knowledge networks positively influence firm performance, congruently to a large body of literature which reported a positive impact of knowledge networks on firm´s strategy and innovation performance (Boschma and Ter Wal 2007, Soo et al. 2004, Wang et al. 2018). However, the quality of the knowledge network matters as knowledge transfer and its outcomes depends on interacting nodes. For instance, de Zubielqui et al. (2019) concluded that knowledge transfers from suppliers (only) influence knowledge quality, and knowledge transfer from suppliers, in turn, has an indirect effect on innovation through knowledge quality. In this study, participating in a professional association does not influence firm performance. Such finding implies that professional associations offer limited high-value knowledge and resources that can be a competitive advantage for agricultural entrepreneurs. However, increased networking activities through professional events or with organizations for advice and information on resources seem to influence firm performance. This suggests that the more agricultural entrepreneurs collaborate with organizations to get advice on the management of their business, or to get information on capital and markets, the better their firms perform. Therefore, advice, and information on capital and markets, are the most important valuable resources for entrepreneurs in knowledge networks. They form the core argument to increase the participation of agricultural entrepreneurs in knowledge networks. For example, they will be more likely to devote time and resources to knowledge networks that will help them develop new products and services to the markets.

However, it is important to nuance the effect of participation in KN on firm performance. First, as it is acknowledged and mainstreamed in the econometric model, other factors affect firm performance (Arregle et al. 2015, Fowowe 2017). Therefore, scholars and practitioners should not overestimate the effect of KN on firm performance. For example, participation in

KN will better improve firms in which there is a knowledgeable human capital that can identify and select which KN channel is more beneficial to the firm and have the capacities to convert the knowledge acquired in KN into assets that can be used by the firm. As such, although agricultural entrepreneurs are advised to participate in KN, they should carefully select which knowledge network and which knowledge networking activities are the most crucial to them and effectively complement a need that was initially identified. For example, our study showed that informal knowledge networking activities with individuals seem not to influence firm performance; therefore, entrepreneurs should reduce such knowledge networking activity by carefully selecting only the ones with clear benefits. Being highly selective and strategic in knowledge networking is particularly important for agricultural entrepreneurs, as knowledge networking opportunities have become overwhelming in recent years. For example, there are more and more professional events that entrepreneurs can attend; more research projects are looking to collaborate with agricultural entrepreneurs. In such a context, entrepreneurs should be aware that the quantity should not overpass quality.

Overall, it is clear from the findings that participating in the right KN is an advantage for agricultural enterprises. As a contribution to higher performance and then likely to endogenous economic growth (Ehrlich et al. 2017), the participation of entrepreneurs in KN should be recommended and supported. Consequently, if this paper stimulates policymakers and practitioners to mainstream knowledge networks' perspective into support to increased contribution of the private sector to agricultural development, then it will have achieved its broader objective.

Limitations

This study was carried out at the national level. Though it offered the possibility to conduct context-specific analyses, it also failed to consider cross-country heterogeneity. Future research could be implemented at a regional level to control for country variability and generate more generalizable findings. A second limitation is related to the measure of firm performance. Although the approach adopted by the study is an acceptable approximation of the performance of businesses, it would be more accurate to use actual reliable sales figures and production/operating costs.

Conclusions

This study explores the participation of agricultural entrepreneurs in knowledge networks and their impact on firm performance. Agricultural entrepreneurs demonstrate complex and strong networking activities, valuing both formal and informal networking channels to acquire information, knowledge, resources, and capacities. The agricultural entrepreneurship landscape in Benin indicates a rich ecosystem of about seven knowledge network channels that complement the knowledge creation processes within the firm. Such networks are

instrumental in interactive learning and innovation. The study also demonstrates that being in the right knowledge network is of utmost importance. Indeed, not all knowledge networks have a positive impact on the performance of the firms. Moreover, the magnitude of the effects varies with networking activities. Overall, participating in knowledge networks is an asset for the performance of the firms and *in fine* for their growth. However, the added value of knowledge networks should not be overestimated; it contributes to firm performance along with other important factors.

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