

# “They call me a woodsman”: cognitive and social aspects on the relationships between woodsmen and forest researchers

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## ABSTRACT

Woodsmen or “mateiros” are people who are commonly hired or contracted to work as special local collaborators, often guiding scientists inside the forest, providing local names of plants and other useful information. We interviewed forest researchers and woodsmen to unveil the process of forest science production in the coastal zone of Northeast Brazil. The concept of network is used as a basis for discussing the connections involving forest knowledge production in and outside scientific academic environments. We presumed that the so-called social invisibility of woodsmen would be a consequence of the asymmetric relationship they have with formal researchers. Information from the interviews was analyzed by means of thematic coding through the content-analysis technique. We found that the “woodsman” category is mainly an academic construct; a designation attributed generally in an unilateral way by scientific professionals towards some people who work as local experts on plants and other components of forest ecosystems. All of the woodsmen we found were men with a low degree of formal education. Researchers tended to recognize woodsmen as bearers of some indispensable information, although treated as a subordinate and local source of knowledge. Although most researchers realized that woodsmen are key collaborators, most of them never referred explicitly to the aid received from these partners. People from both groups agreed that woodsmen are more and more difficult to find. We suggest that forest researchers dealing with woodsmen should develop a more critical vision on the social relationships in which they are involved while doing fieldwork.

**Keywords:** Traditional knowledge, scientific knowledge, ethnoforestry, ethnobotany, ethnoecology.

## INTRODUCTION

Research undertaken in collaboration with both scientists and local specialists can result in more precise results than investigations undertaken solely by conventional scientists (Fortmann and Ballard 2011). Beginning in the colonial period

of Brazil, during the initial expansion of scientific investigations, local informants have positively aided in the construction of formal scientific knowledge – even though the protagonists of those scientific practices have historically been trained researchers, known then as “naturalists”. Although the idea that only knowledge used by “conventio-

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nal scientists" is credible has since become modified (Fortmann and Ballard 2011), "normal science" (Latour 1987) sometimes tends to confer credibility on opinions only when they are couched in specific scientific vocabularies. Diegues (2000) noted that while very precise in their own ways, scientific vocabularies may be inadequate to describe local knowledge among populations involved in nature conservation activities, further emphasizing that the scientific community must be able to understand local realities as presented in traditional knowledge. In that sense, Hanazaki et al. (2010) noted that local or "traditional" knowledge is dynamic and diverse and demonstrates many local and regional variations, while Nakazono (2010) associated local knowledge with certain social agents who are generally invisible to outsiders – the woodsmen or "mateiros".

The quality of research data gathered through surveys of local knowledge is a continual concern to scientists, for it involves very practical questions such as how to deal with local languages, dialects and cultural misunderstandings and confirm the adequacy of the information provided. These questions must be discussed in projects involving local collaborators (Sheil and Lawrence 2004), and new approaches must be developed in terms of an "interdependent science". Fortmann and Ballard (2011) conceived of an interdependent science in the realm of forest sciences, involving scientific practices undertaken by both scientists and local informants in a collaborative manner that would contribute to a better comprehension of the possibilities of conserving nature. Interdependent science recognizes that anyone can create knowledge, and that the accumulated experience of different groups or classes of people must be respected and recognized as an effective and efficient path toward scientific investigation. This seems to be related to "environmental knowledge" (*sensu* Leff 2009), which represents a form of understanding that breaks away from the dogma that "science" is the only legitimate criteria of knowledge. In that sense, environmental knowledge can transform knowledge and liberate natural and social processes that have been subjugated by scientific rationality, technology, and the dominant economy.

Scientific knowledge, whose production is explicitly assumed to be associated with other forms of knowledge, has been growing in acceptance within western societies. In this context, ethnobotany has been perceived as a "post-normal science" (Toledo and Barrera-Bassols 2009) that extends beyond the limits of the paradigms imposed by "normal science". Ethnobotanical as well as ethnobotanical research have contributed in very significant ways to articulating the connections between local or traditional knowledge and scientific or formal knowledge. Albuquerque et al. (2014) reported that the participation of indigenous collaborators was essential to the development of a diagnostic ethnobotanical study in an area of caatinga (dryland) vegetation in Pernambuco State in northeastern Brazil. According to Jimenez-Saa (1969), among the many challenges that ecologists, forest engineers, silviculturists, and other specialists encounter in their investigations of plant communities is the difficulty of identifying native trees. A number of research projects and forest inventories have been undertaken counting on the contributions of people who retain local or traditional ecological knowledge (Wilkie and Saridan 1999; Jinxiu et al. 2004; Procópio and Secco 2008). Even some internationally known researchers who were not explicitly involved in ethnobotanical research, such as Theodosius Dobzhansky and Crodovaldo Pavan (Black et al. 1950) considered the collaboration of "woodsmen" essential to floristic and ecological studies undertaken in the Amazon forest. On the other hand, woodsmen are very rarely given mention in scientific documents. Some other researchers have identified their local collaborators as parataxonomists, who, according to Sheil and Lawrence (2004), are "people who lack formal higher level education, but who are trained to undertake taxonomic tasks."

Our objective was to analyze social relationships along the process of forest science production, taking the relations between woodsmen and researchers as a model. Specifically, we focused on the opinions of researchers and their local collaborators concerning the cognitive and practical abilities that people are expected to show when working as member of the later group, within the perspective of improving the valuing of their contribution.

## MATERIAL AND METHODS

### Selection of the sample set

The target subjects of this study were people belonging to two distinct social groups. On one side were researchers and scientists from institutions of research or higher learning who were accustomed to using the information and services provided by woodsmen; on the other side were the woodsmen themselves who collaborated directly with those same scientists in forestry studies in Atlantic Forest. Having taken this into consideration, we decided to adopt a purposive sampling, as described by Tongco (2007). Informants were then selected in face of their relevant previous experience related to our research objective.

Our geographical scope was the forest region in the Pernambuco State, northeastern Brazil. These people will hereafter be referred to as researchers (or, scientists) and woodsmen (or, local informants). In the regional context under study, woodsmen are sometimes referred to as "mateiros". These are not the same as "common" informants, who are normally interviewed in ethnobiological or ethnoecological research. These woodsmen are many times hired or contracted to work as "special" local collaborators, who accompany scientists inside the forest, providing local names of plants and other information, while the later execute or coordinate formal (whether biological or ethnobiological) research inside forest environments. In this sense, the woodsmen were considered in this paper as "special" collaborators.

To initiate the field research of this investigation we specifically selected a number of researchers who had undertaken research programs or plant inventories in Atlantic Forest areas in Pernambuco State using local informants or guides. The initial choices of subjects were based on the ease of access to these researchers-informants, as the present authors are likewise associated with research institutions headquartered in Pernambuco State where Atlantic Forest remnants can still be found.

We employed the "snowball" technique described by Albuquerque et al (2014) to identify researchers and technicians who had been involved

in research projects and/or inventories in forest environments that had used the services of local woodsmen. The informants-researchers self-identified themselves professionally as biologists (9), forest engineers (9), ecologists (7), botanists (6), taxonomists (5), dendrologists (3), ethnobiologists (3), ethnobotanists (3), ecophysiologicalists (1), ornithologists (1), phytogeographers (1), engineers (1), ethnoecologists (1). It soon became apparent, however, that the number of researchers to be interviewed in the sampling universe investigated was rather limited, and eventually ceased to increase as the subjects repeatedly gave the names of individuals who had already been cited.

A total of 30 researchers were interviewed who were working at that time in research or teaching institutions in Pernambuco State, Brazil: Universidade Federal Rural de Pernambuco (UFRPE); Universidade Federal de Pernambuco (UFPE); Universidade Católica de Pernambuco (UNICAP); Empresa Pernambucana de Pesquisa Agropecuária (IPA); Instituto Federal de Educação, Ciência and Tecnologia (IFET-PE); Diretoria de Meio Ambiente do Recife (DIRMAN); and Companhia Pernambucana de Saneamento (COMPESA). The interviewees were given the opportunity to choose more than one professional designation; as such, the 30 interviewees cited 50 professional characterizations.

We also interviewed 16 people that had been indicated by the researchers as having served as woodsmen in the past. Of these, six resided in the Metropolitan region of Recife and 10 resided in the more inland forest zone of Pernambuco State.

### Data collection and analysis procedures involving researchers

Data collection with the researchers involved applying semi-structured interviews (Albuquerque et al. 2014) lasting approximately 50 minutes. Only a single interview was held with each professional, although in some cases follow-up contacts were made to complement the investigations (in four cases by email and in three cases through personal contacts). The interviews were held within the institutions in which each informant was working.

The themes contemplated in the interviews referred to the roles of the woodsmen in forest

research projects, the forest environments where studies counting on the collaboration of those woodsmen had taken place (geographical localizations and the predominant vegetation types), the names of the woodsmen involved, and the abilities that assistants should display (in the opinion of the researchers) to act as woodsmen.

We applied the "content analysis" technique as described by Bardin (1977) to analyze the data derived from the interviews. In general terms, this type of analysis relates semantic structures (signifiers) with sociological structures (signified). The different phases of this technique are organized around three chronological poles: 1) pre-analyses; 2) the exploration or codification of the material; and 3) treatments of the results, inferences, and their interpretations. Considering the information obtained, we opted to undertake a thematic-categorical analysis that involved the identification of the "sense-nuclei", considering semantic criteria within the categorizations. The contents of the interviews with the researchers were divided into themes, with a table being constructed for each theme with its respective registered cases. Descriptive statistical analyses (calculations of the frequencies) allowed us to visualize how a given theme was important to the set of informants, and to any single informant.

### **Data collection and analysis procedures with the woodsmen**

A single interview was held with each woodsman that was divided into two moments. The first moment consisted of a thematic oral history interview (Meihy and Holanda 2007), as has been used in other studies of human-forest relationships (Silva et al. 2010). The second moment of the interview was loosely structured (Albuquerque et al. 2014) and contained questions similar to those utilized in the semi-structured interview dialogues with the researchers. This allowed us to investigate in a synthetic manner the thematic oral history of each woodsman informant and focus on their relationships with forest environments and, more specifically, with the researchers they had collaborated with in research projects.

According to Meihy and Holanda (2007), one of the cornerstones of oral history is the "revelation of unknown, occult, and other aspects that cannot be found in official written documents". Analyses of documentation were used to complement the interview data, including: identification cards from institutions for which the woodsmen had worked and payment receipts, as well as reports and publications that cited the name of the woodsman. Documental sources like these are often used in studies having a historical approach (Gimmi and Buergi 2007), since they make it easier to achieve a better contextualization of such information as dates, numerical data, and other relevant information coming from our informants.

Data collection involved visiting the locality where the informant lived and/or worked, within the geographical area considered in the research goals (the Metropolitan region of Recife and the inland forest zone). The interviews lasted about an hour and a half each and were undertaken in the residences of the informants, or at their worksites.

The procedures for the systematization and analyses of the data involved *transcription*, *contextualization*, and *trans-creation* (Meihy and Holanda 2007) of the data gathered from thematic oral histories of the local informants, followed by the application of "content analysis" techniques of the classificatory type, as described by Bardin (1977) for semi-structured interview data.

## **RESULTS AND DISCUSSION**

### **Forest research and woodsmen in the Atlantic Forest, northeastern Brazil**

Only men were indicated by the informant-researchers as having worked as special local collaborators in their forestry or similar research. Therefore, we could not find "mateiras" (woodswomen); only "mateiros" (woodsmen) were found. Apparently, women are not commonly contracted to work as local special collaborators in the regional context under study. Among the 16 woodsmen interviewed, only two said to have had any formal education. Among the other 14, we found 10 people who had only the minimum ability to

sign their own names, while the other 4 reported themselves as illiterate. These numbers demonstrate their marked contrast with the researchers interviewed here, most of who had Masters and/or Doctoral degrees. Most of the woodsmen stated that they worked at industrial sugarcane mills or governmental institutions, officially exercising (in the latter cases) functions as fieldworkers, general service help, laboratory workers, or agricultural technicians. A minority of them were self-employed (one being a fisherman and the other a beekeeper). Only one interviewee worked for a non-governmental institution as a woodsman. This data differs from that presented by Nakazono (2010) for woodsmen in the Amazon region, as this author stated that "almost all of those considered woodsmen were or had been incorporated into research institutions". Our study, then, revealed a much more informal relationship between the woodsmen and the scientists who recruited their work. Fully 31% of the woodsmen interviewed declared that they had worked as "*machadeiros*" – wood cutters – at some point during their lives. According to them, *machadeiros* were people who worked in the forest cutting down trees (especially species with high commercial value) using hand axes. Thus, after most of the Atlantic Forest had been devastated, and with the creation of some laws that helped to protect these environments, people and industries who were involved in clearing forests became somewhat involved in forest research. In fact, these woodsmen stated that the end of their careers as wood cutters (and the beginnings of their activities as woodsmen) was related to the intensification of the campaigns against illegal deforestation in the Atlantic Forest. Some of the woodsmen attributed, during the interviews, a large part of their knowledge on the names and characteristics of forest species to their times spent as wood cutters.

In 70% of the cases, the researchers interviewed described their woodsmen collaborators as people who had been hunters, wood cutters, forest guards, small-plot farmers, and sugarcane workers. Descriptions such as "compendiums of natural history", "forest supervisor", "primitive being", "true man of the woods", and "highly trustworthy", were attributed to the woodsmen by the

researchers. One of these special collaborators was compared to a "walking library" by a researcher, due to his wide knowledge of the regional environment. The title of "woodsman", as seen in the researchers discourse, is often associated with a local resident who retains a considerable knowledge of the regional fauna and flora and of ecosystem interactions; but it is principally associated with a person that retains a wide knowledge of the local flora.

The researchers interviewed declared that woodsmen were indispensable to projects undertaken in forest environments. The woodsmen interviewed described their first contacts with the researchers, describing in detail how they were first contacted. The initial contacts of these local collaborators with field research projects occurred during the period between 1963 and 2009, with an apparent peak during the 1970s. Nakazono (2010) reported that the strengthening of formal arrangements among woodsmen integrating research teams in the Amazon region occurred in 1952 with the arrival of various research institutions, including the federal universities. In 1979, the "Minimal Critical Ecosystem Size" project organized by the Instituto Nacional de Pesquisa da Amazônia explicitly mentioned a "team of three woodsmen" (Nakazono 2010). In the context of our study, the creation of the Tapacurá Ecological Station in 1975 was described by one researcher interviewed as a starting point for the appearance of woodsmen with specific functions in Pernambuco State. Recognizing the importance of woodsmen requires considering them as potential collaborators qualified by their living experiences in the forest. These informants have (as reported by one researcher), "a precise vision of the forest", and their long experience within forest environments is the principal differential between woodsmen and researchers. One of the researchers observed that: "... students graduate completely green, without any true experience in forest environments, and they are often PhDs in biodiversity ... their job (that of the woodsmen) is to fill in the gaping hole of our ignorance, which is continually growing ...". All of the woodsmen interviewed reported that they had spent their early lives in forest situations. Apparently, thus, and the assistance of woodsmen has

been fundamental, at least to some forest research projects, due to their unique knowledge. In the Amazonian context, at the beginning of the 1970s, during the so-called "Projeto Radam" ("Radam Project"), these local collaborators were extensively employed in the Amazon region. According to Nakazono (2010), many field excursions within this project were undertaken exclusively by woodsmen – and the collected information was then handed over to the coordinators and researchers responsible for the projects, who systematized and published the results as their own scientific research.

Generally, the workers identified as woodsmen by the researchers self-identified themselves in the same way, but this was not sufficient to explain how they came to be woodsmen. It came clear, nevertheless, through the speech of one of these local informants, who said: "I'm using the word woodsman because one day I heard her (the researcher) calling us that ...". This was expressed in an even more unequivocal manner by another woodsman interviewed: "... They call me a woodsman... I became one through these people (the researchers) who arrived ...". This demonstrates that to obtain the title and condition of woodsman it would probably be necessary to have specific social relationships with researchers. The local informants possessed previous botanical and/or ecological knowledge, mostly acquired through oral traditions, but it was the researchers who, while hiring or contracting these people to work as special local informants in forest research and inventories, bestowed on them the status of "woodsmen". Before the arrival of scientists, these were probably not seen as woodsmen by their neighbors and relatives.

### **Formation, training, and the tendency for the disappearance of woodsmen**

According to more than 80% of the researchers interviewed, it would be preferable to hire woodsmen who had been living in or near the forest being investigated. Moreover, when asked if the collaboration of a single woodsman could be useful under different vegetation types, more than 60% of the researchers interviewed answered "no", meaning that it would be useful only in environments similar to those with which that particular woodsman

was most accustomed. These results seem to reinforce the "local" character that is commonly associated with woodsmen's knowledge, at least in the researchers' point of view. An exception would be a parataxonomist, as was pointed out by one of the researchers: "after I have trained a good parataxonomist, he would be capable of identifying plants from different regions, under different vegetation types". A few woodsmen (three out of 16) likewise recognized the existence of such special conditions, so that the possibility of working in different environments would depend (according to this reasoning) on the experiences and specific knowledge of the woodsman in question. Therefore, a few informants have reported the occurrence of such exceptional situations, in which the same woodsman rendered services in different regions, under different vegetational conditions. On the other hand, one of the researcher-informants (a forest engineer) strongly opposed to this during the interview, saying that "*Absolutely not! Woodsmen shouldn't be moved around ... because they'd lose their own references*". Taking a look at the curriculum of this informant-researcher, we could see that that person had the opportunity of travelling around to study and work in different institutions around Brazil. So, it is possible to argue that the "local" feature attributed by a researcher to non-academic informants' (woodsmen included) is mainly a question of scale (Latour 1987). Due to "mobilization", scientists are able to put together and rearrange large amounts of information, gathered in different places and moments. On the other hand, indigenous, traditional or local people often don't have access to such diverse information. Following this reasoning, the resulting difference between academic and non-academic knowledge is not due to cognitive differences among scientists and lay people. It is rather due to the scientists' ability to extend networks and to "travel along" inside them. Thinking of these relationships as networks is useful for it helps us to see beyond the asymmetrical "great divide" that separates scientists and other people. So it may encourage scientists to break through the ancient limits that separated sciences from other forms of knowledge.

Based on the descriptions provided by the researchers on the abilities that they normally seek in woodsmen, we classified these abilities into three categories: 1) to act as a guide for navigating within the forest; 2) to find, point out and give local names to plants and animals; and 3) to express their knowledge of the ecological aspects of the region and cooperate willingly and conscientiously for the success of the research project. Most of the researchers we interviewed stated that the first of these abilities was the main aspect they used to value while choosing and hiring a person to work as a woodsman. The second ability was emphasized by those researchers that were directly interested in plant identification and taxonomy. These classified themselves as forest engineers, botanists, dendrologists, and taxonomists. The third ability was emphasized by researchers who identified themselves as ecologists, biologists (including those who had been studying ecological succession) phytogeographers, ethnobiologists, ethnoecologists.

The interviewees of both groups (woodsmen and researchers) noted the tendency for woodsmen to disappear. The most often cited cause, in both cases, was supposed to be the lack of interest of younger generations in becoming woodsmen. Researchers cited also the quantitative reductions in the areas covered by natural forest vegetation as a possible factor in this process of woodsmen "disappearing".

Conservation of forest environments in Northeastern Brazil has been based on a model that often excluded local people (mainly peasants), who lived near those remaining forests. In many cases, these local people were not permitted to have access to these environments. This probably has been one of the causes for that tendency for the disappearing of traditional or local knowledge on forests (Silva et al. 2010). Words that indicate this tendency, such as "difficult", "rare", "always less", and "in extinction" were mentioned in more than 80% of the interviews with researchers, referring to the growing difficulty of finding woodsmen. Taking into consideration that the cumulative knowledge of a woodsman is amassed during his long personal relationship with the forest, it can be inferred that as other factors (especially the migration of

woodsmen to work in other regions) interfere in this relationship, less woodsmen will become available. Although this tendency seems to be a consensus inside the academic community, many researchers sometimes encounter difficulties in defending the value of woodsmen's work – even while knowing that without them it would be much more difficult to carry out some specific field studies in forest environments, or even sometimes finding their (scientists') way back home after fieldwork. According to Candotti (2002), the cause of this difficulty is the absence of institutions really dedicated to intermediate the relationships between scientists and the rest of the society in an effective way.

Almost all of the woodsmen confirmed that they had obtained their personal knowledge of the surrounding forest environments from family members and from working within the forests. Only one of the 16 woodsmen interviewed said to have been specifically trained by scientific researchers, and could therefore be considered a parataxonomist (*sensu* Sheil and Lawrence 2004). On the other hand, the phrase "woodsman training" was noted in the oral interviews of a number of researchers, and was indicated by most of them as a potential useful method to aid forest research projects – and despite not having been specifically questioned on that point, more than 50% of them mentioned it. Despite having regarded this kind of "training" as an option, it has not been put in practice frequently by the researchers we interviewed. The unique knowledge of the woodsmen, as was pointed out by the researchers, is closely associated with the relationships those workers had established with the natural environment through their personal histories. Within this context, Sheil and Lawrence (2004) proposed that local collaborators could be trained to be efficient parataxonomists and participate in biodiversity research programs. Basset et al (2004) noted that training parataxonomists would be an efficient strategy and should receive more attention from conservation biologists. Candotti (2002), emphasizing the necessity of formally training parataxonomists, suggested the creation of institutions that would allow exchanges between different cultures and different forms of knowledge, thus extending contacts between "master woodsmen" and "master scien-

tists". This approach was actually suggested by one of the woodsmen in the interviews: a school set up specifically for creating a new generation of woodsmen and for training people who live near the remaining forest fragments and demonstrate the vocation for working in those forests.

Most of the woodsmen thought that it was important to stimulate the training of new local collaborators. For 60% of the researchers interviewed this type of training would consist of transmitting their scientific knowledge to the woodsmen, although acknowledging that not all of the woodsmen could become parataxonomists. According to this line of thinking, the researchers would pass on their knowledge of phyllotaxy, for example, to woodsmen, who could then use this technical tool for identifying trees. In this case, training should be directed only toward giving the woodsman the second ability (mainly giving local names of plants). However, one of the researchers (a forest engineer) was of the opinion that this type of training could interfere with the "reasoning process" of the woodsman, thus changing his "native logic" to the "logic of a researcher" – thus altering (or even losing) a unique manner of interpreting nature that had been constructed over a lifetime. In this sense, considering that the skills acquired by a woodsman were honed over long periods of time through a living relationship with the forest, and considering that this represents the principal differential that these collaborators bring to their work (when compared to a researcher), this formal training would not be necessarily positive from a cognitive point of view. Basset et al (2004) emphasized the usefulness of working with parataxonomists who could aid in data gathering, thus aiding to improve the efficiency of studies on tropical ecosystems.

### **The importance of woodsmen in forest research programs and in generating knowledge**

All of the researchers interviewed were unanimous in their view that the woodsmen with whom they had been associated retained exceptional knowledge about forests and that they were capable of using this information to promote scientific research projects and undertake plant surveys.

Nevertheless, the work of woodsmen is generally "invisible" in research reports and scientific publications. One of our researcher-informants pointed out that, since that work had been paid, it would not make sense to unveil, in publications or reports, any details on that collaboration.

To explain it better, the same person compared the work of a woodsman to that of a photocopy machine manager: "Since I do not need to give details on the participation of the worker who made some photocopies under my request, then my research report doesn't have to contain any explanation on the participation of a woodsman". According to Nakazono (2010), the interface between scientists and woodsmen's knowledge is quite disperse and camouflaged under the veil of labor relationships, since the participation of woodsmen is mostly seen as part of their contractual obligations and not as an integral part of the scientific knowledge produced during a project execution. As was noted by Wiersum (2000), the incorporation of local knowledge into forest management projects (and therefore forest science) would involve a very fundamental change in the concept of silviculture, to the point of being considered a changing paradigm instead of just a simple adaptation by the forest sector. The right way to give explicit (*i. e.* written) recognition on this collaboration, however, is yet an issue under discussion in some academic circles. In parts of the Amazon region, for example, woodsmen are normally excluded *a priori* from any pretension of rights to authorship or to intellectual property.

On one way or another, the value of woodsmen knowledge has been recognized (during interviews) by most of our informant-researchers, but on the other hand the intrinsic variations in that knowledge, was mainly seen by as a disadvantage by these researchers, especially when referring to the variations in local names of plants. In that sense, ethnobiologists and ethnoecologists may have an important role in integrating knowledge systems and strengthening the dialogue between science and other kinds of knowledge, making it easier to understand and manage respectfully the conflicts that sometimes arise at the interface of different forms of knowledge. This places the ethnoscientists in a position to collaborate in an efficient man-

ner with the construction of an "interdependent science" (Fortmann and Ballard 2011), in order to value diversity of knowledge as a potentially positive aspect of social life. Although many scientists already have been doing valuable efforts to take into consideration the unique knowledge provided by local informants (Robertson and McGee 2003), there is no concrete indication that the value attributed to woodsmen's knowledge has improved in our "(euro)scientific culture" (Candotti 2002). The responses of the researchers who were interviewed here make it clear that they value (make use of) this local knowledge, including in the elaboration of their hypotheses and in research undertaken in natural environments, with both researchers and woodsmen agreeing that the final product was the result of scientists' and woodsmen's knowledge. The fact that 90% of the woodsmen interviewed did not have any type of formal education may partially justify the almost complete lack of explicit citations of woodsmen as collaborators in publications. This seems to confirm the idea that the credibility given to people as producers of knowledge is often aligned with their social power (Fortmann and Ballard 2011). In this sense the "invisibility" of the woodsman is associated in large part with the asymmetrical knowledge and labor relationships between scientists and woodsmen. If the aid of these people who work "behind the scenes" in field research could be properly recognized, then there would be an increasing number of scientists realizing those still implicit connections between botany and ethnobotany; between forestry and ethnoforestry; between ecology and ethnoecology; and so on. Furthermore, this could be an opportunity to develop an "ethnobiology of us" (Wolverton et al. 2014).

## CONCLUSIONS

Scientific practices undertaken in a collaborative form by researchers and woodsmen were analyzed based on the testimony of their own experiences. As a result, it is appropriate to conclude that the knowledge constructed during those research interactions is related to interdependent science). Therefore, the model of science and forest data gathering based on the knowledge pro-

duced by scientists and local informants together provides efficient results in relatively short time span. However, the recognition of a scientific practice that considers the hybridization of knowledge requires socio-cultural changes, especially inside the scientific community.

The understanding of networks shaped from the combined knowledge of local informants and researchers can explain important technical and social aspects which are essential to future scientific progress. Analyses of the relationships between researchers and woodsmen are not simply proves of different points of view, but are undertaken with the goal of balancing forces, that is, searching for a symmetrical manner to scrutinize two forms of knowledge and invite epistemological reflections on current science that can be done with the collaboration of woodsmen and other non-academic informants. In this sense, we suggest that scientific knowledge should adjust its relationships with other forms of knowledge.

The unique knowledge of woodsmen (and other categories of local specialists), when utilized in scientific production, must be critically systematized and valued.

Research that gives credit to local knowledge and recognizes its potential is welcome in orientating the relationships between science, culture, and nature. Researchers who use to work in collaboration with woodsmen should have in mind the necessity of minimizing the social invisibility in which woodsmen are normally immersed. Thinking of these relationships as networks could help in achieving a less asymmetrical approach in the practice of forest research work. We scientists (not only ethnoscientists) should more and more recognize explicitly that the knowledge we produce depends to a great extent on interacting with local people. This seems to be even more urgent in the context under study, in which we found a tendency for the disappearing of woodsmen.

Finally, our data suggest the necessity of creating innovative educational strategies involving researchers and their collaborators, in a two-way approach. It may be tempting to suggest an effort towards a better "technical training" for woodsmen as an isolate solution. We argue that this kind of intervention would not work well if it would be

unidirectional. It could in fact intensify the asymmetry. So, there's a need to ask: "what could be done to educate us (scientists) so that we could have a better understanding on the social network that lays behind the construction of formal forest knowledge?". Let us not just think of technically preparing the woodsmen of the future. We should also prepare ourselves to be involved in less asymmetrical social relationships in the construction of science, whether inside or outside forests.

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