INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print), 2222-5234 (Online)
http://www.innspub.net
Vol. 16, No. 3, p. 350-356, 2020

RESEARCH PAPER OPEN ACCESS

Characterization of cashew production actors (*Anacardium occidentale* L.) in the Municipality of Djidja in Central Benin

Gloria Peace Souand Tahi[1], Pascal Gbenou[2], Gbodja Houéhanou François Gbesso[3*]

[1]*Laboratoire de Biomathématiques et d'Estimations Forestières, Université d'Abomey-Calavi, Bénin*
[2]*School of Plant and Seed Management and Productions (EGPVS), National University of Agriculture (UNA), BP 43 Kétou, Bénin*
[3]*School of Horticulture and Green Space Management (EHAEV), National University of Agriculture (UNA), BP 43 Kétou, Bénin*

Key words: Cashew, Type of producer, Multifactorial analysis, Djidja, Benin.

http://dx.doi.org/10.12692/ijb/16.3.350-356 Article published on March 29, 2020

Abstract

Cashew plantations are a boom for the socio-economic development of local populations in Benin. The aim of the study is to characterize the actors involved in the cashew production chain in Djidja commune, one of the production areas in Benin. The study was carried out on a sample of 150 producers distributed in the various districts of the commune. However, a multifactorial analysis on mixed data and a hierarchical classification are carried out to identify the categories of producer. A multiple linear regression is then performed to assess the productivity of the plantations according to various parameters. The results obtained show the presence of four categories of producers in Djidja commune. Category 1 producers are characterized by large area of nut production and the purchase of fields. As for category 2 producers, they are characterized by the purchase of fields with an average area of nut production. Category 3 Producers are characterized by the secondary level with a small fieldsthose of category 4 are characterized by land donation with a small field. The significant factors in cashew yield are the mode of individual organization and production expenses. This implies that the increase of one unit of production expenses increases the yield of plantations by 9.25 e-06 while the increase of one unit of the mode of individual organization decreases the yield of plantations of 0.73.

* **Corresponding Author:** François Gbesso ✉ fr.gbesso@gmail.com

Introduction

In all humid tropical regions, the diversification of tropical perennial culture isan necessity (Ruf and Scrhüth, 2013). Indeed, for countries whose economy is strongly linked to agricultural production such as Benin, monoculture based on the promotion of annual crops is a risk for household food security in the presence of climatic change. For that, the integration of perennial species in cropping systems, in particular fruit trees including cashews, is an advantage for the producer (Somé, 2014).

In West Africa, cashew plantations continue to increase. In Senegal, with the cashew plant distribution program initiated by the government in the 1960s, the cashew culture has experienced rapid development (Goujon *et al*., 1973; INADA, 2012). In Benin, the agricultural sector generates around 70% of income and represents 38% of GDP whereas cashew sector is the second export sector after cotton (Tandjiékpon, 2005; UNDP, 2015; MAEP, 2017).

Nowadays, cashew production represents a new source of income for the rural population (Nugawela *et al*., 2006; Tuo, 2007). In fact, the cashew tree is a perennial crop cultivated in Benin, Burkina, Asia, India and in most countries of West Africa. It is less demanding species. It grows on different soil and admits a wide climatic variation (FAO, 1988). Its farming calendar is less restrictive and the peak period of its activity occurs when the agricultural season ends (Somé, 2014).

Cashew tree (*Anacardium occidentale* L.), native of Caribbean and Northeast of Brazil, was introduced to Senegal in 1914 as reforestation species (Samb *et al*., 2018a; 2018b) and nowadays planted for nut production. Cashew products are widely used (Ndiaye, Charahabil and Diatta, 2017). The multitude of uses make the production and exploitation of cashew trees an activity that contributes to the socioeconomic development of several countries in the world (Martin, 2003; Bezerra *et al*., 2007; Ndiaye, Charahabil and Diatta , 2017). The first seeds were imported from Brazil and introduced to Benin in the 1960s. To protect the environment, collective cashew fields were developed in 1963 (MAEP, 2003). In 1967 the cashew cultivation was first organized in terms of production. This first effort was made by the government, which entrusted the National Society for Forest Development (SNAFOR) with the installation of state plantations. At that time, 5324 hectares of cashew trees were installed. At the same time, individual orchards were installed by a few farmers (MAEP, 2003).

Several actors are involved in the organization of the sector. These are: producers, processors, buyers, national federations and associations, NGOs (Gogohounga *et al*., 2019). In Benin, the cashew sector represents an important source of income and is governed by various agricultural contracts. In the center of the country, several agricultural contracts are developed around the cashew sector. These contracts vary according to the producer's environment and the means available for production (Miassi and Dossa, 2018; Gogohounga *et al*., 2019).

In recent years, the cashew tree has occupied a good place in the income of producers. Apart from cotton, the cashew sector is becoming more interesting because the international market is imposing this pace through strong demand. This study aims to characterize cashew production actors in the communes of Djidja in order to propose appropriate solutions for improving production.

Materials and methods

Study environment

Djidja commune is located between 7 ° 08 and 7 ° 43 north latitude, 1 ° 38 and 2 ° 44 east longitude. It is subdivided into seventy-nine (79) villages grouped into twelve (12) arrondissements that are: Djidja, Setto, Dan, Agouna, Oungbègamè, Mougnon, Monsourou, Zounkon, Agondji, Dohouinmè, Outo and Gobaix. The municipality of Djidja extending over 2315km² or 41.66% of the total area of the department of zou. It enjoys a subequatorial climate with 4 seasons (two dry seasons and two rainy seasons).

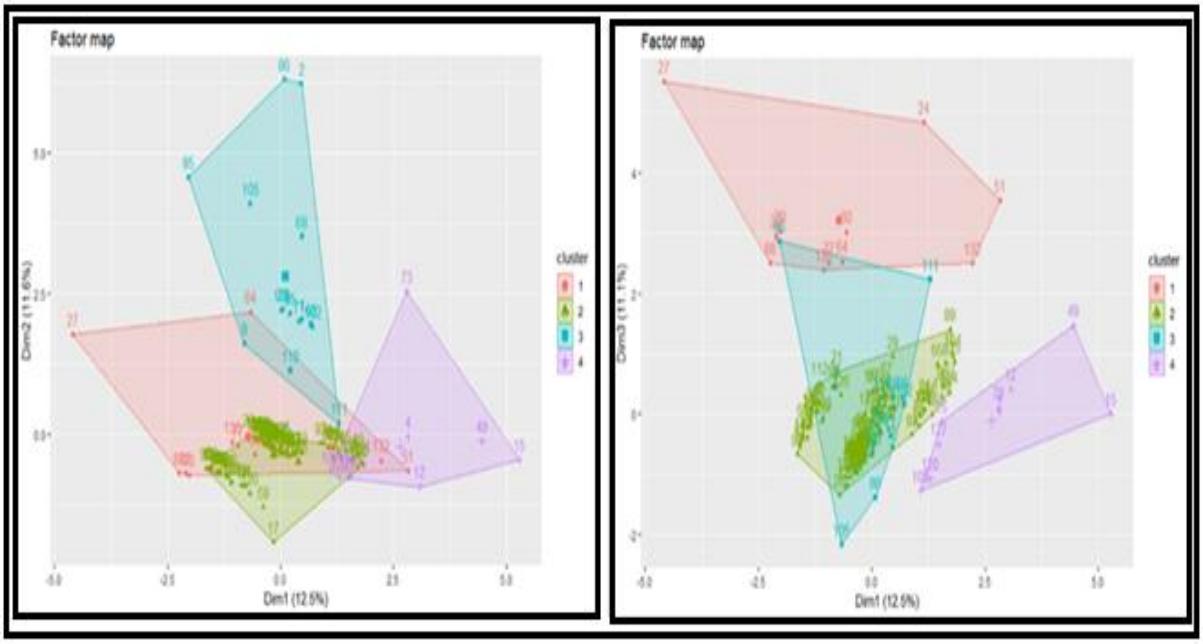

Fig. 1. Representation of the hierarchical classification showing the four groups on axis 1 and 2 and axis 1 and 3.

Data collections

Data collection was carried out in twelve (12) districts of Didjamunicipality. The villages surveyed were chosen according to the distribution of the number of villages by arrondissement. A random sample of 30 people was interviewed to conduct the preliminary survey according to the questionnaire in the survey sheet. The sample size was determined withDagnelie's formula (1998).

$$\mathbf{n} = \frac{U^2_{(\alpha-1/2)} \times P(1-P)}{d^2}$$

n is the sample size; U (1- **α** / 2) the value of the normal random variable for a probability value **α** = 0.05. P is the proportion of producers who have at least 0.5 ha of cashew plantation and d = 0.05 the margin of error which has been fixed taking into account the desired precision.

This has perm to find a sample size of 145 respondents. This size has been rounded to 150 to increase the accuracy of results.

Data processing and analysis

In order to characterize the cashew nuts actors of Djidja commune, factorial analysis on mixed data (FAMD) was performed on the data collected for this purpose. This analysis consists to make the numerous variables homogeneous and examining the relationship which exists between them. The data of departure 1 included 50 individuals with 8 variables (2 Quantitatives and 6 qualitatives). The variables with frequency close to 100% or 0%have been eliminated. Once the FAMD was carried out, an ascending hierarchical classification was carried out with the aim of grouping individuals into groups with similar characteristics. Discriminant analyzes were made on the qualitative variables that discriminate groups. As for variables quantitative ANOVA multiple was performed by taking the group for the independent variable.

To evaluate the yield of cashew nuts, a multiple linear regression was performed on the data after the analysis, the validation conditions for the residuals were checked. At the end, the selection criterion was used to select the best model.

Results

Characterization of production actors

The results show 53.97 % of all the information of data is explained from the 5th axis. We then looked at the first three axes which explain respectively 12.5%, 11.6% and 11.1 of all the information.

Table 1. Correlation between variables and the different dimensions.

Variables	Axis 1		axis2		Axis 3	
	R2	p - value	R2	p - value	R2	p - value
Instruction level	0.444	3.3E-19	0.658	1.6E-34	0.116	1.3E-04
Sex	0.295	9.9E-13	0.060	2.7E-03	0.054	4.4E-03
Ethnic group	0.274	8.5E-11	-	-	-	-
Acquisition mode	0.228	7.4E-09	-	-	0.518	1.1E-23
Profession	0.106	1.0E-03	0.609	3.2E-29	0.222	6.7E-08
Age	0.291	3.4E-04	-	-	0.258	1.6E-03
Planted area	0.254	1.8E-03	-	-	0.589	3.3E-15

On the basis of the most important contributors (Table 1), age is strongly linked to sex and ethnicity variables of the respondents on axis 1. On axis 3, age and area of cashew seeded are strongly linked to the mode of land acquisition.

As for axis 3, the level of education and the profession of the respondents are strongly linked. The ascending hierarchical classification carried out on the FAMD results allow to distinguish four groups of individuals. The first group includes 11 individuals, let 7.33% whom 27.27% are women and 72.73 % of men. As for the second group, it includes 75.33% of the total workforce with 21.23% of respondents are women and 78.77 % of men. Group 3 accounts for 10% of the respondents with 20% women and 80% men.

As for the last group, it includes 6% of all respondents, 100% of whom are men (Fig. 1). After classification, a discriminant analysis was performed on the variables in order to identify the variables that most discriminate each group. Identify the variables that most discriminate against each group.

Table 2. Different groups according to production factors.

??	Estimate	Std - Error	t - value	Pr (> | t |)
(Intercept)	1E + 00	4E-01	3E + 00	0.004 **
Cropped cashew area	3E-03	3E-02	1E-01	9E-01
casual labor	-5th-01	4E-01	1E + 00	2E-01
Family labor	-4E-01	3E-01	1E + 00	2E-01
Individual organization	-5th-01	2E-01	-2E + 00	0.02 *
individual funding	6E-02	2E-01	3E-01	8E-01
fertilizer	-5th-02	2E-01	-3E-01	8E-01
Herbicide	5E-02	2E-01	3E-01	8E-01

The discriminant analysis carried out shows that the area of cashew planted has a highly significant effect on the group (p-value <0.00). Group 1 represents the large producers with more than 10 ha of cashew trees. The producers of this group bought their land. As for group 2, it presents the average producers with 8 ha of cashew trees. The individuals of this group inherited the fields. Groups 3 and 4 include small producers with no more than 5 ha (Fig. 2). Their acquisition mode of field is the gift.

Assessment of the different groups according to production- related factors

The variables “production expenditure” and “individual organization” have significant effects on the yield of cashew nuts. The selection of the model shows a probability value of less than 0.00. increasing a unit of individual labor decreases the yield of cashew by 0.4 while increasing a unit of production costs increases the yield by 9E- 6 (Table 2; 3).

Table 3. Different groups according to production factors.

??	Estimate	Std Error	t - value	Pr (> | t |)
(Intercept)	7E-01	2E-01	4E + 00	0.000 ***
casual labor	-5th-01	2E-01	-3E + 00	0.00 **
production expense	9E-06	8E-07	1E + 01	<2,00E-16

Discussion

The study on the characterization of cashew production actors (*Anacardium occidentale* L.) in the commune of Djidja the center of Benin would be the first that has been carried out on this subject specifically in the area. The adopted methodological approach made it possible to determine and characterize the socio-demographic profiles of producers according to the state of cashew plantations in the different production areas. The study shows that the majority of cashew plantation owners are young people (67.11%) with an average of 34 years of age, who would have acquired the plantations by inheritance. The results obtained by Ndiaye *et al.* (2017), reveal that the planters are mainly elderly people. Their age is between 25 and 87 years with an average age of 57 years. Also, the study of Samb *et al.* (2018) show that the majority of cashew planters have an average age of 51 years.

Our results are far from those of Mole (2000) in Mozambique, Balogoun *et al.* (2014) in Benin, Ndiaye *et al.* (2017) and Samb *et al.* (2018) in Senegal who have found respectively 48 years, 51 years, 49 years, 57 years and 51 years. Also, this study reveals that young people increasingly inherit and are interested in cashew. Among 50% of planters have inherited the land.

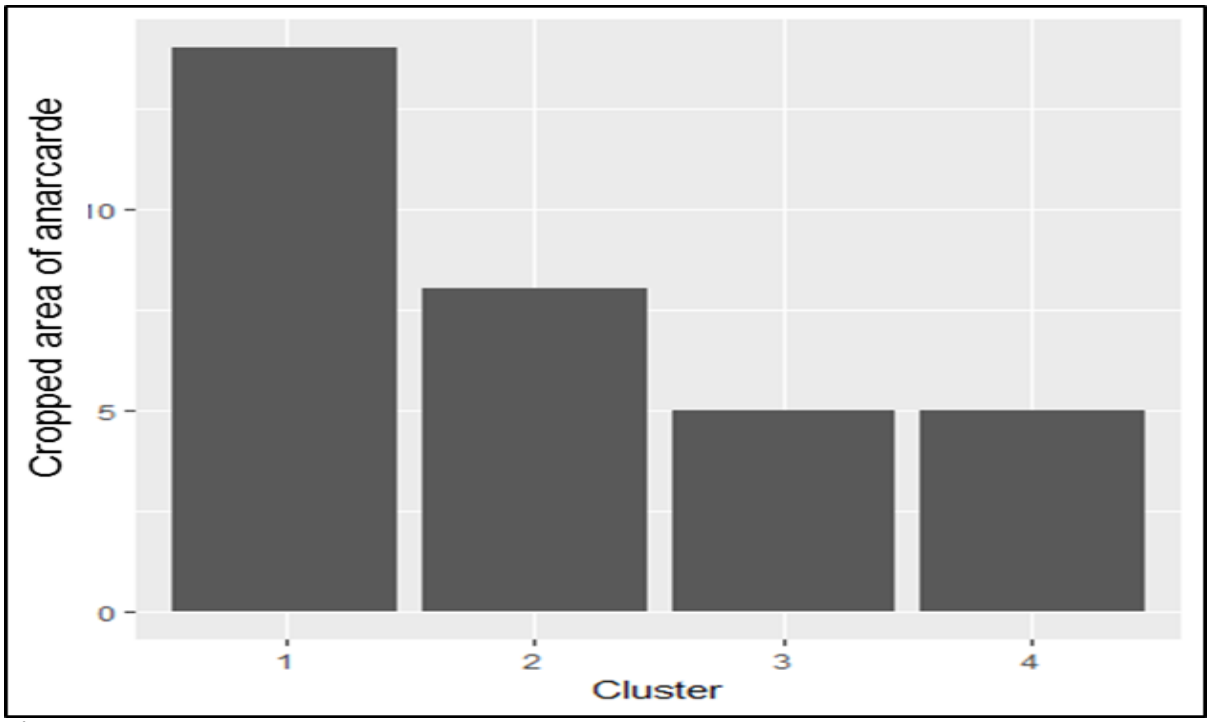

Fig. 2. Representation of the area according to the different groups.

Men invest more in cashew cultivation than women. Gender in the segmentation of production activities is a problem influenced by socio-cultural factors (Sokemawu, 2015). The plantations are generally under the control of men. These results corroborate with those of Tandjiekpon (2005) who reveal that 95% of the plantations are managed by men against 5% for women. The production of cashew trees is more the men business than that of women. It represents 79.73% of producers surveyed (79.73%.

This leads Sokemawu (2015) has argued that the segmentation of production activities is an issue influenced by the socio-cultural factors. These results are corroborating for those of Tandjiekpon (2005) who reveal that 95% of the plantations are managed by men and Samb *et al.* (2018) which reveal an average 93% of the plantations are managed by men.

The practice cultivation observed in all areas of study based on the extensiveness of the systems of production. The area averages used in all of the region are in quite important and varies between 5 to 10 ha in compared those obtained by Tandjiekpon in 2005. This average is similar to the result obtained by Somé (2014) in the two regions of Burkina Faso (7.71 ha) with yield largely in below the average world which of 500 kg/ha (Maftei, 2014). According to Ndiaye *et al.* (2017), the area of plantations varies from one farm to another. Small farms are around 1 to 2 ha and represent 52% of the plantations for all sites. In the large farms, they vary from 10 to 24 hectares. Our results don't agree with those obtained by Samb *et al.* (2018) whose surveys show that the size of a cashew plantation is 3.4 ha. However, plantations of cashew have a tendency to increase (PAEFK, 2003). This justifies the results obtained by Tandjiekpon (2005), an average area of 3.2 ha of cashew orchards in Benin. Several factors are at the basis of the productivity of cashew such as the quality of the workforce, the financial and material means and the state of soil fertility.

Conclusion

The lack of information on cashew production is a handicap to the development of the sector. Through this study, it appears that men are the main holders of orchards. The producing population is old and made up of both natives and non-natives. The large size of households is an asset for maintenance work, while the profitability of the activity and poverty justify production as a priority. The study of the characteristics of the orchards shows that the essential factors are the extensiveness of the areas. Family labor constitutes the main labor force against low employment of wage labor; in addition, there is a low use of inputs. With regard to the typology of producers, a total of five classes have been identified.

These differ from by the age of the farmers, the area of the orchards, the level of yield, the production costs as well as the profit margin achieved. In general, these results make it possible to judge the credibility of the cashew sector in particular, the production link.

References

Bezerra MA, Lacerda de CF, Filho EG, Abreu de CEB, Prisco JT. 2007. Physiology of cashew plants grown under adverse conditions. J. Plant Physiol **19(4),** 449-461.

Dagnelie P. 1998. Statistiques théoriques et appliquées. Brussels : De Boeck.

Gogohounga M, Labiyi IA, Gomez AC, Miassi YE, Ollabode N, Yabi JA. 2019. Caractérisation des formes de contractualisation dans la filière anacarde au Bénin. Agronomie Africaine **31(2),** 173-186. https://www.ajol.info/index.php/aga/article/view/190369

FAO. 1988. Traditional food plants. FAO Food and Nutrition Paper, **42**, 593.

FAO. 2012. Rapport final sur la situation mondiale de l'alimentation et de l'agriculture 2012 : investir dans l'agriculture pour un avenir meilleur.

Goujon P, Lefèbvre A, Leturcq PH, Marcellesi AP, Praloran JC. 1973. Etudes sur l'anacardier. Bois et Forêts des Tropiques **151,** 27-29. https://revues.cirad.fr/index.php/BFT/issue/view/2152

INADA. 2012. Situation de la filière anacarde dans le Balantacounda. Casamance/Sénégal, INADA, **1**, 20.

Konan C, Ricau P. 2010. La filière anacarde en Côte d'Ivoire : acteurs et organisation, Compte-rendu de missions, Mars-Juillet.

MAEP. 2017. Plan Stratégique de Développement du Secteur Agricole (PSDSA) : Orientation stratégiques

2025. République du Bénin.

MAEP. 2003. Diagnostic Global de la Filière Anacarde au Bénin, projet d'amélioration et de diversification des systèmes d'exploitation (PADSE).

Maftei M. 2014. Le marché international de la noix de cajou et les pays africains : évolution et perspectives. Plant regeneration through direct somatic embryogenesis on seed coat explants of cashew (*Anacardium occidentale* L.). Scientia Horticulturae **98,** 299–304.

Miassi YES, Dossa FK. 2018. Socio-economic determinants of the adoption of agricultural contracts : Case of cashew farmers in North-Eastern Benin. International Journal for Research In Agricultural And Food Science **4**, 34-45.
https://gnpublication.org/index.php/afs/article/view/331/323

Ndiaye S, Charahabil MM, Diatta M. 2017. Caractérisation des Plantations à base d'anacardier (Anacardium occidentale L.) dans le Balantacounda: cas des communes de Kaour, Goudomp et Djibanar (Casamance/Sénégal). European Scientific Journal édition **13,** 242-257.
www.doi:10.19044/esj.2017.v13n12p242

Nugawela P, Baldé A, Christophe P. 2006. La chaine de valeurs anacarde : analyse et cadre stratégique d'initiatives pour la croissance de la filière. USAID-Sénégal.

PNUD. 2015. Rapport national sur le développement humain 2015 : Agriculture, Sécurité Alimentaire et Développement Humain au Benin. Cotonou, Bénin.

Ricau P. 2013. Connaître et comprendre le marché international de l'anacarde. RONGEAD.

Samb CO, Touré MA, Faye E, Ba HS, Diallo AM, Badiane S, Sanogo D. 2018. Caractéristiques sociodémographique, structurale et agronomique des plantations d'anacardier (Anacardium occidentale L.) du Bassin arachidier et de la Casamance / Sénégal, Journal of Animal & Plant Sciences **38(3),** 6307-6325.
http://www.m.elewa.org/JAPS

Samb CO, Faye E, Dieng M, Sanogo D, Samba ANS, Koita B. 2018. Dynamique spatio-temporelle des plantations d'anacardier (*Anacardium occidentale* L.) dans deux zones agro-écologiques du Sénégal Afrique SCIENCE **14(3)**, 365-377.
http://www.afriquescience.net/numero3_vol_14.php#

Sokemawu K. 2015. Le Développement de la filière anacarde dans la préfecture de Tchamba au Togo : vers une nouvelle stratégie paysanne de diversification des revenus agricoles. Revue de Géographie de l'Université d'Ouagadougou **4(2),** 22.
http://revuegeographieouaga.com/2020/02/14/

Somé LFMC. 2014. Analyse socio~conomique des systèmes de production d'anacarde au Burkina Faso : cas des régions des Cascades et des Hauts-Bassins, Mémoire d'Ingénieur du Développement Rural, Sociologie et économie rurale, Université Polytechnique de Bobo-Dioulasso, Burkina Faso.

Tandjiékpon AM. 2005. Caractérisation du système agro forestier à base d'anacardier (Anacardium occidentale L.) en zone de savane au Bénin. Mémoire pour l'obtention du Diplôme d'Étude Approfondie (DEA), Faculté des Lettres, Arts et Sciences Humaines, Université d'Abomey-Calavi, Bénin.

Tuo G. 2007. Analyse de la filière anacarde en Côte d'Ivoire : stratégie de développement et lutte contre la pauvreté. Mémoire de DEA, Université de Bouaké.

USAID. 2006. Etude de la filière de l'anacardier dans la vallée du Yamé au Mali.