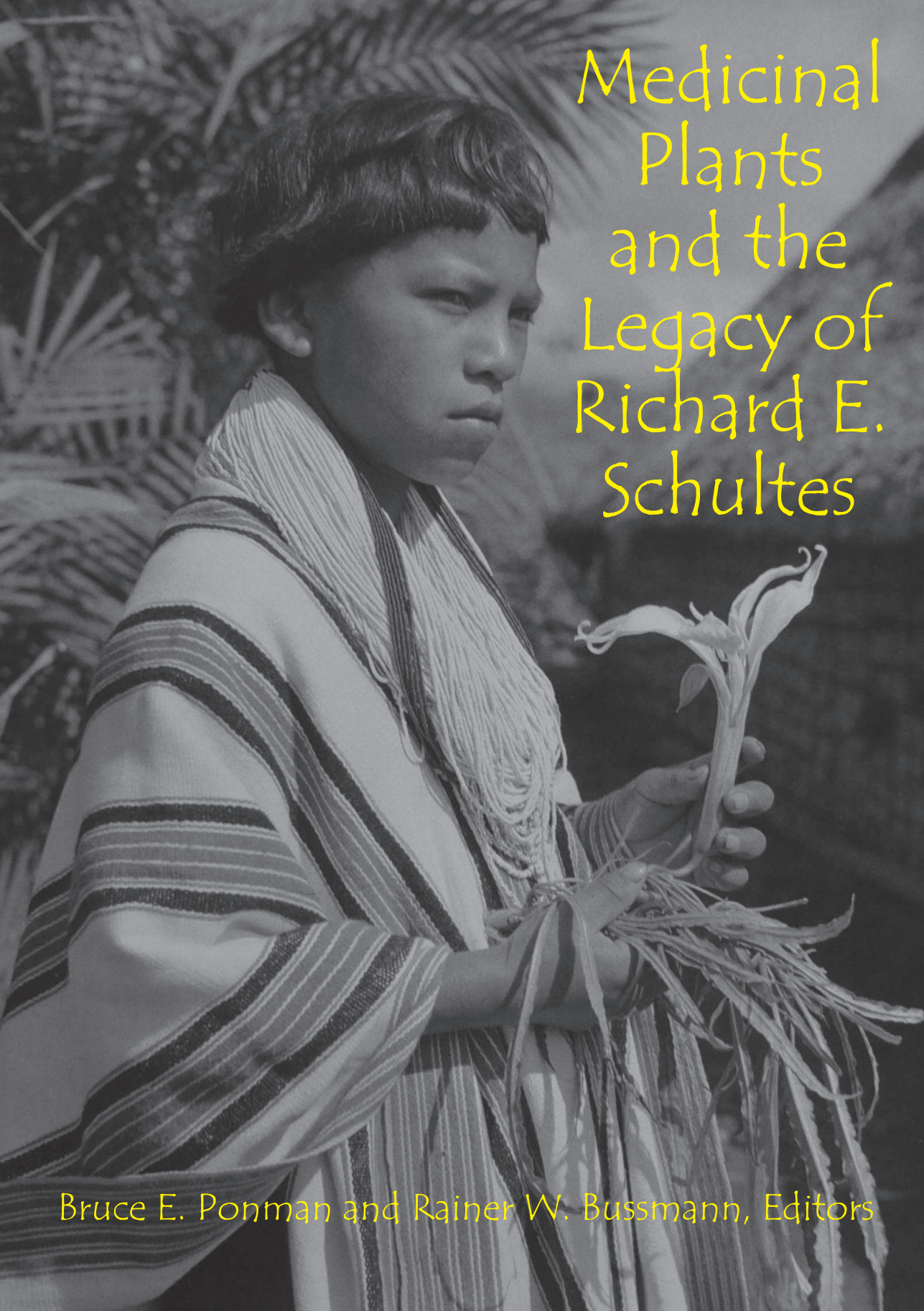

Medicinal Plants and the Legacy of Richard E. Schultes

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A Standard Protocol for Gathering Palm Ethnobotanical Data and Socioeconomic Variables across the Tropics

Rodrigo Cámara-Leret,[1] Narel Y. Paniagua Zambrana,[1,2] and Manuel J. Macía[1]

This paper describes a protocol for collecting information on palm ethnobotany and related socioeconomic variables in rural communities across the tropics. The steps to follow when conducting quantitative ethnobotanical fieldwork are presented chronologically: 1) selection of study communities, 2) preparation of materials and permits, 3) planning work at the community, 4) community census, 5) selection of informants, 6) types of interviews for gathering ethnobotanical data and socioeconomic variables, and 7) returning information to the communities. Although this protocol was developed and tested in northwestern South America, it can be used for comparing palm use patterns in any country, ecoregion, habitat, human group and use categories across the tropics.

Introduction

In the last decades, ethnobotanists have broadened the discipline's methods and goals resulting in a shift from purely descriptive to more quantitative approaches (Carneiro 1978, Trotter and Logan 1986, Prance et al. 1987, Johns et al. 1990, Phillips and Gentry 1993, Phillips et al. 1994, Galeano 2000, Macía et al. 2001, Collins et al. 2006, Reyes-García et al. 2007, Vandebroek 2010). Within the framework of the PALMS project (http://www.fp7-palms.org), we designed and tested (>2000 interviews) during almost two years of fieldwork in northwestern South America (Colombia, Ecuador, Peru, and Bolivia) the protocol we present in this paper for gathering palm ethnobotanical data and related socioeconomic variables. Although many articles and books discussing methodology exist (e.g., Martin 1995, Alexiades 1996, Höft et al. 1999, Reyes-García et al. 2007), we chose to disseminate this protocol for its precise focus on a specific group of plants: Arecaceae. To our knowledge, this is the first regional initiative in quantitative palm ethnobotany (covering several countries, ecoregions and human groups). Hence, we propose to extrapolate this same methodology to other areas to enable global comparisons of palms use patterns.

Palms are an ideal ethnobotanical group of plants to be studied because they are easily recognized by people worldwide, there are many useful species, and they are very ecologically important (Henderson et al. 1995, Macía 2004, De la Torre et al. 2009, Balslev et al. 2011). Quantitative ethnobotanical studies on palms are scarce and have mostly been focused on topics such as the relationships between palm use and palm diversity and abundance (Byg et al. 2006, De la Torre et al. 2009), socioeconomic factors (Byg and Balslev 2001a, b; Paniagua et al. 2007), palm ecological and morphological characteristics (Byg et al. 2006, De la Torre et al. 2009), palm cultivation and management (Byg and Balslev 2006) and use categories and subcategories, ecoregions, countries and human groups in northwestern South America (Macía

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et al. 2011). The compilation of information using database management systems has produced important reference works (Balick and Beck 1990) and quantitative reviews (Macía et al. 2011), providing a solid base for highlighting research needs in the future.

Palm ethnobotanical fieldwork has been facilitated by the existence of field guides (Henderson et al. 1995, Dransfield et al. 2006, Galeano and Bernal 2010), and during interviews the use of photographs has been recommended (Nguyen 2003, Thomas et al. 2007), although limitations for some taxa exist. Since the first field guide to tropical palms was published (Wallace 1853, Knapp et al. 2002), there have been many comprehensive advances in palm taxonomy. In the Neotropics, palm taxonomy is sufficiently well understood (Henderson 1995, Henderson et al. 1995, Pintaud et al. 2008, Lorenzi 2010, Galeano and Bernal 2010, Henderson 2011) although new species are still described (Henderson 2005, 2011; Lorenzi et al. 2010). For some parts of Africa, the palm flora is well worked out (Dransfield 1986, Tuley 1995, Sunderland 2007). The palms of Madagascar have been recently monographed (Dransfield et al. 2006), but still new palm species are being discovered (Rakotoanirivo et al. 2007, Dransfield et al. 2008b, Rakotoarinivo 2008). Taxonomic studies in Asia lag behind, which is likely due to high species diversity. Southern Asia is apparently better understood, with a guide of its species recently published (Henderson 2009). The Malesian palm flora, the richest on earth with 992 estimated species in 50 genera (Dransfield et al. 2008), lacks a modern taxonomic treatment. This is often also the case at the country level. Indonesia, for instance, has 477 known palm species (Johnson 1991), but a detailed flora exists only for the rattans of Borneo (Dransfield and Patel 2005). Likewise, at the island level only a generic field guide of New Guinea palms has been published (Baker and Dransfield 2006). Considering Asia's unrivaled species diversity and its rich ethnic diversity in comparison to the Neotropics (the island of New Guinea alone harbors over 1000 different ethnic groups), palm ethnobotanical studies are needed in most countries and regions.

As suggested by numerous ethnobotanists, comparative studies and their replication in different parts of the world are warranted to identify similarities and differences in the use of plant resources and for the development of a well-formulated theory for ethnobotany (Albuquerque and Hanakazi 2009). In northwestern South America, palm ethnobotanical research priorities have been highlighted by Macía et al. (2011). In Asia, comparative palm ethnobotany is practically nonexistent (but see Johnson 1991, 2011), and no comprehensive bibliographical review exists as in the Neotropics of palms use besides that of rattans (Dransfield and Manokaran 1993, Wulijarni-Soitjipto and Danimihardja 1995).

For the reasons listed above, we present a protocol with the goal of contributing to a more profound and unified ethnobotanical research approach of palm use patterns throughout the tropics. As an example, based on our work in northwestern South America (Paniagua et al. 2010), among the aims and research questions that can be addressed are:

1) Comparatively describe the diversity of useful palms and their use patterns in the tropical humid forests at different scales:
- Countries: e.g., Colombia, Ecuador, Peru, and Bolivia

- Ecoregions: e.g., Amazonia, Andes, and the Pacific humid coast (Chocó)
- Habitats: e.g., Amazon terra firme and inundated forests, humid montane forest, and Chocó forests
- Human groups: e.g., indigenous, afroamerican, mestizo, and settler (colonos)
- Use categories and subcategories

2) Analyze the factors that determine distribution and transmission of knowledge in the use of palms from an ecologic, socioeconomic, cultural, and historical perspective.
3) Study the relationship between palm use patterns and their morphologic, ecologic, and phylogenetic characteristics.
4) Determine if the characteristics of palm use are related to their diversity and abundance in the forests near human settlements, using quantitative inventories.
5) Assess the influence of accessibility to urban centers and markets on the use of palms.
6) Evaluate the degree of management, cultivation, and commercialization of palms and palm products.

Protocol

The steps to follow when conducting quantitative ethnobotanical fieldwork are presented chronologically and include: 1) selection of study communities, 2) preparation of materials and permits, 3) planning work in the communitites, 4) community census, 5) selection of informants, 6) types of interviews and ethnobotanical data gathering, and 7) returning information to the communities.

1. Selection of communities

Considering the compilation of palm ethnobotanical knowledge across different ecoregions, forest types and several ethnic groups in varying degrees of accessibility, we propose a protocol and sample size taking into account all these criteria at local and broad scales:

A - Ecoregions and Forest types

Palm communities vary greatly from one ecoregion to another (Bjorholm et al. 2005) and from one forest type to another (Kristiansen et al. 2011). In northwestern South America, to understand how ethnobotanical knowledge and palm use are related to ecological traits (palm floristic composition, individual abundances, species morphology, and phylogeny) and to socioeconomic factors (informant age, gender, status, ethnicity), communities found in the proximity of three target ecoregions were selected: 1) Amazonian terra firme, floodplain and swamp forests, 2) humid Andean montane forests and 3) Chocó forests. In each ecoregion, at least one locality was selected where two different ethnic groups share the same palm flora.

To compare ethnobotanical information with ecological parameters, palm transect data were gathered in all target areas. A detailed protocol on how to conduct palm transects can be found in Balslev et al. (2010).

B - Ethnic Origin

Intercultural or intercommunity ethnobotanical comparisons are desirable but still scarce (Benz et al. 2000), and those focusing on palms are practically absent (e.g., De la Torre et al. 2009). For instance, in northwestern South America, only 49% of Amazonian, and 29% of Andean, indigenous groups count with palm ethnobotanical information, and even this information is only preliminary

for many ethnicities (Macía et al. 2011). To compare palm use between different human groups, in each study locality the aim was to work with communities where one human group is dominant. In our example of northwestern South America, the following human groups were studied: 1) indigenous, 2) afroamerican, 3) mestizo, 4) settler (colono) and 5) mixed communities (where several of the human groups described coexist).

C - Accessibility

Previous studies have shown that less access to markets and large cities, linked to poorer market integration, insufficient government services, and infrastructure (schools, health, electricity, telephone) associates with a greater preservation of local ethnobotanical knowledge (Benz et al. 2000, Byg and Balslev 2001a, 2004; Byg et al. 2007, Crepaldi and Peixoto 2010, De la Torre et al. 2012). To compare the correlation between accessibility and ethnobotanical knowledge throughout the four countries in northwestern South America to test previous conclusions, we selected one to several communities, where each ethnic group was dominant on the basis of differential proximity to cities or markets. Accessibility was considered as the combination of 1) distance from the communities to larger cities and towns (in kilometers) and 2) transportation type (see Appendix 1).

D - Sample size

To compare local ecological knowledge between gender and age groups as suggested by previous researchers (Begossi 1996, Caniago and Siebert 1998, Begossi et al. 2002, Reyes García et al. 2007), we interviewed (in most localities if possible) at least 87 informants in five age categories per locality (see Table 1 for gender and age group distribution). To reach the number of informants planned, on occasions we worked in only one community but in other cases we had to visit as many communities as necessary (all of the same ethnic group) to meet this figure. In our research, a large sampling size was chosen since effective sampling size is a prerequisite for determining the factors that explain the use and knowledge of plants regionally and for a most significant statisticaltesting (Albuquerque and Hanakazi 2009).

2. Preparation of work materials and permits before travelling

Prior to conducting ethnobotanical research, the first step is to obtain all research permits and pertinent authorizations from official institutions and from the communities where the study is to take place, and to establish prior informed consent.

To facilitate fieldwork the following material needs to be prepared before travelling:

GENDER/AGE CATEGORY	18–30 years	31–40 years	41–50 years	51–60 years	>60 years
Male	8	9	9	9	9
Female	8	9	9	9	9
TOTAL	16	18	18	18	18

Table 1. Distribution per locality of the number of informants in relation to gender and age categories.

- Copies of the project description, research and collecting permits and correspondence with permitting entities and community organizations / community leaders
- List of the names and contact information of the community leaders and other important people from the selected study area
- List of palm species to be found in the area with their vernacular names in different languages
- Printed questionnaires as guidelines for ethnobotanical and socioeconomic data gathering (Appendices 1–7)
- A field guide with color photographs of the palms is highly recommended. See Appendix 8 for a list of the most important tropical palm field guides.

3. Planning work in the communities

A - Arrival at the community

Once in the community, the researchers will contact first the local leader(s) to explain the scope of the research and the activities planned during the researchers' visit, in order to set a time for organizing a meeting with all the community members, as prerequisite for obtaining prior informed consent. This meeting is preferably conducted at the time of day that is most appropriate to ensure that all community members are present.

The establishment of confidence between researchers and community members is a process that requires time. Prior to beginning ethnobotanical interviews, it is important to acknowledge and familiarize oneself with the daily activities and with the people who live in the community. For that reason, this period is dedicated to complementary activities such as gathering general information on the socioeconomic and historical background of the community with the local leader(s), and additional meetings (if they are requested) after obtaining prior informed consent in which the research work is planned. Developing these activities properly will allow for greater possibilities in the next work phase and most important one, the ethnobotanical interviews and collection of palm specimens.

B - Interview with the local leader(s)

This interview can be done (at least in part) on the day of arrival to the community. In the case of time constraints, it is important to program this activity as a priority, as it must be done before any other tasks. Activities during the interview include: 1) Gathering socioeconomic and historical information of the community (questionnaire in Appendix 1); 2) Gaining insight on the community member's routines in order to plan interview times more effectively; 3) Elaboration of a synthetic community map, with approximate location of the houses (to be used as support of the census, for a example see Appendices 1 and 2); 4) Drawing a simple vegetation map showing the different forest types (to plan the field trips with the expert informants); 5) Names of members with higher knowledge on palm uses, (to be considered and suggested as possible expert informants during the community meetings).

C - Meeting and presentation of research to the community

In the meeting, the researchers need to again explain the objectives, methodology and outputs of the research to all community members in a simple fashion. Additionally, details

of all activities to be developed within the community must be provided, including 1) interviews with the leaders, 2) community census, 3) selection of expert and general informants, 4) fieldwork with expert informants, 5) collection of botanical material, 6) interviews within the community and schedule of visits in the different houses, 7) economic matters, 8) outputs of the research to the community and to collaborators.

After the meeting, prior informed consent should be established and signed on the equitable benefit sharing arising from research, along the lines of the Convention of Biological Diversity articles 8j and 15 (http://www.cbd.int) and its future protocol about access to genetic resources and benefit sharing. In addition, national legislation on access to genetic material and traditional knowledge and benefit sharing must be fulfilled. If the community does not wish to participate in the research, this must be respected.

4. Community census

It is recommended to elaborate the community census and community map accompanied by a community leader or other member(s) (including children) who can facilitate the conversations and help obtain the correct names of the members inhabiting each house, even if these are away. This activity is a first chance to acquaint oneself with the local inhabitants, for both parts to initiate friendships (and gain more confidence) and for the researcher to gain first hand information needed to select the final interviewees. All houses are to be visited and information gathered using the questionnaire provided in Appendix 2. In the case of working in towns or large communities with numerous inhabitants and houses, the community census may be too complex and time consuming to complete and therefore can be obviated.

5. Selection of informants

To comprehensively document palm ethnobotanical lore in the communities our interview strategy is based on two types of informants: 1) Seven expert informants, selected mainly by members of the community for their greater knowledge on the forest around the community, the palm species, their uses, processing, harvesting and management; and 2) Eighty general informants, chosen by the researchers to obtain information on how palm use knowledge varies within members in the community. This type of approach using various kinds of informants has been recommended previously (Davis and Wagner 2003, Vandebroek 2010, Ruelle and Kassam 2011).

A - Expert informants

Recognizing the necessity of employing a systematical methodological approach when identifying expert informants (Davis and Wagner 2003), these are selected based on information provided by the community leader(s), community meetings and talks with members of the community (Crepaldi and Peixoto 2010). Expert informants are usually over 35 years age, because they are more experienced, and the participation of women is encouraged.

Working with the expert informant(s) consists on three fundamental tasks: 1) walking in different forest types neighboring the communities in search of all palm species present, 2) collecting palm specimens, and 3) interviewing the expert informant(s) (see questionnaire in Appendix 4). The time suggested to work

with each expert informant is half to a full day depending on the palm diversity of the locality and the expert informant's ethnobotanical knowledge. Seven experts accompany the researchers in different days to document as many vernacular names as possible during fieldwork.The use of vernacular names is the basis for interviewing the majority of informants, and effort must be made during the walk in the woods with the expert(s) to assure matching them with actual palm species. Vernacular names can be registered using a voice recorder and transcribed later with the aid of bilingual teachers back in the community. It is recommended to dedicate sufficient time to collect duplicates of botanical material so as to distribute material to national and international herbaria and palm taxonomic experts. Details on preparing palm specimens can be found in Dransfield (1986) and Balslev et al. (2010). During the walk in the woods, all data from the questionnaire (Appendix 4) should be filled for every species found but also for those the informant knows from other areas.

B - General informants

For their selection, the information gathered during the population census in the community prior interviewing is used. It is also highly recommendable to work with a local guide that facilitates finding and interviewing informants within the community. Depending on the size of the community, a person from each family is selected, trying to interview at least 80% of the families that live in one community. If the minimum number of interviews required is not fulfilled in one community, the distribution of informants per gender and age range would be among several communities, depending on population.

To evaluate the gender differences in palm use knowledge a proportion of 50% female and 50% male informants in a given locality (or community) was targeted. However, it is important to note that in certain localities these proportions are difficult to obtain (e.g., the expert informants are often male, insufficient number of women above age 61 in a locality, etc.). The relationship between the informant's age and the knowledge on palm use is studied to analyze the transmission of palm ethnobotanical knowledge between generations, grouping the latter into five categories (Table 1). Efforts are made to achieve an even grouping of informants according to the age ranges.

6. Types of interviews and ethnobotanical data gathering

The following general aspects should be considered during the interviews:

- The interviewee must be informed that the interview will be written down or recorded, and that the information gathered is private and just for scientific use.
- To compare individual knowledge among informants, we suggest working in a calm setting where the interviews must be realized with one person at a time, avoiding the presence of others around. Yet, this ideal case is not always achieved and we recognize the difficulty of working with only one informant, especially with ethnic groups where women are culturally banned from speaking to outsiders. Thus sometimes, it might be more realistic to interview couples, and through comparative questions assess the differences in knowledge between informants.

- The interviews should be done in a place where the informant feels comfortable, which is usually their home.
- It is important not to rush answers during the interviews, even if time is limited, but also to lead the interview and avoid different topics other than palm ethnobotany.
- Sensibility and respect are always important, even more when informants prove shy or uncomfortable with certain questions or they do not have answers for the questions.
- In the case interviewers require translators, these must be competent and well versed in both languages.

To gather ethnobotanical information and socioeconomic variables from the informants, two types of interviews are utilized (Martin 1995, Alexiades 1996, Cunningham 2001):

A) Structured interviews

Structured interviews are based on a fixed number of standardized questions used for all informants. This methodology allows for greater control of the answers received. These interviews are conducted with: 1) the community leader to obtain socioeconomic and historical information of the community (Appendix 1) and with all informants (expert and general) for gathering personal socioeconomic information (Appendix 3).

B) Semi-structured interviews

Semi-structured interviews are composed of a list of open-ended questions, to obtain greater responses than in the previous case. These interviews have a greater degree of flexibility, as from certain responses new questions can arise. At the end of the interview all proposed questions must be answered. These interviews are to be used with expert and general informants.

To obtain information from expert and general informants on the uses and products of all plant species targeted, uses according to each plant part are grouped in 10 ethnobotanical categories and various subcategories (Appendix 5). A palm use is defined as in Macía et al. (2011): the use associated to a use category and a use subcategory for a specific plant part (Appendix 6).

These types of interviews are developed in various phases:

1. Field work:

With each of the expert informants all palm species in the different vegetation types surrounding the communities are visited during the walks in the forest, and it is highly recommended to collect the different species found (see section 5A.).

2. Work in the expert informants' houses

A second directed interview is conducted asking about the existence and utilization of palm species that grow in common in all target areas, in our test case in the humid tropical forests of Colombia, Ecuador, Peru, and Bolivia (Appendix 7); this list of species is based on a bibliographic revision of palm uses and distribution (Macía et al. 2011). Many of the common species will already have been found during fieldwork with the expert informants, and questions should focus only on the remaining species. Two levels of priority are proposed for the registration of the information, based on the probability of finding species in the field: 1) High priority: abundant and

conspicuous species, easy to recognize in the forests and which have a vast range of uses or a certain outstanding use; 2) Medium priority: species which can be locally abundant, but are less frequent in the forests and have a smaller range of uses. By defining levels of priority it is possible to evaluate the relationships between local availability and local perception of the importance of the resource, contrasting at broader scales results of previous ethnobotanical studies (Phillips and Gentry 1993, Galeano 2000, Macía et al. 2001, Byg et al. 2006, De la Torre et al. 2009).

3. Revisionary work

Once field interviews are concluded with all expert informants, some of them may be interviewed again in the community to obtain ethnobotanical information on those palm species not encountered with them during fieldwork. The overall objective is that all expert informants contribute with use information on all palm species existing in the region.

4. Work in the general informants' houses

When all experts have been interviewed, general informants are visited in their respective houses and interviewed using as reference the list of useful palms gathered with the experts. This list may be complemented showing the interviewees photographs (Foster et al. 2004, Galeano and Bernal 2010) or fresh palm parts (leaves, fruits, seeds) if available. General informants will be asked about all palm species growing near the community, although the questionnaire is simplified with respect to that of the experts. If any of the general informants shows profound knowledge he/she may be considered as an expert informant and interviewed with greater detail using the expert questionnaire. Additionally, at the end of the questionnaire informants are asked about the existence and utilization of palm species of high priority (species growing in common in the forests of Colombia, Ecuador, Peru, and Bolivia)and of medium priority (only if they are present in the forests near the community)(Appendix 7), if these have not been mentioned.

C) Informal interviews

All casual conversations that may arise besides interviews (during community meetings, elaboration of the census, etc.) are grouped under this category. It is recommended that information from these conversations be registered in field books, mentioning the informants' name.

7. Return of information to the communities

Once work is completed in the communities, the registered ethnobotanical information should be returned in a manner appropriate for the community. The way of returning information, initially agreed upon during the community meetings, may change as community members and informants get more familiar with the study approach during fieldwork. The final form and scope of returning the research results to the community should be discussed and defined in a final community meeting.

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GENERAL INFORMATION ON THE COMMUNITY

Date: (dd.mm..yyyy) _____/_____/ 2012 Country/Province/Community:

Name of community leader (s): Position:

COMMUNITY SIZE (*)This information can be filled in detail when there is sufficient information from a community census

N° families: N° males (*) N° boys (*) (<18 yrs)

N° inhabitants: N° females (*) N° girls (*) (<18 yrs)

HISTORY & ETHNIC BACKGROUND

Date of the community's foundation

Principal productive activities

Ethnic background: *Ethnic groups present in the community, their estimated proportion (% E) and estimated proportion of members from each ethnic group who speak their native languate (% S)*

1.		% E		% S		6.		% E		% S	
2.		% E		% S		7.		% E		% S	
3.		% E		% S		8.		% E		% S	
4.		% E		% S		9.		% E		% S	
5.		% E		% S		10.		% E		% S	

BASIC SERVICES AVAILABLE WITHIN THE COMMUNITY

Education

Primary level: _____ years N° students primary level: Secondary level: _____ years N° students secondary level:

Medical attention

Health post: Hospital: Communal health worker: Traditional healer:

Other:

Lighting source

Overland line Public generator

Personal generator Solar panel

Oil lamp/candles Gas

Other

Drinking water source

Public tap, NOT drinkable Public tap, drinkable

Tap in house, NOT drinkable Tap in house, drinkable

Well River/Stream

Other

Sewage system

Yes No Other

Sanitary system

Toilets Latrine Septic tank Other

Cooking fuel source

Gas Firewood Coal Other

Church/Mosque/Temple

Yes No Other

Communications services

Radio Public phone Celular TV/DVD Other

Appendix 1. Socioeconomic and Historic Community Questionnaire. To be Filled with the Local Leader(s).

Markets and/or supply sources

Markets: Permanent ☐ Weekly ☐ Monthly ☐ Village shops: Yes ☐ No ☐ Number ☐

Products sold: ☐

SOCIOECONOMIC INDICATORS

Type of tools in the community (and quantity)

Tractor ☐ Plough ☐ Chainsaw ☐ Other ☐

Type of transportation in the community (and quantity)

Truck ☐ Car ☐ Motorcycle ☐ Bicycle ☐ Canoe ☐ Outboard motor ☐ Other ☐

Type of animals in the community (and quantity)

Cows ☐ Horses ☐ Mules ☐ Pigs ☐ Chickens ☐ Ducks ☐ Other ☐

Crops planted in the community

☐

ACCESSIBILITY (Distance registered in Km for terrestial and in hours for fluvial transportation)

Town/market/path: ☐ Transportation type: ☐ Distance: ☐

Town/market/path: ☐ Transportation type: ☐ Distance: ☐

Town/market/path: ☐ Transportation type: ☐ Distance: ☐

LAND

Type of land ownership ☐

Comunal area (ha) ☐ Populated area (ha) ☐ Forest area (ha) ☐

Forest type found in the comunal area ☐

COMMUNITY MAP (with location of houses)

COMMUNITY AREA MAP (with vegetation types)

Appendix 1 (cont.).

COMMUNITY CENSUS

Information provided by the interviewee:

- Number of families in each house. If more than one family is present, establish the relationships among them.
- Number of people in each family, gender and age of those above 18 years.

Other information registerd by the researcher:

- House census number
- Materials employed in the construction
    - Only local material
    - Only external material
    - Local and external material
- Palm species and local material used for:
    - Thatch
    - Walls
    - Floors
    - Structural material (posts, beams, etc.)
- House condition:
    - Good condition
    - Minor defects
    - Major defects
    - Poor condition

Appendix 2. Community census questionnaire. All questions to be filled out for each household visited.

N° Informant:_____

Date (dd.mm..yyyy) _____/_____/ 2012 Community/N° house _____/_____

PERSONAL PROFILE

Name: Communal post:

Male ☐ Female ☐ Age ☐ Married ☐ Single ☐ Widow ☐ N° children ☐ Nº people living in the house ☐

Place of birth Ethnic group

Time of residence in this community

Name of previous community(s) and time of residence					
1.			3.		
2.			4.		

Years of schooling Years superior education Other

Language(s) spoken (S), read (R) or written (W)												
1.		S	R	W	3.		S	R	W
2.		S	R	W	4.		S	R	W

Main occupation

Main income source

SOCIOECONOMIC INDICATORS

Lighting source

Overland line ☐ Public generator ☐

Personal generator ☐ Solar panel ☐

Oil lamp/candles ☐ Gas ☐

Other

Drinking water source

Public tap, NOT drinkable ☐ Public tap, drinkable ☐

Tap in house , NOT drinkable ☐ Tap in house, drinkable ☐

Well ☐ River/Stream ☐

Other

Cooking fuel source

Gas ☐ Firewood ☐ Coal ☐ Others

Sanitary system

Toilet ☐ Latrine ☐ Septic tank ☐ Others

Animals (and quantity)

Cows ☐ Horses ☐ Mules ☐ Pigs ☐ Chickens ☐ Ducks ☐ Other

Crops or plantations (and size in hectares or square meters)

Appendix 3. Informant socioeconomic information.

Tools and utensils (and quantity)

Tractor ☐ Plough ☐ Shovel ☐ Pick ax ☐ Machet ☐ Planting stick ☐ Ax ☐ Chainsaw ☐

Shotgun ☐ Bow/arrow ☐ Blowgun ☐ Fish-hooks ☐ Fishing-rod ☐ Fishing-net ☐ Harpoon ☐

Transportation owned by family (and quantity)

Truck ☐ Car ☐ Motorcycle ☐ Bicycle ☐ Canoe ☐ Outboard motor ☐

Number of markets and supply centers attended regularly (city, town, other community)

Place ☐ Frequency (weekly, monthly, etc.) ☐

Products bought ☐

Products sold ☐

Place ☐ Frequency (weekly, monthly, etc.) ☐

Products bought ☐

Products sold ☐

USE INFORMATION

Perception of species quality for certain use categories

Human food	1.	2.	3.	4.	5.
Oils	1.	2.	3.	4.	5.
Thatching	1.	2.	3.	4.	5.
Walls	1.	2.	3.	4.	5.
Framework	1.	2.	3.	4.	5.
Local markets	1.	2.	3.	4.	5.
Regional markets	1.	2.	3.	4.	5.

Of the species known, which one is the most important? Why?

Knowledge Transmission

Is the knowledge on palm uses transmitted within the community? Why? Yes No

Appendix 3 (cont.).

PALM USE QUESTIONARY – GENERAL INFORMANT

1. Vernacular (local) name(s) of the palm

   Language of vernacular name and meaning of the name

2. Are there different varieties of the species? How are they differentiated?

3. What are the uses for this species? For reference use the categories and subcategories of use refer to Annex 5, for plant parts used to Annex 6.

   Which products are obtained?

   What is the palm part used for each case? (specify when possible the local names for the products)

   Which is the frequency of use? Is it a: **a)** Actual or **b)** Past use? If it is a past use, when was the last time it was used?

   Where is the resource collected? **a)** Agroforestry systems, **b)** Garden/courtyard **c)** Primary forest **d)** Plantations **e)** Palm stand **f)** Grasslands **g)** Secondary forest

   What are the techniques of harvesting? **a)** Destructive: necessary felling **b)** Destructive: unnecessary felling **c)** Non-destructive: climbing **d)** Non-destructive: harvest of cespitose palms (felling few or no trunks) **e)** Non-destructive: direct harvest of low palms (also juvenile, sub adults) or acaulescents **f)** Non-destructive: harvest (collection) on the ground **g)** Non-destructive: but without information

4. Abundance of the species in the past 10 years: **a)** Same **b)** Increased **c)** Decreased

5. Use of the species in the past 10 years: **a)** Same **b)** Increased **c)** Decreased

6. Commercialization: Type of product / Market type: (L) local; (R) regional; (N) national; (E) exportation / Frequency (daily, weekly, monthly, etc.) / Quantity / Price

Appendix 4. Palm use questionnaire for general and expert informants. Options in the questions techniques of harvesting and management systems are based on Bernal et al. 2011.

PALM USE QUESTIONARY – EXPERT INFORMANT

1. Vernacular (local) name(s) of the palm:

   Language of vernacular name and meaning of the name:

2. Are there different varieties of the species? How are they differentiated?

3. What are the uses for this species? For reference use the categories and subcategories of use refer to Annex 5, for plant parts used to Annex 6.

   Which products are obtained?

   What is the palm part used for each case? (Specify when possible the local names for the products)

   When is the resource collected? according to age of the plant: **a)** Seedling **b)** Juvenile **c)** Sub adult **d)** Adult **e)** Indistinct

   What are the characteristics of the processing? **a)** Without processing, direct use **b)** With processing (describe). For medicinal use, indicate information on preparation, administration and contraindications (if any)

   Which is the frequency of use? **a)** Actual or **b)** Past use? If it is a past use, when was the last time it was used?

   Where is the resource collected? **a)** Agroforestry systems, **b)** Garden/courtyard **c)** Primary forest **d)** Plantations **e)** Palm stand **f)** Grasslands **g)** Secondary forest

   What are the techniques of harvesting? **a)** Destructive: necessary felling **b)** Destructive: unnecessary felling **c)** Non-destructive: climbing **d)** Non-destructive: harvest of cespitose palms (felling few or no trunks) **e)** Non-destructive: direct harvest of low palms (also juvenile, sub adults) or acaulescents **f)** Non-destructive: harvest (collection) on the ground **g)** Non-destructive: but without information

   Is there a management system? **a)** Cultivation **b)** Enrichment areas of harvest with dispersion of seeds or seedlings planting **c)** Fertilization **d)** Use of fire (to increase the presence of palms) **e)** Rotating the harvest area **f)** Leaving the palms when the forest is cut **g)** Selective harvest by age, size and/or sex **h)** Seasonal restriction (moon phases, phenology or climate) **i)** Individuals or areas left as seed banks **j)** Pruning

Appendix 4 (cont.).

k) Transplanting **l)** Clearing other shrubs, trees and lianas (eliminate competition) **m)** They have a formal study (e.g. Management Plan)

4. How is it distributed in the vicinity of the community? **a)** Abundant **b)** Moderate (common) **c)** Rare **d)** Cultivated **e)** Other (describe)

5. Abundance of the species in the past 10 years: **a)** Same **b)** Increased **c)** Decreased

6. Use of the species in the past 10 years: **a)** Same **b)** Increased **c)** Decreased

7. Commercialization: Type of product / Market type: (L) local; (R) regional; (N) national; (E) exportation / Frequency (daily, weekly, monthly, etc.) / Quantity / Price

Appendix 4 (cont.).

Use category	Use subcategory	Description
Animal Food	Fish Bait	Bait for fishing
	Fodder	Food for domestic animals
	Wildlife Attractant	Palms that provide food for mammals and whose location constitutes preferential areas for hunting
Construction	Bridges	Materials to bridge watercourses
	Houses	Houses and other constructions such as temporary camps, animal yards
	Thatch	House thatching and other constructions
	Transportation	Canoes, rafts, oars and other materials for sealing
	Other	Uses not classifiable within the previous subcategories, for example stems used as posts for telephone lines and gutters to transport water
Cultural Uses	Clothes and Accessories	Articles of clothing and accessories such as hats
	Cosmetic	Beauty products, including perfumes, oils, shampoo, and other hair care products
	Dyes	Dyeing of diverse materials (vegetables) and as body paint
	Personal Adornment	Necklaces, bracelets, earrings, armbands, pectorals, anklets
	Recreational	Musical instruments, toys, ashes as additives to the consumption of tobacco and coca leaves
	Ritual	Uses related to myth-religious aspects, including festivals and feasts, construction of coffins, to drive away feared animals, sorcery
	Other	Uses not classifiable under the previous subcategories
Environmental Uses	Agroforestry	Palms that are part of agroforestry systems with different management degrees
	Fences	Delimitation of properties, barriers
	Ornamental	Palms cultivated for ornamental purposes
	Soil Improvers	Fertilizers, edaphic protectors and agents against soil erosion
Fuel	Firewood	Wood to make fire
	Fire Starter	Combustion starters
	Lighting	Lamps, torches and candles
	Other	Uses not classifiable within the previous subcategories, for example for waterproofing canoes
Human Food	Beverages	Elaboration of unfermented or fermented drinks
	Food	Edible, generally with little preparation
	Food Additives	Ingredients used in the preparation and processing of foods
	Oils	Edible fats
Medicinal and Veterinary	Blood and Cardio-vascular System	Anemia, cardiovascular problems and ailments, cardiac diseases, varicose veins, hypertension, hypotension, haemorrhoids

Appendix 5. Description of the use categories and subcategories under which ethnobotanical information is categorized for palm uses during interviews. Use categories and subcategories are based in Cook (1995) with adaptations for tropical regions. This has also been published in Macía et al. (2011).

	Cultural Diseases and Disorders	Ailments or disorders of magic-religious origin recognized by a specific culture, like mal aire ('bad air'), arrebato ('outburst'), susto, huaraña
	Dental Health	Caries, tooth pains, fillings, dental hygiene
	Digestive System	Carminative, colics, flatulence, emetic, indigestion, purgative, gastric or intestinal ulcers, diarrhea, laxatives, liver and vesicular disorders, hepatitis
	Endocrine System	Diabetes
	General Ailments with Unspecific Symptoms	General ailments like body pains, general discomfort, weakness, headache, fever
	Infections and Infestations	Malaria, leishmaniasis, measles, antihelminthic, louse, fleas, chiggers, scabies
	Metabolic System and Nutrition	Obesity, weight loss
	Muscular-Skeletal System	Rheumatism, twists, fractures, sciatic, lumbalgia
	Nervous System and Mental Health	Migraine, mental disorders, epilepsy, paralysis, nervous disorders
	Poisoning	Snakebites, scorpion stings, rays, spiders, insects
	Pregnancy, Birth and Puerperium	Gestation, haemorrhage, childbirth, postnatal, lactation, abortive, postpartum
	Reproductive System and Reproductive Health	Menstruation, fertility, venereal diseases, prostrate, impotence, menopause, aphrodisiacs, contraceptives
	Respiratory System	Flu, cold, loss of voice, bronchitis, pneumonia, expectorant, cough
	Sensory System	Eye infections, cataracts, loss of sight or smell, deafness, ear infection
	Skin and Subcutaneous Tissue	Acne, boils, eczemas, burns, extraction of spines stuck on the skin
	Urinary System	Diuretic, kidney stones, urinary incontinence, urinary infections, cystitis
	Veterinary	Treatment of diseases or ailments for domestic animals
	Not Specified	Medicinal use or with pharmacological properties, but with insufficient information to assign to one of the described subcategories
	Other	Uses not classifiable within the previous subcategories, for example tumours, cancer, anaesthetic
Toxic	Fishing	Fish poison
	Hunting	Poison for hunting
Utensils and Tools	Domestic Utensils	Baskets, fans, hammocks, bags, domestic furniture, air freshener
	Hunting and Fishing Tools	Bows, arrows, blowpipes, harpoons, fishing nets, hunting traps
	Labour Tools	Agricultural or domestic tools like spinners, machetes and lubricants of these materials
	Rope	Manufacturing of ropes and moorings
	Wrappers	Wrappers for materials and foods
	Other	Uses not classifiable within the previous subcategories, for example insect repellents
Other Uses	Miscellaneous	Uses not classifiable within the previous categories. Indirect use of palms: insect larvae feeding on rotting stems used as food, medicine or bait

Appendix 5 (cont.).

ANNEX 6. Palm parts mentioned in the description of uses by the informants during interviews.

- Complete plant
- Root: fulcreous, adventitious, subterranean
- Stem
- Spines (stem)
- Leaf
- Leaf sheath
- Petiole
- Lamina (leaf)
- Rachis (leaf)
- New leaf (unnopened)
- Palm heart
- Peduncular bract
- Inflorescences
- Flowers
- Infrutescence
- Fruits: exo, meso, endocarp
- Endosperm

Appendix 6. Palm parts mentioned in the description of uses by the informants during interviews.

Species	Priority of registering use information	Description
Astrocaryum sect. *huicungo*		
Astrocaryum chambira Burret		
Attalea butyracea (Mutis ex L.f) Wess. Boer		
Astrocaryum standleyanum L.H. Bailey		
Bactris gasipaes Kunth		
Ceroxylon spp.		
Euterpe precatoria Mart.	High	These species will be asked to all informants (experts and general) in all study sites.
Geonoma deversa (Poit.) Kunth		
Geonoma macrostachys Mart.		
Iriartea deltoidea Ruiz & Pav.		
Mauritia flexuosa L.f.		
Oenocarpus bataua Mart.		
Phytelephas macrocarpa Ruiz & Pav.		
Socratea exorrhiza (Mart.) H. Wendl.		
Attalea maripa (Aubl.) Mart.		
Bactris acanthocarpa Mart.		
Bactris concinna Mart.		
Bactris maraja Mart.		
Chamaedorea pinnatifrons (Jacq.) Oerst.		
Cocos nucifera L.	Medium	These species will be asked to all informants only if they are found in the forest or in the community.
Desmoncus mitis Mart.		
Desmoncus polyacanthos Mart.		
Geonoma maxima (Poit.) Kunth		
Geonoma stricta (Poit.) Kunth		
Mauritiella armata (Mart.) Burret		
Oenocarpus mapora H. Karst.		

Appendix 7. List of common useful palms species growing in Amazonian forests of Colombia, Ecuador, Perú y Bolivia (based on Macía et al. 2011) from which ethnobotanical information will be registered with all informants in the areas the species exist.

CARIBBEAN:

Regional:
Henderson, A., Galeano, G. & R. Bernal. 1997. Field Guide to the Palms of the Americas. Princeton University Press, Princeton. 363 p.

Read, R.W. 1979. Palmae. Pp. 320—368 in Howard, R.A. (ed.), Flora of the Lesser Antilles-Monocotyledoneae. Brooke Thomson-Mills, Massachusetts.

Antigua and Barbuda: refer to Regional references

Bahamas: refer to Regional references

Barbados: refer to Regional references

Cuba:
Leiva S., A. 2001. Cuba y sus palmas. Instituto Cubano del Libro. Editorial Gente Nueva, La Habana. 73 p.

Moya L., C.E. & A.T. Leiva S. 2000. Checklist of the palms of Cuba, with notes on their ecology, distribution and conservation. Palms 44 (2): 69--84.

Dominica: refer to Regional references
James, A. 2009. Notes on the uses of Dominica's Native Palms. Palms 53(2): 61--67.

Dominican Republic:
Hoppe, J. 1998. Palms of the Dominican Republic. Fundación Manuel de Jesus Tavares Portes, Santo Domingo. 106 p.

Grenada: refer to Regional references

Guadeloupe & Martinique: refer to Regional references
Fournet, J. 1978. Flore illustrée des phanerogames de Guadeloupe et de Martinique. I.N.R.A., Paris. 2538 p.

Haiti: refer to Regional references

Jamaica: refer to Regional references

Puerto Rico: refer to Regional references

Saint Kitts and Nevis: refer to Regional references

Saint Lucia: refer to Regional references

Saint Vincent and the Grenadines: refer to Regional references

Trinidad & Tobago: refer to Regional references
Comeau, P.L., Comeau, Y.S. & W. Johnson. 2003. The Palm Book of Trinidad and Tobago, including the Lesser Antilles. The International Palm Society. 108 p.

MESOAMERICA:

Regional:
Henderson, A., Galeano, G. & R. Bernal. 1997. Field Guide to the Palms of the Americas. Princeton University Press, Princeton. 363 p.

Appendix 8. Tropical palm field guides and checklists. References are arranged by geographical region. For each region listed, first is the general reference, followed by the remaining guides sorted alphabetically by countries. Country references are sorted chronologically from most recent to the oldest.

Belize:
Brewer, S.W. 1999. The palms of Belize: Species richness and a key based on vegetative characters. Palms 43(3): 109-113.

Costa Rica:
Grayum, M.H. 2003. Arecaceae. Pp. 201--293 in Hammel, B.H., Grayum, M. H., Herrera, C. & N. Zamora (eds.), Manual de plantas de Costa Rica. Vol. II. Gimnospermas y monocotiledóneas (Agavaceae-Musaceae). Monogr. Syst. Bot. Missouri Bot. Gard. 92.

El Salvador: refer to Regional references

Guatemala: refer to Regional references
Standley, P. & J. Steyermark. 1958. Palmae. Flora of Guatemala. Fieldiana Botany 24:196--299.

Honduras: refer to Regional references

Mexico:
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Medicinal Plants and the Legacy of Richard E. Schultes was an all-day event held at the Botany 2011 meetings in St. Louis in honor of Dr. Richard E. Schultes. Professor Schultes was one of the great botanical explorers of the Amazon Basin, whose work redefined the discipline of Ethnobotany. Contributors recounted his work and the research it inspired.

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