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Introduction of *J. curcas linn.* in farming system and traditional utilization facing climate change in Northern Benin

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ABSTRACT

Jatropha curcas is multipurpose species which draws nowadays, a resurgence of national and international interest. However, the importance of the plant for the population is still poorly understood. The study was conducted in all departments of the Sudanian region of Benin. Benin's map zoning and ethnolinguistic map are the main field materials. In each department, two cities were chosen. By town two survey areas were chosen according to two main criteria: the ethnic variability and the importance of the species for the populations which are determined by a survey. Focus groups and semi-structured interviews were used to determine

population knowledge. The introduction of *J. curcas* in agroforestry system, use form and use value were collected. Excel and Minitab 14 were used to perform the analysis. The results indicate that Bariba, Otamari, Yoruba and Dendi are favorable to the introduction of *J. curcas* in agroforestry system and cultivated in the fields while recognizing its fertilizer role on poor soils. Yoalokpa, Hausa, Fon and Peulh are unfavorable to the domestication of the species. This local population Northwest Benin uses the *J. curcas* in medicine, bioenergy, magical practices, making hedges, food, cosmetic, herbal medicine and for leisure. The medicinal use of *J. curcas* is the most cited by local people (over 70%). The organs mostly used are the root (25.08%) and the leave (24.09%) of the total use. Bariba, Otamari, Yoruba and Dendi have a large knowledge about this species.

Keywords: Agroforestry, traditional utilization, fertilizer, climate change.

1. INTRODUCTION

Since the end of 1960s, all the countries of West Africa, is experiencing worsening climate variability (Boko *et al* 1993). The adverse effects that climate change cause changes in the physical environment or biota resulting from climate change which have significant deleterious effects on the composition; resilience of ecosystem productivity; on the socio-economic functioning systems; on health and human welfare. This phenomenon leads to land degradation, reducing the productive capacity of land, pastures and woodlands where is increasing the demand for food, fiber, fuel, fresh water, fodder, energy for households and income (FAO 2008. For remedying this situation, crop diversification is a priority to stabilize farmers' incomes. However, agricultural diversification is necessary for increasing farmers' income and thus stimulates the rural economy and reduces poverty. It is in this context that West Africa countries choose *J. curcas* as one able crop to guarantee their expectations. It grew everywhere as so as poverties lands. The introduction of *J. curcas* in agricultural systems are generated a lot of benefits. Socio-economically, the seeds of *J. curcas* produce oil readily convertible into biodiesel as a biofuel and used in the production of soap (Francis *et al* 2005). The oil of *J. curcas* has been found useful for veterinary use as an insecticide (Gubitz *et al* 1999). Despite this importance, limited information is available on the perception of domestication of *J. curcas*. This study was designed to assess the knowledge of population about the domestication of *J. curcas* and the knowledge variability according to the different sociolinguistics groups for reducing climate change impact in Northern Benin.

2. MATERIALS AND METHODS

2.1. Study area

The study area is located in northern Benin and includes the Departments of Borgou and Alibori (51082 km2), Atacora and Donga (31200 km2). It is situated in the Sudanian Zone between latitude 8°5 and 12°5 north with tropical climate (Boko *et al* 1993). The dry season covers October to April and follows a rainy season that extends May to September and is characterized by significant rainfall variations. The average temperature is about 28°C with variations of 17 ° C to 35 ° C and the daily thermal amplitude oscillate to 8°C during the period of harmattan. The PETP balances are reported seven dry months (October to April). August is the wettest and the normal rainfall is between 900 m to 1000 mm North West of Atacora and between 1200 mm and 1300 mm in Donga. The mountain presence modifies the area climate since we recorded rainfall about 1300 mm (Houndénou *et al* 1998). During the year, the relative humidity varies between 26.8% and 80.5% (Avohou 2003).

2.2. Sampling

The study was conducted through the distribution range of the species all of the departments of the Sudanian zone in North Benin. From the zoning map and the ethno-linguistic map of Benin, two townships were chosen by department. The townships were selected according to ethnic group variability and the importance of species for the population which is determined by an exploratory investigation. The informants were selected by the criterion of possession of at least one foot of *J. curcas*. During the investigation, the informants were randomed and the number of informants to sample in each township for the investigation was computed using the normal approximation of the binomial distribution (Dagnelie 1998).

$$N = \frac{Pi(1-Pi)\ U^2_{1-\alpha/2}}{d^2}$$

Where N = 282: sample size, Pi represents the proportion of people who have used once the organs of *J. curcas*, $U_{1-\alpha/2}$ is the value of the Normal random variable corresponding to a probability value of 1-ά/2. For a probability value of 0.975 (or a = 0.05), $U_{1-\alpha/2}$=

1:96; d is the margin error of the estimation of any parameter to be computed from the survey and a value of 8% (Assogbadjo *et al* 2011)

Table 1 Distribution of joint study following the surveyed workforce

departments	Township randomed	sociolinguistics groups	language families	Investigated numbers by township
Alibori	Malanville	Zerrma, Hausa Dendi	Songhaï	39
	Kandi	Dendi, Bariba	Gur	36
Borgou	Kalalé	Boo, Fulani	Mande	38
	Tchaorou	Nagot, Fon Bariba, Dendi	Mdefoid	42
	Tanguiéta	Wama, Berba, Biali	Gur	31
Atakora	Boukoumbé	Otamari	Gur	32
	Ouaké	Lokpa, Fulani, Fon	Gur	30
Donga	Bassila	Nagot, Anii, Fon	Déroidi	34
	Total interviewee			282

2.3. Data collection

The data were collected based on the work of (Assogbadjo *et al* 2008). Data were collected using semi-structured interviews. Interviews were conducted orally with sometimes the assistance of a local translator. Individual semi-structured interviews were used to collect data from the sampled participants. However, some focus group discussions were also done to check the reliability of the information gathered during the individual interviews. The data collected on each investigated include: perception of population about introduction of *J. curcas* in Agroforestry system, categories uses and uses forms of the species.

2.4. Data analysis

The respondents are grouped by ethnicity, gender and age. Each ethnic group was split in six subgroups: young men (JH), adult men (AH), old men (VH), young women (JF), adult women (AF), and the old women (VF). Young people are the persons who are aged <30 years, adult are those between 30 and 60 years, old are the persons who have over 60 years (Assogbadjo et al 2008). The relative frequency of each feature is determined for each subgroup. This parameter is defined as the proportion of respondents belonging to the group that identified the special character of *J. curcas*. The different sociolinguistic groups met were grouped into larger sets that are eight (8) sociolinguistic groups: Bariba, Dendi, Fon, Hausa, Otamari, Peulh, Yoalokpa and Yoruba. The organs uses of *J. curcas* are grouped into types of uses. The collected data were entered in the EXCEL spreadsheet. A data array comprising the relative frequencies of the features of *J. curcas* according subgroups is submitted to principal component analysis (PCA) using Minitab 14. This statistical method is used at each stage of this study to describe the relationship between the choices of characteristic of *J. curcas* by local population. It is also used to identify the best characteristic explain patterns of variation according to different subgroups. Use value were calculated by sociolinguistic group and performed by Principal Component Analysis (PCA) to better describe the relationship between the organs and sociolinguistic groups considered. To describe the different uses of *J. curcas* according to the different sociolinguistic categories, matrix containing the use of *J. curcas* organs by sociolinguistic groups and categories of ages and sexes were submitted to principal component analysis (PCA). Ethnobotanical indices are calculated to appreciate the diversity of use of *J. curcas* by local population in North Benin.

3. RESULTS

3.1. Knowledge of local population about introduction of *J. curcas* in agroforestry system

3.1.1. Names of J. curcas in local language

The different sociolinguistics group's respondents designated *J. curcas* by different names. The table below shows the grouping of different sociolinguistic groups and different local names of *J. curcas*

Table 2 Locals names of J. curcas in different sociolinguistics groups curcas in North Benin

sociolinguistic groups	Ethnic groups	local names	Transcript names
Bariba	Bariba, Boo, Boko	Bukatunu	Resurrection
Dendi	Dendi, Zerma	Bukatunu	Resurrection
fon	Fon, Goun, Aïzo, Mahi, Ouémé, Torri Kotafon, Tofin, Seto	Kpotinwéwé,gbaguidi kpotin, gnonkpotin.	White Jatropha, King tree, teeth tree.
Hausa	Hausa	Bukatunu	Resurrection
Otamari	Ditamari, Berba, Wama, Natimba, Otamari, Yendé Gourmantché.	Bukatunu	Resurrection
Peulh	Fulani Fulfulde, Gando	Atabaliou	Resurrection
Yoa Lokpa	Yoa Lokpa, Anii, Koto-Koli Windji-Windji, Kabyè, Soruba Biyobè, Tanéka	Atabaliou	Resurrection
Yoruba	Nagot, Yoruba, Idaasha, chabe,holli-ecd, Ife, Mokolé	Igui onan shorokanlè, bukatunu, Akpokoro, opupu	Difficult way tree

3.1.2. Knowledge of population about introduction of J. curcas in agroforestry systems

The knowledge about introduction of *J. curcas* in agroforestry system various according to sociolinguistic group. The Figure5 showed the favorable percentage of sociolinguistic group to introduction of *J. curcas* in the agroforestry system in North Benin. The results indicated that Bariba are mostly favorable to the introduction of *J. curcas* in agroferestry system (45%), followed Otamari, Yoruba and Dendi (25%, 15% and 10%). The Yoalokpa, Fon, Peulh and Haussa are less favorable.

3.1.3. Farmer's knowledge about cultivated of J. curcas as plantation

The Figure 5 indicated the percentage of farmer who is favorable for cultivated of *J. curcas* as plantation. First of all, 65% of Bariba are favorable for cultivated of *J. curcas* as plantation. Second, Yoruba, Otamari and Dendi respectively (43%, 37% and 15%). Then, Yoalokpa, Fon, Peulh and Haussa are less favorable.

3.1.4. Farmers' knowledge about the fertilizing function of J. curcas on poor land

The farmers' perception requires knowledge varied with personal experiences of the producer. The Figure1 indicated the percentage of producer who recognize fertilizer role of *J. curcas* on poor land. This figure indicates that Bariba, Otamari, Yoruba and Dendi were acknowledged fertilizing role for *J. curcas* on poor land respectively (40%, 40%, 25% and 15%). Then Yoalokpa, Hausa, Fon and Peulh were recognized less the fertilizing role of *J. curcas*.

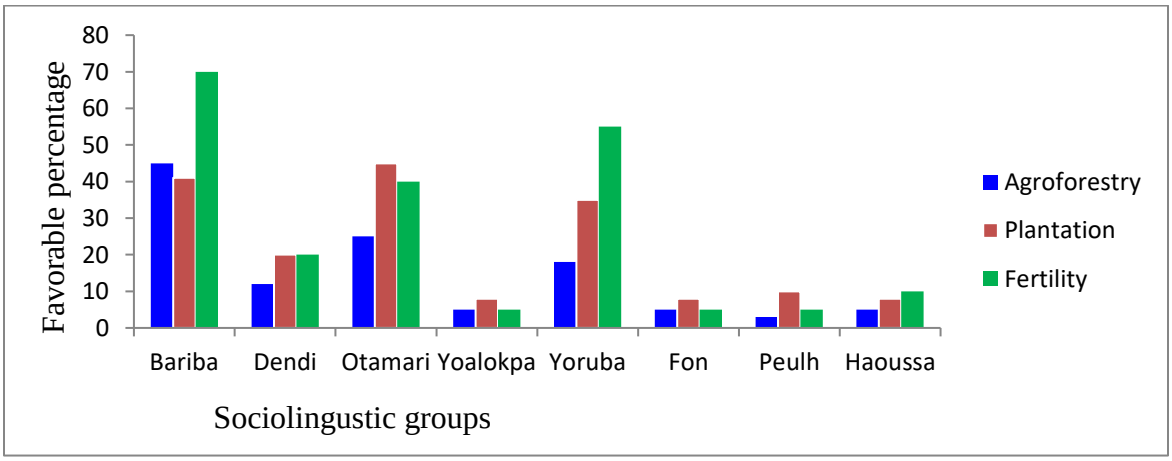

Figure 1 Favorable percentage of sociolinguistic groups

3.1.5. Knowledge of population about introduction of J. curcas in farming system according to age and sex categories

The results showed that adult men are mostly favorable to the introduction of *J. curcas* (60%), adult women (35%). Then young and old men are moderately favorable to the introduction of species in the agroforestry system (30%). Young and old women are less favorable. Considering the sex respondent, over (90%) of men are favorable to introduction of *J. curcas* against (55%) of women. According to age respondent, (90%) adults are favorable to introduction of *J. curcas* in agroforestry system, young people (42% and 36%) old.

3.1.6. Knowledge of population about cultivated of J. curcas as plantation

As different sociolinguistic groups, the perception respondents changed according age and sex. The Figure 6 informed about the different perceptions of the individuals surveyed according age and sex. The analysis indicated the adult men are mostly favorable to the plantation of *J. curcas* (47%), then young and adult men and women respectively (18% and 15%). According to old men, young and old women, they are less favorable to cultivate *J. curcas* as plantation respectively (10%, 8% and 4%). Regarding the sex respondent, 75% of men are favorable for cultivation as plantation against 27% of women.

3.1.7. Perceptions of population about cultivated of J. curcas on marginal soils

The population perception about cultivated *J. curcas* on marginal soils according to age and sex are illustrated in Figure 6. The results indicated that adult men recognized fertilizing role of *J.curcas* on marginal soils (60%). Adult women, youth and old men recognized less fertilizing role (35%, 22% and 22%). A little old woman recognized fertilizing role of *J. curcas*. Considering sex, men are largely recognized fertilizing role of *J. curcas* (90%) against (50%) of women.

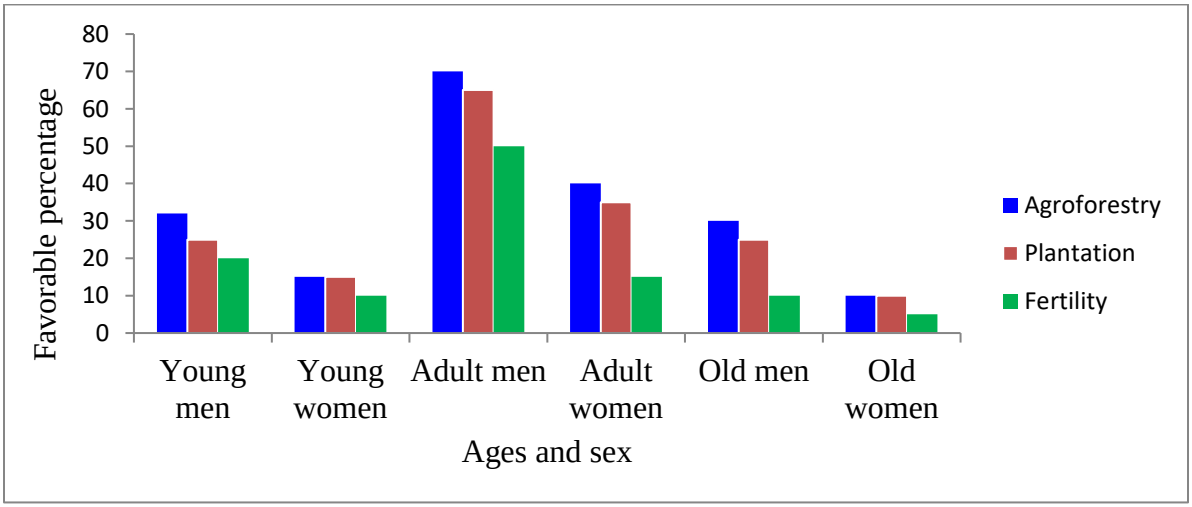

Figure 2 Favorable percentage according to age and sex categories

3.2. Use value of J.curcas

3.2.1. Organs uses diversity of J.curcas according ages and sex

A principal component analysis (PCA) was performed on *J.curcas* organs and different categories age and sex. The results revealed that the first two components explained (84.2%) of the observed variation. Table 3 showed the coefficients of correlation between the different organs of *J.curcas* with the first two PCA axes.

Table 3 Correlation between the different organs on the axes

variables	PC1	PC2
Leave	-0.489	0.106
Seed	0.138	-0.400
Fruit	-0.280	-0.544
Stem	-0.328	-0.505

Root	-0.431	0,260
Bark	-0.311	0.451
Latex	0.523	0.079

We noticed from this table that, the use of latex is associated with low the use of the leave and root (axis1). Moreover, the use of the bark is accompanied by a low use of the seed, fruit and stem (axis2). Figure 3 and 4 showed the projection of the different ages, sex and organs in the system axes 1and 2 respectively. Taking into account the figures3 and 4; and data from Table 3, we deduced first of all that young women use mostly latex and fruit of *J.curcas*. Contrary to young men, adult men, adult women, old women and old men who use the leaves, seed, stem, root and bark; but have less knowledge of latex and fruit. Second, young women, adult men and old women use mostly the leaf, root, latex and bark; as opposed to young men, old men and adult women use mostly the stem, seed and fruit; but have less knowledge on the leave, seed, stem, root and bark.

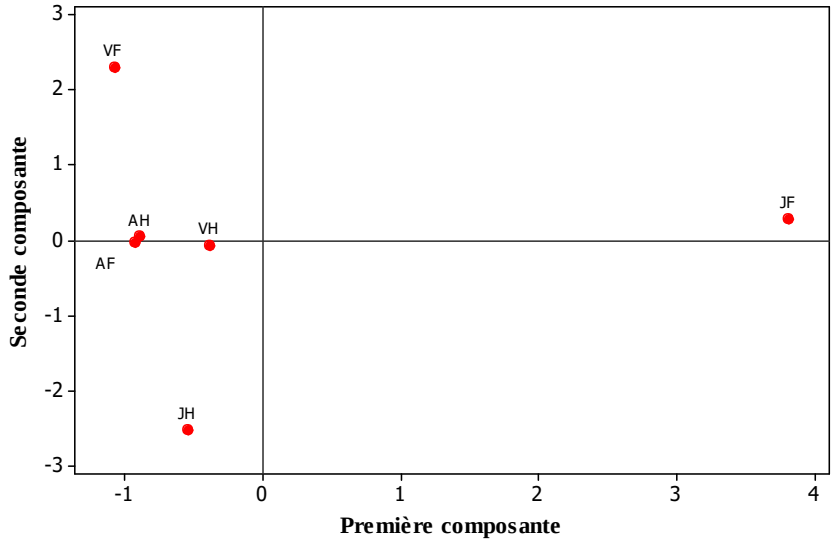

Figure 3 Projection of different categories ages and sex on different axes

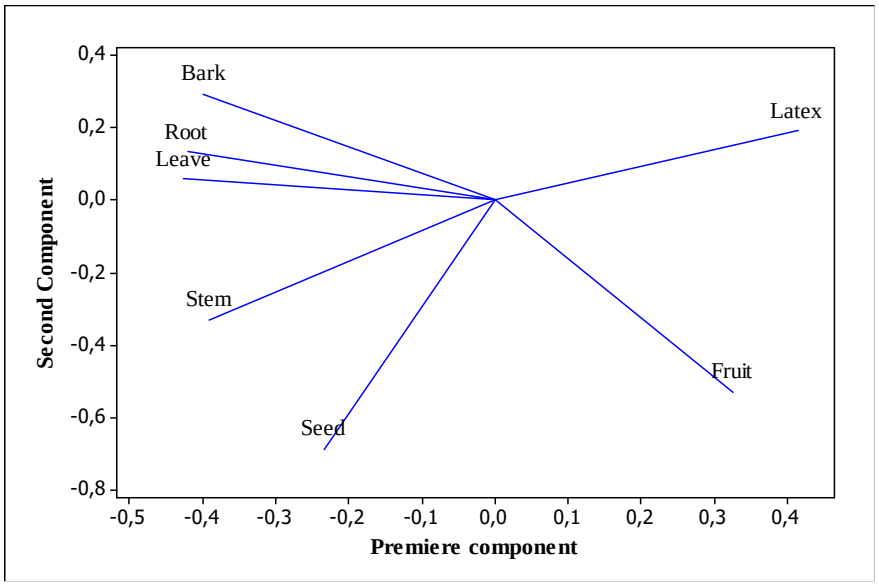

Figure 4 Correlation of *J. curcas* members used with the two components

3.2.1. Sociolinguistics groups and usage of uses of J. curcas

To appreciate the types of used of *J. curcas* with different ethnic groups (Bariba, Dendi, Otamari, Yoruba Yoalokpa, Fon, Fulani and Hausa) a principal component analysis (PCA) was performed. The analysis revealed that the first two components explained (57.9%) the observed variation. Table 4 showed the coefficients of correlation between the different types of used with the first two PCA axes.

Table 4 Correlation between the types of used on the axes

Variable	PC1	PC2
Food	-0.509	-0.299
Bioenergy	0.525	-0.218
Cosmetic	0.081	-0.659
Hedge	-0.009	0.118
Leisure	0.522	-0.249
Magic	0.173	0,038
Medicinal	0.238	-0.166
Herbal medicine	-0.316	-0.569

Analysis of table 4 revealed that the axis 1, leisure, bioenergy and food usages are represented on this axis 1, but magical and medicinal usages despite their relatively low correlations (0, 173 and 0.238) with this axis 1 are interpreted as there because they are better represented than axis 2. Moreover, the food usage is negatively correlated on this axis 1. Thus, a high usage of *J. curcas* organs for leisure, bioenergy, magical and medicinal is associated with fewer usages for food. On axis 2, cosmetics and herbal medicine usages are represented. The hedge usage despite its relatively low correlation (0.118) with this axis will be interpreted; because is better represented. Furthermore, the cosmetic and herbal medicine usages are negatively correlated with this axis 2. Proper, herbal medicine and cosmetic usages are associated with fewer for hedge. Figure 5 and 6 showed the projection of the different sociolinguistic groups in the system axes 1 and 2 respectively. Taking into account the figures 5 and 6; and data from Table 4, we deduced that Yoruba, Otamari and Bariba used *J curcas* organs for medicinal, cosmetic, bioenergy, hedge, leisure and magic, but rarely used the organs for food and herbal medicine. In contrary, Hausa, Fon and Dendi used the organs of *J. curcas* for food and herbal medicine but used it fewer for medicine, cosmetics, bioenergy, hedge, leisure and magical (axis 1). The results revealed that Yoalokpa, Yoruba and Peulh are used *J. curcas* organs for medicinal, herbal medicine, cosmetic, food, bioenergy and leisure, but weakly used *J. curcas* for hedge and magic. However, Hausa, Dendi, Fon, and Otamari Bariba are used *J. curcas* for hedge magic, but rarely for medicinal, herbal medicine, cosmetic, food, bioenergy and leisure (axis2). Taking into account axis 1 and 2, Bariba and Otamari are located on the positive side of the axis 1 and axis 2 and used mostly *J. curcas* for magic and hedge, but use fewer *J. curcas* for medicinal, food, cosmetics, Bioenergy, leisure and herbal medicine. Contrary, Peulh and Yoalokpa are located on the negative side of the axis 1 and 2; and used *J. curcas* for food and herbal medicine, but used rarely for magical, hedge, cosmetic, medicinal, bioenergy and leisure.

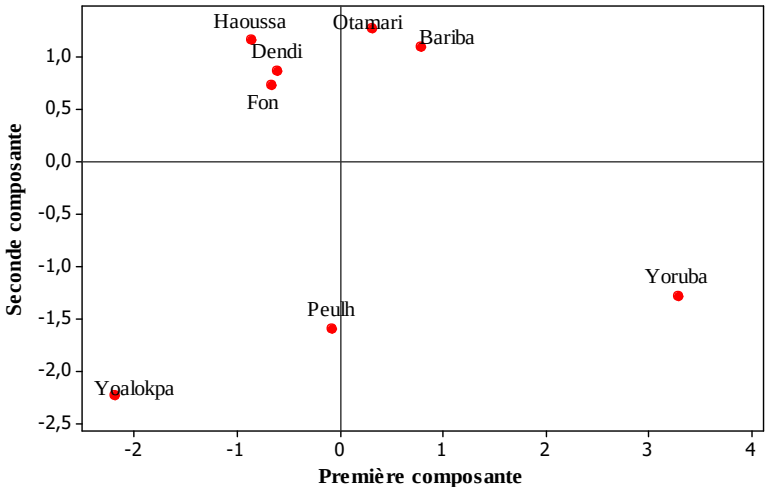

Figure 5 Projection sociolinguistic groups in the system axis1 and 2

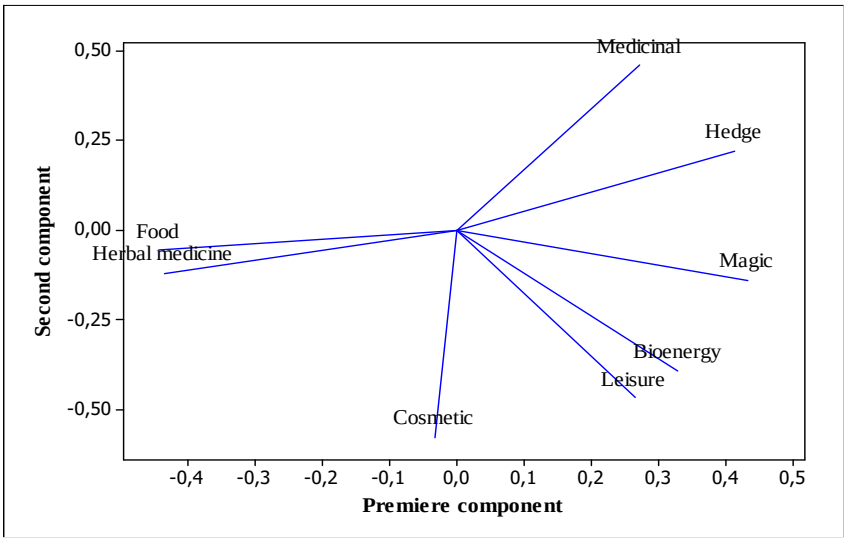

Figure 6 Correlation different usages of J. curcas by sociolinguistic groups with the first two components

3.3. Diversity index and equitability of use

3.3.1. Diversity index and equitability of used according to the sociolinguistic groups

The results of diversity index are contained in Table 5. These results indicated that Bariba, Otamari, Yoruba and Dendi presented higher diversities index respectively (0.7 ± 0.01), (0.67 ± 0.02), (0.6 ± 0.03) and (0.4 ± 0.003). For the equitability index, the result indicated that Bariba, Otamari, Yoruba and Dendi have the highest index respectively (0.72 ± 0.01), (0.5 ± 0.02), (0.48 ± 0.03) and (0, 3 ± 0.03). The sociolinguistic groups such as Fon, Yoalokpa, Peulh, Haussa and have low diversity index respectively (0.25 ± 0.05), (0.21 ± 0.03), (0.2 ± 0.07) and (0.19 ± 0.01). Then they have also the lowest equitability index.

Table 5 Index of diversity and equitability according to sociolinguistic groups

Sociolinguistics groups	ID	IE
Bariba	0.7±0.01	0.72 ±0.01
Dendi	0.40±00	0.3±0.03
fon	0.25±0.05	0.2±0.05
Hausa	0.190.01	0.16±0.00
Otamari	0.67±0.02	0.5±0.02
Peul	0.20±0.07	0.11±0.07
Yoalokpa	0.219±0.03	0.19 ±0.03
yoruba	0.6±0.03	0.48±0.03

3.3.2. Diversity index and equitability usages according to age and sex

The diversity index and equitability were calculated from the distribution of knowledge and the degree of homogeneity according to age and sex (Table 6). These results indicated that the old women, old men and adult women have the highest diversity index (0.7 ± 0.11). Regarding equitability index, old women, old men and adult women have the highest values respectively (0.73 ± 0.01) and (0.65 ± 0.01).

Table 6 Index of diversity and equitability according to age and sex

Age and Gender	ID	IE
Young men	0.07± 0.02	0.1± 0.02
Young women	0.06± 0.01	0.14± 0.01

adult men	0.3± 0.02	0.26± 0.02
adult women	0.46± 0.02	0.52± 0.02
old men	0.61± 0.10	0.65± 0.01
Old women	0.7± 0.11	0.73± 0.01

3.3.3. Consensual value according to sociolinguistic groups

The consensual value according sociolinguistic groups were illustrated in Table 10. The results show that Hausa, Peulh and Otamari have the highest consensual value (0.22 ± 0.00) (0.22 ± 0, 02) and (0.22 ± 0.07), then Yoalokpa and Bariba (0.21 ± 0.01) and (0.2 ± 0.08). Fon, Dendi and Yoruba have the lowest indexes (0.18 ± 0.07), (0.18 ± 0.06) and (0.17 ±, 06).

Table 7 Consensus value according to sociolinguistic groups

Sociolinguistics groups	CTU
Bariba	0.2±0.08
Dendi	0.18±0.07
fon	0.18±0.06
Hausa	0.22±0.00
Otamari	0.22±0.02
Peul	0.22±0.07
Yoalokpa	0.21±0.10
yoruba	0.17±0.06

3.3.4. Consensus value of types of uses according to age and sex

The consensus values of type of use according to age and sex are determined for different age's groups and sex (Table 8). The results indicated that old women and old men have mostly the same consensus use values . In addition, adult women and adult men have the same consensus value use of *J.curcas*.

Table 8 Consensus value according to age and sex

Age and sex	CTU
Young man	0.01± 0.00
Young woman	0.04± 0.1
adult man	0.08± 0.00
adult woman	0.08± 0.00
Old man	0.91± 0.07
Old woman	0.95±0.11

4. DISCUSSION

4.1. Introduction of J. curcas Linn. in farming system

This study focused on *J. curcas*, a multipurpose species in North Benin. The study focused on the introduction in agroforestry system and traditional utilization of *J. curcas* in North Benin. The results of this study firstly showed that populations of northern Benin appreciated differently the introduction of *J. curcas* according to sociolinguistics groups, age and sex. Moreover, these results showed that the perception who different from sociolinguistic group is under the influence of socioeconomic and cultural contexts (poor soil, the scarcity of sources of income, the high cost of agricultural inputs, social phenomena and climate change). This result conformed those (Belliveau *et al* 2006; Madison 2006; Gbetibouo 2009). People who perceived the introduction of *J. curcas* in the farming system as a development factor is men and women who are age tranche is ≤ 30 years. According to the authors above mentioned, it is a person's belonging to age tranche over 30 years. Therefore, to be successful promotion of *J. curcas*, persons belonging to this age tranche represented considerable potential for introduction of this species. The introduction of *J. curcas* in

agroforestry system is perceived by population as a way of valuing marginal soils (Yaméogo 2005). Also, different sociolinguistic groups have reported the ability of the plant to adapt to all types of soils. It is also able to grow between the rocks under which there is little sand, and can be grown on dry, stony soils. These results confirmed those obtained by (Godin 1971). The results indicated that there is a difference between the views point of the respondents. These differences are related to several factors: age, sex, educational level and marital status of the respondents. This result is contrary to that of (Gbetibouo 2009). On the other hand, difference between proportions observed (Figure 5) is linked to the main activity that each sociolinguistics group practiced. The sociolinguistics groups Bariba, Otamari, Yoruba and Dendi who are favorable to introduction of *J. curcas* in agroforestry system; are mostly practicing agriculture in North Benin. These sociolinguistics groups are landlord, so have large cultivated space that explained their motivation for the introduction of *J. curcas* in agroforestry system. Contrary, Yoalokpa, Fon, Hausa and Peulh who haven't as main activity agriculture have little land to accommodate this innovation. It is reason justified their lowly adherence to the introduction of *J. curcas* in agroforestry system. This way perception of Bariba, Otamari, Yoruba and Dendi is influenced by access to agricultural diffusion services. This result is identical to (Gbetibouo 2009) which state that access to agricultural diffusion services increases the farmer's perception. Opposite, Yoalokpa, Fon, Peulh and Hausa whose main activity is trade, livestock and least extent agriculture did not have the same perceptions as other sociolinguistic groups. Regarding the cultivation of *J. curcas,* Bariba, Otamari, Yoruba are more interesting than other sociolinguistics groups. Particularly, in Kandi Township, *J. curcas* is used as hedge of the municipal graveyard, which justified the reason they have not accepted this presence at home. During our investigation, it was revealed that the presence of *J. curcas* in the concession attracts malediction (repeated decease, repeated defeats). Opposite, Yoalokpa, Fon, Peulh and Hausa are mostly favorable for cultivated *J. curcas* in home garden that explained the presence of the species in their agglomeration. According to them, the home hedge for this species constituted a barrier for malicious spirits (sorcery, snakes, and allows good reproduction of guinea hens). In addition, Yoalokpa, Fon, Peulh and Hausa have little land, and for this reason they preferred *J. curcas* cultivated in the home garden. The men motivation of *J.curcas* cultivated (68.28% and 31, 71% of women) explained that the women are not land owners and dependent of men. But according to (Drucker, 1985), the adoption of innovation is not depending only on it technical advantages, but some sociocultural factors.

Despite all these advantages that promote *J. curcas* cultivated, many weaknesses prevented intensive production. Fist, the high investment costs, and similar exploitation system is only accessible for rich farmers. This exploitation requires important manual work (pruning, harvesting) and increases employment opportunities for the local land-worker. However, they used the land allocated to cereals for *J.curcas* cultivated; which suggests in the future, competition with food production (Diedhiou 2011). A large monoculture is destroyed of biodiversity and deforestation. Given the weaknesses of large farms, *J. curcas* becomes like any other plant that needs regular inputs such as water and nutrients.

4.2. Different forms of use J.curcas following the different sociolinguistic categories

Local population of northern Benin used J. curcas organs in medicine, bioenergy, magical practices, making hedges, food, cosmetic, pest control and leisure. Knowledge about the usages of J. curcas is similar distributed between different sociolinguistic groups. The results of this study showed that over (70%) of the organs involved in diseases treatments. This report explained the fact that J. curcas is mainly used in traditional medicine by sociolinguistic groups investigated. These results are compatible with those of (Arbonnier 2002; de souza 2005). In Benin, especially in North Benin, different parts of this plant are used for illness treatments: malaria, painful menses, hypertension, ulcers, diabetes, fractures and aches. These results are conformed to those obtained by (Arbonnier 2002; de souza 2005) which showed that the leaves and young stems of J. curcas are also used to treat fever, syphilis, malaria, icterus, oral infections, and rheumatism etc. Local people have recognized that J. curcas parts contain substances capable of treating various diseases. The toxicity of J. curcas seeds is recognized by local people. These results confirm those of (Higham 2007) which showed that the organs of J. curcas are riched in phytoprogestogens; and are used to treat infertility, dysentery and diarrhea. The leaves triturated or crushed with seeds and neem leaves is a real biological insecticide. This confirms the results of (Solsoloy 2000) on the molluscicides properties of J. curcas. According to these authors, the fresh leaves in a concentration of 0.3 g / l caused death of all molluscs Lymnaea natalensis in 7 days. With chopped stems, mortality reached 80% of mollusks, with whole seeds, 100% mortality at 0.2-0.3 g / l, even with the almonds to 0.1-0.2 g / l. However, it is attacked by some insects as Zonocerus (Padonou 2009). The seed surrounded by shea butter is a real fuel. These results are identical with those of (Lopez 1997) which showed the possibility of biogas from fruit pulp and seed. Cosmetics and food usages are related to the manufacture of soap; and the used of stem in the local beverage production (tchoukoutou) and confirmed the results of (Assogbadjo 2009).

4.3. Use value according to sociolinguistic groups

The results of diversity index revealed significant difference between sociolinguistics groups surveyed. The highest diversity index observed at Bariba, Otamari, Yoruba and Dendi indicated that parts of the plant involved in several used. Furthermore, the used of resources is a function of abundance. The most abundant species are then therefore the most used. These results are conformed with those of (Benz1994). Among other sociolinguistic groups, lower values are related either to the non-availability of *J .curcas* or a lower level of knowledge (Stoffle 1990, Pieroni 2001). Also this difference is also observed with equitability index. Hausa, Peulh and Bariba exhibit similar degrees of homogeneity. These results explained existence of the cultural link between sociolinguistic groups Hausa, Fulani, Yoalokpa and Fon. The results confirm a resemblance in ways of part used by these sociolinguistic groups (Boster1985, Begossi et al 2002, Voeks *et al* 2004). However, social conditions such as occupation, religion, personal experience and lifestyle among others (Boster 1985) are also being considered in another study to further characterize the respondent sociolinguistic group. Old women, old men, adult men and adult women possessed large knowledge about the speciess. These results are also valid for the different sociolinguistic groups such as Bariba, Otamari, Yoruba and Dendi who presented similar values. The analysis of sex function permitted to understanding labor division between men and women, of indigenous knowledge, access to resources and their control natural resource management (Thomas-Slayter *et al* 1993). Women are the main managers and users of *J. curas*.

5. CONCLUSION

This study identified information about introduction of *J. curcas* in agroforestry system. However, knowledge of different ethnic groups listed here, constitute a guarantee for the development of strategies to better exploitation. *J.curcas* is a botanical species well-known in Benin and appreciated for its leaves, roots, seeds, and bark. The perception about introduction of *J. curcas* in agroforestry system varied with sociolinguistic groups. Bariba are mostly favorable for cultivation of *J. curcas* as plantation, and then Yoruba, Otamari and Dendi. The men are favorable to introduction of *J. curcas* then women. The leaves are used by various ethnic groups as a source of food. The various organs of the plant are used to help in the cure of various diseases such as cardiovascular diseases, infectious diseases, tropical diseases, inflammatory complaints, otorhino-laryngological complaints, skin infections, digestive diseases, infertility disorders, etc. Given its purpose, it is necessary to pursue these studies in order to exploit the full potential of the plant. This information is necessary for the selection and breeding to develop the product range, improve performance, and increase household income and fight against poverty.

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