Reciprocity in ethnobotanical research: case of a study carried out in the Mbe plain of Adamawa, Cameroon

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Research

Abstract

Background: The reciprocity in the exchanges between the local populations who hold the authentic traditional knowledge that they share with the conservation biologists was not sufficiently taken into account. For fairness and justice in these exchanges, the Nagoya Protocol on Access and Benefit-sharing was established. However, there is a lack of information on access and benefit sharing in unfunded ethnobotanical studies in Africa (MS and PhD research). Traditional knowledge on *Detarium microcarpum* Guill. & Perr. a multipurpose Fabaceae, unfortunately threatened with extinction, exists in Adamawa, Cameroon. Thus, in relation to a Master Research thesis without funding, a study was dedicated to this plant.

Methods: Ethnobotanical methods have made it possible to test the following hypothesis: for an equal number of men and women, the points attributed according to gender to the categories of reciprocity experienced during an ethnobotanical study without funding are equal. Thirty available informed consent volunteers (15 men and 15 women) with knowledge on this plant participated in this study.

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Results: The majority socio-economic information was : [36-65] years old (66.67%), uneducated (for those with zero years of formal schooling) i.e. 53.34%, agriculture (source of income for men and women) i.e. 63.34%, Dii (66.67%) and Muslims (73%) respectively for age groups, level of education, main activity, ethno-linguistic group and religion. Overall, the "exchange of knowledge" was the reciprocity with more points (31.79%). The analysis of variance (ANOVA) revealed a non-significant difference (P > 0.05) between the sexes. Thus, in the unfunded ethnobotanical study conducted in the study area, experienced reciprocity were not gender dependent.

Conclusions: For this case study carried out in the Mbe plain (Adamawa, Cameroon), six categories of reciprocity were tested: Volunteer, material gift, co-author citation, Acknowledgement citation, report back and exchange of knowledge. These proposals for reciprocity may serve as a reference for future similar studies.

Keywords: Nagoya Protocol, respondent, informed consent, reciprocity, *Detarium microcarpum*, Cameroon

Résumé

Contexte: La perte du savoir locale accélérée favorisera le protocole de Nagoya sur l'accès et le partage de ses avantages. Ainsi, lors des études financées, des réciprocités contribueront à encourager les populations à conserver durablement leurs savoirs. Cependant, un manque d'informations existe sur l'accès et le partage des avantages lors des études ethnobotaniques non financées en Afrique (Master recherche et Thèse de Doctorat/PhD). Un savoir traditionnel sur *Detarium microcarpum* Guill. & Perr., une Fabaceae multifonctionnelle malheureusement menacée de disparition existe dans l'Adamaoua, Cameroun. Ainsi, relativement à un mémoire de Master Recherche sans financement, une étude lui a été dédiée.

Méthodes: Des méthodes ethnobotaniques ont permis de tester l'hypothèse suivante: pour un nombre d'hommes et femmes égal, les points attribués selon le sexe aux catégories de réciprocité expérimentées lors d'une étude ethnobotanique sans financement sont égaux. Trente volontaires (15 hommes et 15 femmes) de consentement éclairé, disponibles ayant un savoir sur la plante ont participé.

Résultats: Les informations socio-économiques majoritaires étaient: [36-65] ans (66,67 %), sans instruction (pour ceux ayant zéro année d'école formelle) soit 53,34%, agriculture (source de revenus des hommes et femmes) soit 63,34 %, *Dii* (66,67 %) et musulmans (73%) respectivement pour tranches d'âge, niveau d'instruction, principale activité, groupe ethnolinguistique et religion. Globalement, l'« échange de savoirs » était la réciprocité ayant plus de points (31,79%). L'analyse de variance (ANOVA) a révélé une différence non significative (P > 0,05) entre les sexes. Donc, lors de l'étude ethnobotanique sans financement réalisée dans la zone d'étude, les réciprocités expérimentées ne dépendaient pas du sexe.

Conclusion: Pour cette étude réalisée dans la plaine de Mbé (Adamaoua, Cameroun), six catégories de réciprocité ont été expérimentées: Bénévolat, cadeau matériel, citation co-auteur, citation remerciement, compte rendu et échange de savoirs. Ces propositions de réciprocité pourront servir de référence aux études similaires ultérieures.

Mots-clés: Protocole de Nagoya, enquêté, consentement éclairé, réciprocité, *Detarium microcarpum*, Cameroun

Background

In principle, in order to obtain authentic information from local populations, research, particularly ethnobotanical research, must allow participation with informed consent of these populations and be a source of motivation during exchanges with conservation biologists. Unfortunately, this has not always been the case (International Society of Ethnobiology 2006). Although developing countries possess a great wealth of genetic resources, they do not benefit equitably from the exploitation of these resources (Kounga & Perron-Welch 2014). These unfortunate realities have led to many compensatory initiatives, such as the Nagoya Protocol on Access and Benefit Sharing from Local Resources (Greiber et *al*. 2014, Artige 2016). In accordance with this protocol, reciprocity (monetary or non-monetary) or mutual benefits and equitable sharing between indigenous peoples and researchers are increasingly recommended (Gary 1995, International Society of Ethnobiology 2006, Kounga & Perron-Welch 2014, Bussmann 2019). In the same vein, the Code of Ethics of the International Society of Ethnobiology was established to serve as a guide for the conduct of research in ethnobiology and related activities such as ethnobotany, ethnomedicine and ethnopharmacology. In general, these equity measures are favorable to field research that receives funding. Published studies revealed that there is a lack of information on reciprocity (monetary or non-monetary) in ethnobotanical studies conducted without funding. However, it is often not obvious for some students, especially African

students, to find funding to carry out their MS or PhD research. Without funding, many concerns exist. In particular, what reciprocity can be offered to local people who have successfully conserved authentic traditional knowledge, which they agree to share voluntarily with researchers? How can these populations be motivated to share their authentic local knowledge with other researchers conducting studies in their locality in the future? In this regard, what kind of reciprocity can a young researcher without financial assistance have for local populations? It is in this context that we undertook a Masters' degree research in ethnobotanical, on the species *Detarium microcarpum* Guill. & Perr. a multipurpose Fabaceae threatened with extinction in the Mbe plain of the Adamawa, Cameroon (Mapongmetsem et *al*. 2008, Mapongmetsem et *al*. 2015, Fawa et *al*. 2015). The ethnobotanical knowledge available on *D. microcarpum* although rare shows that the plant plays a very important socioeconomic, sociocultural, nutritional, medicinal, ecological, religious and environmental role in rural areas in southern Mali (Kouyaté 2005). It was essentiel to determine the socio-economic characteristics (age, occupation, religion, ethnolinguistic group, education level and gender) of the population with knowledge of the plant as well as its local names. In this study, the objective was to test the following hypothesis: for equal numbers of men and women, the points awarded to the categories of reciprocity experienced by gender in the ethnobotanical study on *Detarium microcarpum* without funding are equal.

Materials and methods

Description of the study site

The sites in which the investigations were carried out are located in the Mbe plain, particularly in the villages of Def, Karna Manga and Karna Petel (Figure 1). The geographical coordinates of the Mbe plain obtained with a GPS are among others, Latitude (E): 07°85.819' and Longitude (N): 13°58.968'. The district of Mbe is located about 70 km north of the administrative center of the Adamawa region, Cameroon. This region is located between the 6th and 8th degrees of north latitude and between the 10th and 16th degrees of east longitude. It covers an area of 62 km^2. Its altitude is between 900-1500 m. The climate is of the Sudano-Guinean type of altitude with an annual rainfall of 1.600 to 1.800 mm, spread over 7 to 8 months (Deffo et *al*. 2009). However, in the Mbe plain, the climate is typically Sudanese. The Adamawa region is sparsely populated with approximately 12.6 inhabitants per km² (Moudingo 2007). The main economic activity in this region is cattle breeding. The soil of the region consists mainly of red ferralitic structures developed on old basalts (Yonkeu 1993). Various types of vegetation are observed in this region ranging from meadows through shrub savannas to tree savannas dominated by *Daniellia oliveri* (Rolfe) Hutch. & Dalziel (Fabaceae) and *Lophira lanceolata* Tiegh. ex Keay (Ochnaceae) (Letouzey 1968). The density of these species is clearly decreasing due to anthropogenic action (Mapongmetsem et *al.* 2006)

Interview methods

This study is part of the Master Research work carried out between 2010 and 2018 in the study area (Figure 1). The presence of *Detarium microcarpum* feet had been reported during ethnobotanical surveys carried out in periodic markets in the Study Area (Mapongmetsem et *al*. 2008). Within the framework of the domestication programme for endangered species in the Adamawa region, initiated by the University of Ngaoundéré (Lamy *et al*. 2019) samples of the plant (leaves, seeds, flowers, etc.) were kept at the Botany and Sustainable Development Laboratory. Among the volunteer respondents with knowledge of the plant, 15 men and 15 women agreed to sign the informed consent form (Annex 1), an essential element for the success of the study. In accordance with the Nagoya Protocol on Access and Benefit Sharing and Principle Number 7 (Principle of Prior Informed Consent) of the Code of Ethics of the International Society of Ethnobiology, some respondents signed this sheet anonymously and others by name. For those respondents who requested anonymity, aliases were found (Table 1). For the questionnaire (Annex 2), the section "Respondent's knowledge of *D. microcarpum*" there was lack of relevant information from the literature on the plant such as its local names in the study area (Kouyaté 2002, Ouôba et *al*. 2006, Bastide & Ouedraogo 2008, Agbo et *al*. 2017). The questionnaire was drafted in French and then translated into English for the international scientific community. A translator was recommended to us by the chiefs of the localities where the study was conducted. Prior to discussions with the respondents, a team including a translator translated all questions into *Fulfulde*, the most common local language in the region. The interviews were structured, providing a precise list of questions to the respondents.

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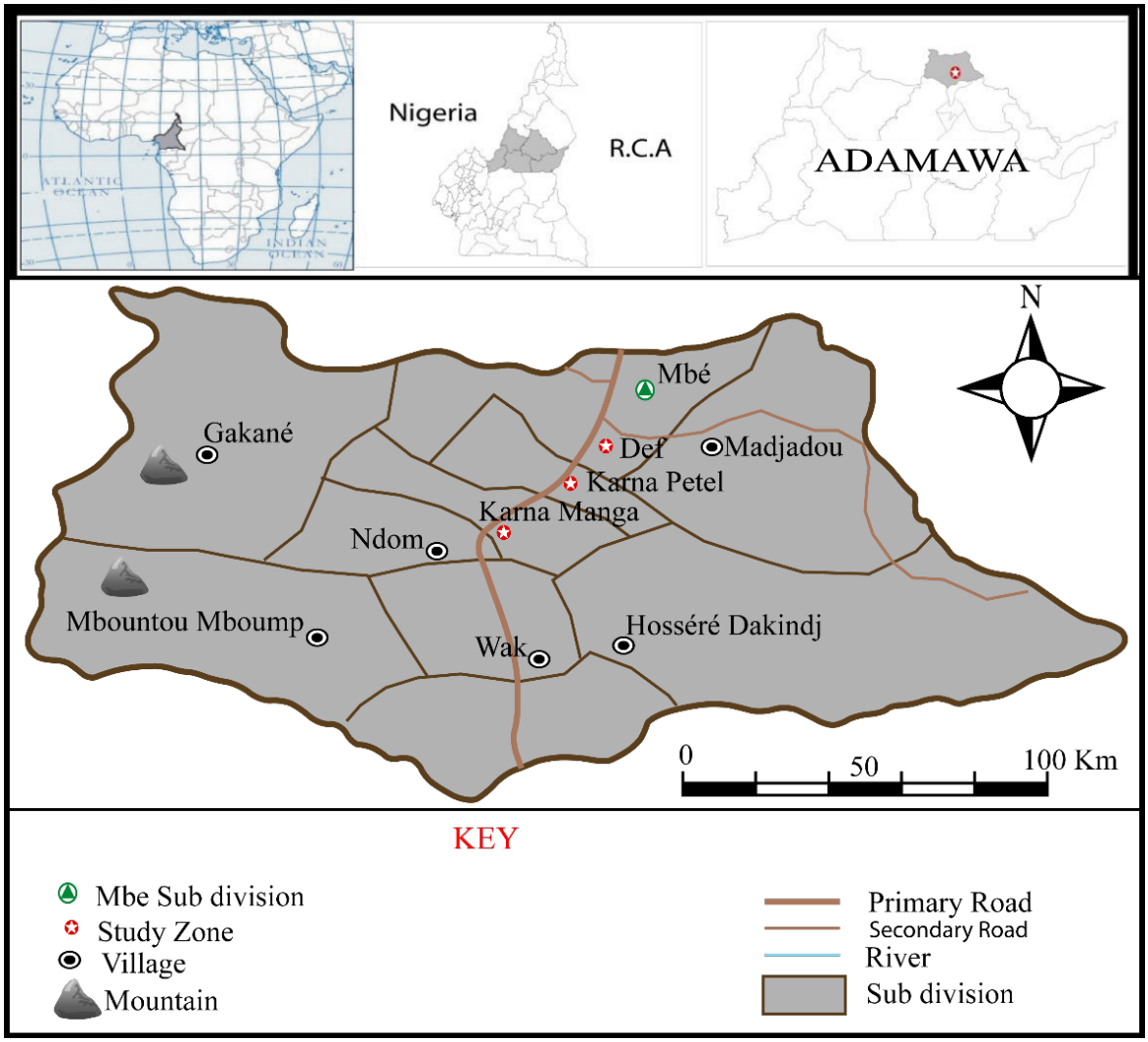

Figure 1. Location map of the study area

Respondents with informed consent were assigned to one of six categories of reciprocity :

- Volunteer/respondent renders service free of charge, expects nothing in return, voluntarily commits;
- Acknowledgement citation/researcher agrees to name the consenting respondent(s) in the acknowledgement section of the scientific work resulting from the ethnobotanical survey;
- Co-author citation/researcher agrees to name the consenting respondent(s) among the authors of the scientific work resulting from the ethnobotanical survey;
- Report back / the researcher undertakes to report back to the respondents at a later date on the impact of the research results;
- Exchange of knowledge/the respondents do not expect anything in return, they naturally share their traditional knowledge with the researchers during the exchanges;
- Material gift/depends on what the researcher (clothing, shoes, bags, etc.) is willing to offer or give to respondents.

These reciprocities have been inspired by existing literature (Philips and Gentry 1993a, Philips and Gentry 1993b, International Society of Ethnobiology 2006, Gary 2015, Bussmann 2019).

Allocation to a category was based on the following criteria:

1- Each respondent assigned points ranging from a minimum (1) to a maximum (5) to each of the six (6) reciprocity categories (Table 2) ;
2- The sum of the points ranging from a minimum (1) to a maximum (5) in each reciprocity category was added up;
3- The sum of all the points recorded in each reciprocity category was added together;
4- In each reciprocity category, the points awarded by each respondent were identified using the colors red and black respectively for female and male respondents;

5- The points allocated by each respondent in the different categories were added.

Data processing and analysis

The data collected was processed using Excel and Word software. Subsequently, these data were analyzed (ANOVA) using the Statgraphics Plus program (trial version).

Results

Reciprocity categories for ethnobotanical study without funding

The analysis in Table 1 suggests a classification of 6 reciprocity categories in descending order according to their points. Thus, the local reciprocity category "knowledge exchange" is the highest ranked category (89 points) in the study area. The "co-author citation" category is second (79 points), followed by "report back" (49 points), then " acknowledgement citation" (22 points), "material gift" (21 points) and "volunteer" (20 points).

Socio-economic characteristics of respondents in the study area

Regarding the socio-economic characteristics of the respondents, 2 and 3 respondents had respectively ≤ 15 years old and ≥ 65 years old (Figure 2a). The age group [15-35] years old had 5 speakers, while the age group [36-65] years old had the majority (20) of participants. The level of education was increasing, from no education for those with no formal schooling (16 informants) to University (0 respondents), elementary school (9) and high school with 5 facilitators (Figure 2b). Religion wise, Muslims were in the majority (73%) compared to Christians (20%) and other religions (7%) (Figure 2c). The *Dii* ethnolinguistic group had more respondents, 20 compared to the *Fulani* (7) and *Mbororo* (3) (Figure 2d). The main activity was agriculture (19 respondents), followed by commerce (7 respondents) and breeding (4 respondents) (Figure 2e).

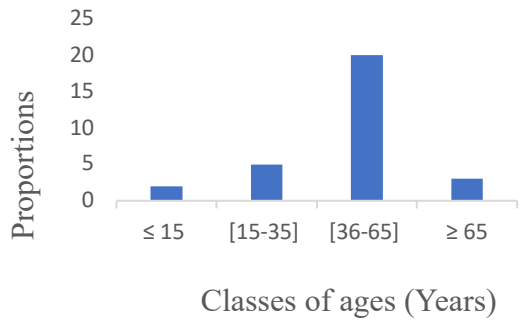

Figure 2a. Proportion of the age groups respondents

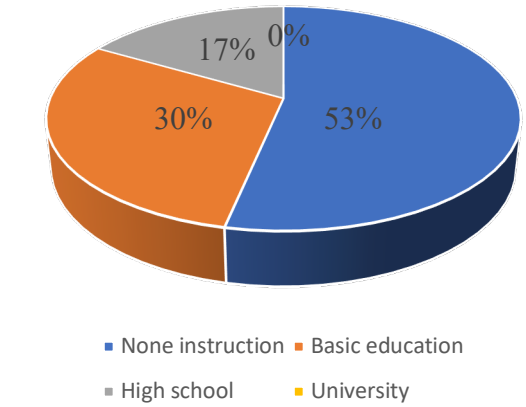

Figure 2b. Respondent education levels

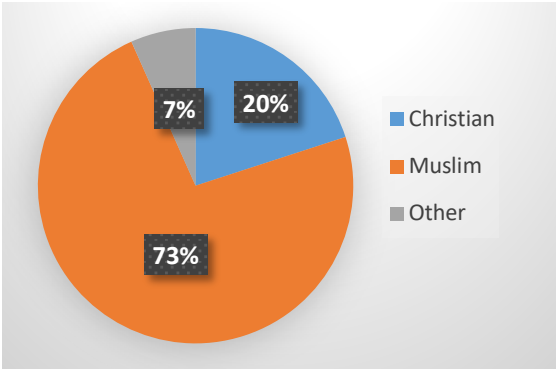

Figure 2c. Respondent religion

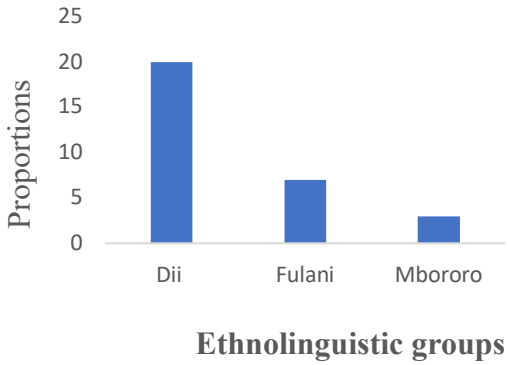

Figure 2d. Ethnolinguistic groups of respondents

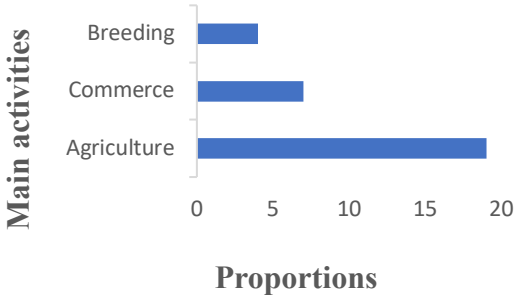

Figure 2e. Main activities of respondents

Table 1. Categories of reciprocity and points awarded by respondents

Respondents	Categories of reciprocity with points awarded																											Total
	Volunteer					Material gift					Co-authors citation					Acknowledgment citations					Report back					Exchange of knowledge					
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
Anonymous 1					x																				x						**10**
Anonymous 2															x																**5**
Anonymous 3															x															x	**10**
Anonymous 4															x																**5**
Anonymous 5																														x	**5**
Anonymous 6								x																x							**7**
Anonymous 7					x																									x	**10**
Anonymous 8										x																					**5**
Anonymous 9															x										x					x	**15**
Anonymous 10															x																**5**
Anonymous 11													x					x													**6**
Anonymous 12								x							x				x						x					x	**22**
Anonymous 13					x																										**5**
Anonymous 14															x					x								x			**13**
Anonymous 15															x					x					x					x	**20**
Anonymous 16										x																				x	**10**
Anonymous 17									x					x						x					x						**18**
Anonymous 18															x										x					x	**15**
Anonymous 19	x										x																				**1**
Anonymous 20																														x	**6**
Anonymous 21															x											x				x	**11**
Anonymous 22																								x						x	**9**
Anonymous 23															x											x				x	**11**
Anonymous 24				x																											**4**
Anonymous 25											x																			x	**6**
Anonymous 26															x															x	**10**
Anonymous 27														x							x				x				x		**14**
Anonymous 28						x																								x	**6**
Anonymous 29											x																				**1**
Anonymous 30															x										x					x	**15**
Total	1	0	0	4	15	1	0	6	4	10	3	0	3	8	65	0	0	3	4	15	1	0	0	8	40	2	0	3	4	80	**280**
	20					**21**					**79**					**22**					**49**					**89**					**280**

Legend. Red color (female respondents); black color (male respondents)

Local names of *Detarium microcarpum* Guill. & Perr. in the study area

Three local names (*Garmadjé*, *Konkéyi* and *Mboopê*) were assigned to *D. microcarpum* in the study area (Table 2). Depending on the local languages, *Dii* informants mainly (70%) named the plant *Mboopê*. However, other respondents named the *Konkeyi* plant moderately (26.67%) in the local *Fulfulde* language, while the Mbororo ethnolinguistic group named the plant minority (03.33%) *Garmadjé*. In terms of gender, women (40%) of the *Dii* ethnolinguistic group were more represented than men (30%). However, men (16.67%) of the *Fulfulde* ethnolinguistic group were in the majority compared to women (10%). The same trend was observed in the *Mbororo* ethnolinguistic group where no women (00%) were represented compared to the men who took part in the study (03.33%).

Breakdown of respondents' points according to gender and reciprocity categories

A summary of the different points awarded by the respondents according to gender and by category of local counterpart was established (Table 3). Irrespective of the category of local counterparty, the points awarded by women were higher than those awarded by men. For example, 11 women versus 09 men were for "volunteering" or 7.14% and 47 women versus 42 men were for "knowledge exchange" or 31.79%.

Table 2. Local names of *D. microcarpum* in the Mbe plain (Adamawa, Cameroon)

	Dii		*Fulfuldé*		*Mbororo*	
Local names	Men	Women	Men	Women	Men	Women
Mboopê	09	12	00	00	00	00
Konkéyi	00	00	05	03	00	00
Garmadjé	00	00	00	00	01	00
Total	30%	40%	16,67%	10%	03,33%	00%

Table 3. Distribution of points for the reciprocity categories according to the gender of the respondents and value of the probabilities

	Volunteer	**Material gift**	**Co-author citation**	**Acknowledgment citation**	**Report back**	**Knowledge Exchange**	**Total**
Women	11	12	40	14	30	47	**152**
Men	09	09	39	08	19	42	**128**
Points	**20** (7,14%)	**21** (7,5%)	**79** (28,21%)	**22** (7,86%)	**49** (17,5%)	**89** (31,79%)	**280** (100%)
P-value	**0,7952**	**0,6605**	**0,8977**	**0,4333**	**0,1187**	**0,1187**	**0,3891**

Discussion

Reciprocity categories for ethnobotanical study without funding

The fact that the reciprocity categories 'material gift' and 'volunteering' occupy the second-to-last and last place respectively (Table 1) suggests that respondents in the study area are not willing to share their traditional plant knowledge with conservation biologists for free, without mutual benefit and equitable sharing. Particularly for this analysis, the immediate consequence is that it will not be obvious for conservation biologists to gain access to sought after authentic local knowledge without the knowledge holders having a source of motivation. Since the holders of authentic local knowledge generally do not know whether a study is funded or not, this means that these knowledge holders are simply waiting for a source of motivation. So everything will depend on the nature of this source of motivation whether a study has received funding or not.

In the "co-author citation" category, reciprocity will be to cite the respondent(s) as the first, second, third or nth author. The most important is "official scientific recognition" of the efforts made by people to collect and sustainably conserve authentic traditional knowledge about the plants or plant families in the study area. Citation of respondents as co-authors may have a significant impact in the community. Studies may be conducted after each decade to assess the impact of citing these local co-authors in the published scientific literature related to this research. This analysis is in accordance with Principle Number 12 (Principle of Reciprocity, Mutual Benefit and Equitable Sharing) of the Code of Ethics of the International Society of Ethnobiology (International Society of Ethnobiology 2006). Indeed, this principle recognizes that "indigenous peoples, traditional societies and local communities have the right to participate in and benefit from the tangible or intangible processes, results and effects that result

directly or indirectly, in the short and/or long term, from ethnobiological research or related activities such as ethnobotany that involve their knowledge and resources."

For many local people, it is a pleasure to naturally share traditional knowledge, hence the category 'knowledge exchange'. However, reluctance to provide accurate information can be observed, particularly from local residents who question the frankness of researchers. For others who are reluctant, researchers enrich themselves with traditional knowledge and do not think of those who have freely offered it to them. As a result, the latter (reticent) instead of sharing all their local knowledge, opt for the dissemination of part of this knowledge. Consequently, results published in scientific journals may be misleading. Recognizing oneself in a study, feeling important, valued, motivates the traditional knowledge holder to voluntarily share everything he or she knows about the subject matter of an ethnobotanical study. Hence, the rationale for the reciprocity categories of "co-author citation and acknowledgement citation". This analysis corroborates principle number 3 (Principle of inalienability) of the Code of Ethics (International Society of Ethnobiology 2006).

With regard to the category 'debriefing', it must be said that, presently disinterested persons may change their minds with time. Indeed, seeing other respondents, for example, being cited in scientific works may motivate previously reluctant respondents to reconsider their position. Everything will therefore depend on the impact of reciprocity in the daily lives of the respondents. For example, in subsequent ethnobotanical studies, researchers will be able to go into the field with articles that include reciprocity. The citation of the local co-authors could be provided as evidence to potential respondents before the start of the interviews in order to motivate them.

The category 'material gifts' is consistent with the work of Philips & Gentry (1993a). However, these authors worked within the framework of a project, and therefore a funded study. Indeed, these authors opted to compensate for the respondents' time spent on the project with tools or clothing that the respondents had asked for. A financial equivalent of these tools had been made prior to the purchase of these gifts.

A study like this helps to establish the ownership and specification of knowledge and resources according to the Nagoya Protocol.

However, the terminologies used differ from one author to another, although they all refer to the same thing (Gary 1995, Global Diversity Foundation 2014, Bussmann 2019).

Socio-economic characteristics of Study Area respondents

According to many authors, the socio-economic characteristics of the populations in a study area are indispensable (Cunningham 2001, Case et *al*. 2015, Ahmad et *al*. 2018, Bussmann 2019). Indeed, the socio-economic characteristics of the respondents enabled the international community to have several pieces of information on the target population. For example, they made it possible to know that this population is young, adult or ageing. It also provided information on the religions encountered, the professions more or less widely practised, the minority and majority ethno-linguistic groups, the level of literacy, etc. The socio-economic characteristics of the respondents provided the international community with several pieces of information on the target population.

Local Names of *Detarium microcarpum* Guill. & Perr. in the Study Area

Various local names have been attributed to *D. microcarpum* in several African countries, respectively *Simfarga* in Mali (Kouyaté 2005), *Korô* in Burkina Faso (Zerbo et *al*. 2011) and *Taura* in Niger (Baggnian et *al*. 2018). The common names of the plant are *sweet dattock* in English and *petit détar* in French. The three local names of the plant listed in the study area thus enrich the existing literature. The advantage of the local names is that they allow easy identification of the plants in their phytogeographic range. In addition, they avoid confusion between plant species.

Distribution of respondents' points according to gender and reciprocity categories

In the analysis of Table 2, given the equal number of male and female respondents, this result that women in the study area lay more emphasis on reciprocity compared to men. In other words, in the absence of reciprocity, women in the study area do not seem willing to pass on their authentic knowledge about *D. microcarpum*. These results could be explained by the fact that in western Mali, rural women have more local knowledge than men about the plant (Kouyaté 2005). Indeed, they are the ones who pick the fruits of the plant, market them and use them to prepare a local dish in the form of couscous. In addition, they are the ones who led the Regional Commission of Users of Research Results to identify *D. microcarpum* as a species to be domesticated because it is highly overexploited and therefore threatened with extinction in most village lands in

Mali. However, in view of the statistical results, particularly the analysis of variance (ANOVA), regardless of the category of reciprocity, P > 0.05. There was no significant difference between the points awarded by women and those awarded by men to the different categories of reciprocity. In conclusion, the hypothesis of this study was accepted. Therefore, in the unfunded ethnobotanical study, reciprocity does not depend on gender. Both men and women are interested in reciprocity. These results are consistent with those previously reported on ethnobotany quantification and statistical testing (Phillips & Gentry 1993a, Phillips & Gentry 1993b, De Albuquerque 2009, Phillips 2016).

Conclusions

This study aimed to contribute to participatory research by showing the need for reciprocity in ethnobotanical research without funding involving local people and conservation biologists. The objective was to test the following hypothesis: for equal numbers of men and women, the points awarded to the categories of reciprocity experienced in the Mbe Plain (Adamawa, Cameroon) by gender in the ethnobotanical study on unfunded *Detarium microcarpum* are equal. Simple analyses of respondents' responses gave the impression that women in the study area did not seem willing to pass on their knowledge about *D. microcarpum* in the absence of reciprocity, unlike men. However, statistically, reciprocity did not depend on gender. In order to obtain authentic knowledge about the plant, both men and women expected reciprocity. At the end of this study, six categories of reciprocity (Volunteer, Acknowledgement citation, Exchange of knowledge, co-author citation, Report back and Material gift) were proposed. In perspective, it would be important to extend this contribution for reciprocity in ethnobotanical studies without funding to the determination of the points attributed to the categories of reciprocity experimented as much on a larger number of plants, on a large sample size as on more than 3 localities.

Declarations

List of abbreviations: ANOVA: Analysis of variance; PhD: Doctor of Philosophy; P: P-value or probability at 95 per cent

Ethics approval and consent to participate: This study is part of the research Master thesis approved in 2010 by the Department of Biological Sciences, Faculty of Sciences, University of Ngaoundere (Cameroon). In accordance with the Nagoya Protocol on Access and Benefit-sharing, informed consent forms were signed by the participants and available as attachments (Annex 1).

Consent for publication: Informed consent forms signed by the respondents who agreed to participate in the study by name and under anonymity are available in the appendices 1.

Availability of data and materials: The annexes and the questionnaire are deposited in public repositories.

Competing interests: The authors declare that they have no competing interests.

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Author contributions: GMLL (Georges Maxime LAMY LAMY) initiated the study. **GMLL** (Georges Maxime LAMY LAMY), **PKM** (Phalone KENNE MELI), **TD** (TALBA DALATOU), **CAA** (Constantin AMOUGOU ALEGA), **LZZ** (Laela ZAMBOU ZEBAZE), **AD** (ADOUM DONA), **RN** (Rosette NDJIB), **FG** (FAWA GUIDAWA), **GJN** (Germo Justine NZWEUNDJI), **ND** (Néhémie DONFAGSITELI) and **GAA** (Gabriel AGBOR AGBOR) carried out the statistical analyzes and contributed to the writing of the manuscript. **JVPBW** (Jean Vincent POOM BIDOU WADJIRI) and **W** (WACKILOU) contributed to the collection of data in the field.

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Research questionnaire (*Detarium microcarpum* Guill. & Perr.)

Personal informant information

Last names and first names……
Sex ……
Age…….years
Ethnolinguistics Group……
Religion……
Educational level ……..
Main activity……..

Informant's opinion on the reciprocity

Completion of the informed consent form: anonymously ☐ by name ☐

Informant's opinion on the reciprocity

What would you like to share your knowledge about plants in the study area with researchers who do not have funding?

- Volunteer ;
- Material gift ;
- Co-author citation ;
- Aknowledgment citation;
- Report back ;
- Knowledge exchange.

In relation to the previous question, assign points ranging from minimum (1) to maximum (5) to each of the following 6 elements:

:

- Volunteer ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
- Material gift ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
- Co-author citation ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
- Aknowledgement citation ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
- Report back ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
- Knowledge exchange ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Knowledge of the informant on *Detarium microcarpum* Guill. & Perr.

What are the local names of the plant in:

- *Dii* ;
- *Fulfuldé* ;
- *Mbororo*