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Applied research in ethnoecology: Fieldwork experiences

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SUMMARY:
Ethnoecology studies human beings' relation with their environment aiming at understanding several current social-ecological problems such as ecological degradation and loss of cultural diversity, mainly from a local point of view. Since 2006, the research team of the Ethnoecology Laboratory (Universitat Autònoma de Barcelona) is conducting research projects focused on the study of social, cultural, political, and ecological factors and dynamics influencing the relation of rural and indigenous communities in Africa, Asia, Latin America, and Europe, with their surrounding environment. Contrary to the common practice of simply extracting information from rural communities, projects from the Ethnoecology Laboratory blend academic research and actions oriented to return their findings to the populations where they take place to contribute in some direct or indirect way to the improvement of their well-being and sustainable use of natural resources.

KEY WORDS:
Ethnoecology, cooperation, action-research, dissemination, education, outreach.

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Introduction

Ethnoecology is the interdisciplinary study -from a particularly local perspective- of the dynamic relations between human beings and the environment in which they live. From its inception in the fifties (cf. Conklin, 1954; Frake, 1962), ethnoecology's definition and main research focus have greatly evolved. In its beginnings, ethnoecology mainly dealt with the *cultural systems* of classification of the natural environment (Conklin, 1954; Frake, 1962). Nowadays most ethnoecological studies focus on the study of traditional ecological knowledge under a highly holistic approach. Such approach includes, among others, analyses of how traditional ecological knowledge is generated, its history, its social and ecological functions, as well as its relation with the dominant culture, with which societies holding this knowledge interact. Apart from a cultural heritage that is determined by its own history and embedded within major cosmologies –at times millennial–, which also conditions the future development of traditional ecological knowledge, this knowledge is mainly understood as a human strategy to adjust to and transform a given habitat which is the product of co-evolution between culture and nature (Berkes et al. 2000; Reyes-García and Martí, 2007).

Ethnoecology explores the ways in which different human groups perceive and/or represent ecological systems through an ensemble of knowledge, beliefs and practices (Toledo, 1992). This discipline suggests, therefore, the study of a knowledge system made up of 1) belief systems and world views (*cosmos*) belonging to different human collectives about their environment, 2) the set of traditional ecological knowledge in *stricto sensu* (*corpus*) whose ultimate goal is the use and management of natural resources, 3) the combination of productive practices (*praxis*) with which societies fulfil their material and spiritual needs (Berkes et al., 2000; Toledo, 2002), and 4) the local (formal and informal) institutions involved in natural resources management (Ostrom, 1990). By assimilation of meanings, values and actions, ethnoecological research intends to comprehend local reality and –very frequently– also aims to create guidelines to implement local sustainable development strategies with local actors' involvement (Toledo and Barrera-Bassols, 2008).

Ethnoecological studies hold a trans-disciplinary perspective based on contributions made by natural and social sciences on different levels, from a rural inhabitant's perspective to politicians' opinion (Reyes-García, 2007). Currently, a lot of ethnoecological research focuses on the following topics: 1) local or traditional ecological knowledge (Berlin et al., 1974; Reyes-García et al., 2003), 2) the relationship between bio-

logical diversity and cultural diversity (Harmon 2005; Dove et al., 2005; Maffi, 2005), 3) natural resource management systems (Balee, 1994; Berkes and Folke, 1998; Atran et al., 1999; Haenn, 1999; Olsson et al., 2004), 4) local environmental perceptions and representations (Frake, 1962; Goedlier, 1984; Descola, 1986 and 2005), and 5) relations between economic development and human wellbeing (Guest, 2002; McDade et al., 2007; Reyes-García et al., 2007).

Most empirical studies in ethnoecolgy mainly focus on rural and indigenous groups and, thus, require ~~in~~ one way or another—their participation. On a theoretical-methodological level, scientific organizations that deal with subjects that are close to ethnoecology have developed ethical codes with the aim of emphasizing the need to establish egalitarian relationships between scientists and local populations (check, for example, moral codes within the Society of Economic Botany http://www.econbot.org/ or the International Society of Ethnobiology http://ethnobiology.net, among others). These codes serve as a basis for the establishment of cooperation mechanisms between local people and researchers. The aforementioned mechanisms imply several actions that range from returning results to the people involved, to development, cooperation and participatory action-research; the latter understood as "a growing family of approaches and methods to enable rural people to share, enhance and analyze their knowledge of life and conditions, to plan and act" (Chambers, 1994: 953). The goal is for these mechanisms to improve the quality of life of the rural and indigenous communities where the studies take place, as well as encourage a better management of natural resources, in so far as possible.

In practice, however, there are still few ethnoecological studies that are able to develop collaboration mechanisms actively involving local people in the selection of research topics, analysis, and discussion of results. Also uncommon are analytical approaches aimed at systemizing cooperation mechanisms and techniques between researchers and locals. Given that without local people's involvement ethnoecological research would not feasible, our speciality needs to keep reflecting on the importance of establishing guidelines in order to regulate the rights and obligations of researchers in local communities, and vice versa. These guidelines must regulate collaboration, not only during the data collecting process, but also when planning the study, as well as when returning the results, aiming at making a positive impact on the communities we deal with. Additionally, collaboration must foresee its potential influence within the dialogical relationship every research has with the rest of the world (scientific, social, institutional, corporate, etc.).

In this article we present five case studies carried out by the Ethnoecology Laboratory within the Institute for Environmental Science and Technology at the Universitat Autònoma de Barcelona (ICTA-UAB). Those case studies are used to describe and reflect on cooperation methodologies within the ethnoecological research context. These studies exemplify the Ethnoecology Lab's experience in the establishment of areas of discussion between locals and researchers, as well as in the development of resources, communication and mutual learning strategies.

Methods

Since 2006 the ICTA-UAB's Ethnoecology Lab (http://icta.uab.cat/Etnoecologia/) carries out research activities and scholarly training in Africa, Asia, Latin America and Europe. As a common practice during the research periods, actions are performed to create synergies between local inhabitants and researchers. Table 1 shows the main features regarding the five case studies we analyze in this article. The several research programs discussed present different collaboration levels between local population and researchers: from the return of information obtained during research to local populations, to the scholarly support to obtain recognition for indigenous territories. We will now summarize the context associated with each of the five studies in order to later analyze the forms of collaboration used in each case.

1. *Landrace knowledge in Vall Fosca, in the Catalan Pyrenees (northeast Spain)*. Vall Fosca is a Pyrenean valley of about 200 km^2 and approximately 1,000 inhabitants, the majority of which are cattle herders who depend on traditional practices based on the use of natural resources, as well as economic activities related to tourism. For three years, as part of a PhD research, members of the Ethnoecology Lab have carried out a study in which they analyzed the conservation of agro-biodiversity and the maintenance of local agro-ecological knowledge through diverse social networks for the exchange of seeds in the area (Calvet-Mir et al., 2010b; Calvet-Mir et al., 2011a; Calvet-Mir et al., 2011b). Cooperation actions began in 2009, motivated by the researchers' initiative to return the obtained scientific knowledge to the local population. This proposal is still under way. During this PhD research, valuable information was obtained and returned to the people involved, while measures were taken to

increase local agro-biodiversity's value, in the form of a seed sponsorship project.

2. *Community conservation: The role of local participation in biodiversity conservation. Case studies from Southeastern Mexico.* The project begun in 2009 as an inter-institutional and inter-disciplinary research project between Mexico, Spain and United Kingdom, to assess the effects of local participation in the conservation of protected areas that overlap six rural and indigenous communities in southeast Mexico. These settlements, built in agrarian communities or *ejidos* (another form of collective land ownership), are located within government's protected areas, and consequently face limitations in their productive activities. To improve and diversify their life strategies, residents are carrying out conservation initiatives through ecotourism projects, community reserves, reforestation programs and payments for ecosystem services (Ruiz-Mallén et al., 2011). In order to establish an ongoing collaborative process between locals and researchers to return the results, the research team -called CONSERVCOM- conducted training workshops and forums for the discussion of results with locals to improve natural resource management. The research also included a specific methodological design to disseminate the results.

3. *Traditional community-based natural resource management systems in Morocco.* The agdal is the seasonal prohibition to access pastures, forests and other communal natural resources with the aim of assuring their preservation and renewal. Thanks to trans-disciplinary methods and an historical and spatial comparative approach, researchers identified and worked in several agdals in the High Zat region (High Atlas of Marrakech). The action-research process was designed in a collaborative manner between researchers, members of a local non-governmental organization (NGO Association des Amis du Zat) and the local population led by the *jmaa*, the highest Berber organization for autonomous government in the High Atlas. Members of the Ethnoecology Lab were mainly associated with the valley's ecotourism development project led by the NGO, supporting and reinforcing cultural and scientific tourism. Such project is promoted along the High Zat valley to improve local life conditions as well as to offer an alternative to mass tourism – common in other areas of Morocco– such as, for example, in the

Ourika valley and the Oukaïmeden agdal. The Lab's cooperation actions consisted of dissemination materials, training, and the construction of infrastructures in the context of the scientific tourism project; these actions aimed to enhance the value of the region's agro-pastoralism, biology, architecture and landscape.

4. *Preservation of the Amazon Forest and Indigenous Territories: from conflict to cooperation. Case study in the Bolivian Amazon forest*. Since 1999 the Ethnoecology Lab is involved with TAPS (Tsimane' Amazonian Panel Study, http://www.tsimane.org/), a long term program that aims to assess the effects of market exposure on the Tsimane' well-being and on the use of natural resources. The Tsimane' are a hunter-gatherer group within the Bolivian Amazon forest which, as many other indigenous people in Latin America, has to face political and economic factors restricting their territorial rights, often under the base that indigenous groups already have enough land, that they are relatively few for so much space, or that they ask for more than they can handle (Stocks, 2005). The Tsimane' have no legal tools to fully exercise their land's ownership, which makes it easier for outsiders to invade their ancestral land, enabling deforestation by settlers, cattle ranchers and timber merchants, while destroying their social norms and creating internal conflicts (Reyes-Garcia et al., 2012). Despite the Bolivian government's intention of handing down these lands to rural and indigenous people for the last 20 years (Stocks, 2005), in many of these territories, progress has been moderate and sluggish. In order to help the Tsimane' advance in their entitlement process, researchers carried out a participative mapping of 32 indigenous communities located in the Tsimane' Communal Territories and adjoining areas (Reyes-García et al., 2012). With this information at hand, maps of the area have been prepared, detailing different uses the Tsimane' people make of their land.

5. *Ethno-cartography of the impacts of petroleum activities, along the Corrientes River (Peruvian Amazon)*. Since 2005, and in response to the local demands of Achuar, Quechua and Urarina communities in the Corrientes River area (northern Peru Amazon forest), members of the Ethnoecology Lab, in collaboration with the Federation of Native Communities of the Corrientes River (FECONACO) and other Peruvian NGO's (Shinai), have developed a system of indigenous cartography

–ethno-cartography– (Chapin et al., 2005) of the impacts of petroleum activities in the Corrientes River indigenous area. This territory has been affected by the oil industry's activities (Oxy, Petroperu and Pluspetrol) since late 1960 (Orta-Martinez et al., 2007), becoming the largest and most lengthy oil production project in the Peruvian Amazon and the most productive within the country. However, it has created huge social, cultural and environmental damage in the region. Ethnoecology Lab researchers and members of Peruvian NGO's, with the aid of local indigenous people, developed an independent community-based monitoring system of the petroleum industry's impact through ethno-cartography in 32 communities.

Cooperation forms between local people and researchers

Collaboration between local people and researchers in the mentioned case studies is structured across different levels of local participation and engagement, which implies the following conceptual and methodological lines: 1) The return of information to the communities, 2) Local training, 3) Creation of jobs and infrastructures at local level, and 4) Support communities' political demands. The projects discussed here bear elements of each form of cooperation, although in each project some of them are prioritized. Next we will describe and analyze the aforementioned lines starting from the cooperation actions performed during our five case studies.

1. The return of information to the community

Cooperation actions between local people and researchers frequently start out with researcher's initiative to return scientific knowledge to the communities from who it was obtained. In spite of financial limitations, the return of results, such as dissemination and environmental education activities and materials, has an impact on the community's socio-cultural and educational development. With such actions it is intended to stimulate and increase the value of traditional or local forms of knowledge and culture in local people's minds.

For instance, in the Catalan Pyrenees landraces project, and thanks to the researchers' initiative, materials were prepared to return information to the community and four actions were performed to enhance the value of local agro-diversity. First, the researchers designed an informa-

CASE STUDY	LOCATION	COLLABORATION GOAL	FINANCIAL BACKERS	PERÍOD
Landrace knowledge in Vall Fosca, Catalan Pyrenees (northeast Spain).	Rural communities of Torre de Cabdella and Senterrada, Vall Fosca, Catalan Pyrenees, Spain.	To return the scientific knowledge obtained during research, back to the studied community.	Centre de Promoció de la Cultura Popular i Tradicional Catalana (CPCPTC), Agència de Gestió d'Ajuts, Universitaris i de Recerca (AGAUR).	2009-2011
Community conservation: the role of local participation in conserving biodiversity. Case studies from South-eastern Mexico.	Indigenous and rural communities in Felipe Carillo Puerto and Chunyaxché (QRoo); Xmaben and Union Veinte de Junio (Cam.); Tonalaco (Ver.); Santa Cruz Tepetotutla (Oax.), Mexico.	To return the scientific knowledge obtained during research back to the studied community.	Fondo de Cooperación Internacional en Ciencia y Tecnología Europa-México (FONCICYT), Agency for International Development Cooperation (AECID), UAB's Fundació Autònoma Solidària (FAS).	2009-2011
Traditional community-based natural resource management systems in Morocco.	Berber rural communities of the High Zat valley in the High Atlas, Morocco.	To support local scientific and cultural ecotourism as a sustainable development strategy.	Institut de Recherche pour le Développement (IRD), Spanish Agency for International Development Cooperation (AECID), Universität Uppsala (UU).	2003-2008
Preservation of the Amazon Forest and Indigenous Territories: from conflict to cooperation. Case study in the Bolivian Amazon forest.	32 communities within the Tsimane' Indigenous territory, Bolivia.	To map usable Tsimane' territory in order to provide them with tools with which they can advance in their land entitlement process.	BBVA Foundation.	2008-2011
Ethno-cartography of the impacts of petroleum activities, along the Corrientes River (Peruvian Amazon).	32 Achuar, Quechua and Urarina communities along the Corrientes River (FECONACO, Federation of Native Communities of the Corrientes River), Peru.	To promote the recognition of indigenous territory and the impact of petroleum activities on it; to guarantee control and insuring subsistence and sustainability of the tropical forest.	Fundació Autònoma Solidària de la UAB (FAS), Ministry of Science and Innovation (MINCIN).	2005-2011

TABLE 1: Case studies' main features

tive leaflet and a landraces catalogue (Calvet-Mir et al., 2010a), which were given to all the home-gardeners who participated in the study, city councils, schools and the valley's cultural associations as well as in neighbouring areas. Second, a website was designed to spread the conclusions beyond the local area: a website where the catalogue is to be found in digital format (http://icta.uab.cat/Etnoecologia/Docs/%5B47%5D-catalogovallfosca.pdf). Thanks to these actions, we have also been able to reach more people and establish relationships with others who are interested in the subject of agro-biodiversity conservation and ethnoecological knowledge. Third, also with the aim of establishing contact with gardeners and come up with strategies to improve the *in situ* conservation of agro-biodiversity (within home gardens themselves), we carried out workshop-talks on landraces in the area and their exchange networks. In these workshop-talks it was proposed, for example, to have a Seed-Exchange Day and carry out a school project for the conservation of local seeds. Here came along the idea of implementing a fourth course of action, a seed sponsorship project as a pedagogical resource with the aim of observing and studying diverse aspects (natural, social and cultural) of agro-biodiversity and to promote the value and respect for natural and cultural heritage among schoolchildren. This last action contributes to a long term increase in the value of agro-biodiversity. This project started out in March 2011 and has been very successful due to the great involvement of researchers, students, parents and Vall Fosca's town council.

In a very different context, the Mexican case study, exemplifies another instance of valuable return of information. Due to the fact that the project involved more staff and financial backing than the landraces project, in Mexico, actions to spread the research project were defined through a Communication Plan. This Communication Plan included local needs and interests regarding environmental learning, which were detected by researchers during the study. Previous studies in rural communities show that the participatory design of educational materials and contextualization of their contents in the local social-ecological reality are effective strategies for environmental learning (Ruiz-Mallén et al., 2010). Consequently participatory methods were included in the methodological design of the project to disseminate the results through two meetings for the exchange of knowledge and experiences on community-based conservation among the six studied populations. These encounters, in which 20 to 30 people from different communities met for three days, encouraged dialogue on the experiences people had, and allowed identifying factors which help or hinder the conservation process. They also served to jointly design, with local people, dissemination and ed-

ucation materials drawing from the research conclusions. Some of the Communication Plan's activities included providing vegetation maps, in which the communities' environmental history and land use changes were made visible, the creation of a website (www.conservcom.org), as well as pilot experiences in environmental education. For example, in the *ejido* of Felipe Carrillo Puerto, an environmental education program was designed, implemented and evaluated, in relation to a reserve owned by the *ejido*. Such program was addressed to the community's secondary school students (González Ventosa, 2011).

In the Moroccan case study, the return of results did not only serve to inform the local population, but also to provide support for its eco-tourism initiative. Specifically, collaboratively with the research project on local commons, an eco-tourism guide of the valley was produced to promote and increase the patrimonial value of traditional culture. An exhibition was also organized showing the value of the local agro-pastoral systems, berber commons or *agdals*, and the region's landscape, flora and architecture. The exhibition remains in the building of the local NGO (the AAZ or Association des Amis du Zat) which tourists can visit, so that it also has a function within the ecotourism conservation and sustainable approach of the AAZ, raising awareness among tourists.

In both mapping cases, Bolivia and Peru, the results returned had a more practical than informative character. Thus, in Bolivia, once the project ended, the research team gave back a copy of the territorial maps produced to each of the communities involved: a detailed map of the community's area and a map of the multi-communal territories which had been mapped. The maps were handed out in meetings with the communities in which their meaning was explained and emphasis was placed on how the Tsimane' could use these tools to defend their territory and their natural resources. These community visits were employed to discuss the importance of conserving natural resources as a way to face the changes taking place within the land (deforestation, climate change, etc).

Similarly, in the Peruvian case, the database of impacts of oil activities developed by the project was given to the indigenous federation FENOCACO, which regulates its access and use, as well as a DVD per each community, with of the photographs and videos of the oil spills. An educational report on the impacts that the oil industry has on the region has also been published (Stoll, 2011).

2. Capacity building

Capacity building activities represent another cooperation level between researchers and local people. Even though a frequent result in research projects is their contribution to specialized training of students on undergraduate, master and PhD levels, it is less frequent to invest in technical training for local people. In several of our case studies, researchers have promoted training for local people in various fields such as tourism, cartography and photography.

In Morocco, for example, training was provided for members of a local NGO (training local tourist guides, increasing heritage valuation and environmental education), while in Latin America local collaborators were trained to use GPS systems and carry out field routes to monitor land use changes. In Mexico, for instance, two participatory mapping workshops took place in each of the six studied communities which enabled a participatory spatial analysis of the territory (between locals and researchers), with the help of up to 251 people of which 65 were women and 186 men. Collaborative photography workshops were also carried out to provide supporting visual records of the fieldwork itineraries. The project donated the GPS devices and cameras used in the workshops to the communities to be used in this way in community-based environmental management. In Peru, 24 indigenous environmental monitors were trained in the use of GPS devices, cameras and digital video cameras, report writing, computing, environmental chemistry, environmental law and legislation (Orta-Martinez et al., submitted; Stoll, 2011). In Bolivia, as well as training in the use of GPS devices to map the territory, several indigenous monitors were trained to collect data to estimate the density of fauna. They also received training to collect socioeconomic information by using surveys, in order to fully understand the Tsimane livelihoods.

3. Employment and infrastructure creation

Some of the ethnoecological research studies have made direct contributions to development cooperation by generating jobs (both temporary and long term positions) as well as the creation of infrastructures.

In regard to job creation, a way in which the Ethnoecology Lab's projects try to help the local economy is by hiring community members as fieldwork assistants (e.g. data collection, transportation, territorial guides, etc.). To this, we add training in the use of research tools. In the Bolivian case study, for instance, a team of indigenous monitors worked

for two years with the research team in order to map the Tsimane' territory. Once the project ended, the National Institute for Agrarian Reform (INRA), a legal organism responsible for land entitlement, asked for two monitors who participated in the project, to get involved in the official team which is currently carrying out the demarcation of the Tsimane' territory.

When possible, long term jobs are created beyond the research project's duration. Nevertheless, in some cases, when there are not enough resources, these initiatives turn out more in the shape of recommendations, as in the case of the Catalan Pyrenees. With the aim of improving the landrace conservation strategy, a plan was designed to improve the seed exchange space promoted since 2006 by *Planter de Gerri* (local seedbank). Thanks to this plan, problems in the seed bank were revealed, such as a deficit in seed return by those collaborating with the project, and a bad seed management due to a lack of personnel. In order to keep the seedbank functioning, several correcting measures were applied, among which one was hiring a technician.

In other cases, long term job creation is achieved during the research itself. In Peru, an indigenous team of environmental monitors received economic support during 15 days per month in which they supervised the impact of the petroleum industry, during the time they would otherwise gather food or hunt. Thanks to indigenous mobilization, the oil company committed to provide the indigenous federation with resources to fund their monitors, without having itself any control over the monitoring system. Currently, we are working for the official inclusion of the community-based monitoring in the national environmental supervision programme of extractive industries activities.

In Morocco, the creation of jobs such as guides and escorts, were encouraged. These were intermittent long term jobs, as a result of a local NGO's ecotourism project and collective scientific fieldworks, but consequently produced an international network of potential tourists that are still periodically visiting the region through this NGO and under its sustainability principles. At the same time, while the different visits take place, local communities established rotating turns to provide services to the visitors such as mule and charge carrier transport, but also cooks, so that currently each of the community's families has a paid job shared evenly with the rest. In total, for the last five years, researchers were able to bring through the NGO's local production process more than a hundred scientists and tourists, four international research projects with their human and infrastructural needs ordered within the local community and over a gross economic injection of 25,000—of which 20% served

to finance directly local programs.

In regard to the creation of infrastructures, the Moroccan experience exemplifies how this type of collaboration should be carried out. Once the local population started to receive benefits from the ecotourism project, the community was asked to choose future projects to be done in the community. Thus, they decided to use the money to build public water fountains in the village, as well as a permanent bridge along the lower reaches of river Ikis to access one of its settlements. At the same time, the hostels of the NGO (three in total) were built in three different villages in accordance with the region's landscape and architecture. These have been strategically distributed in an area of over 500 km^2 within the High Zat valley (in the villages of Tizirt, Warzart et Ait Ali n'Oubdir) to encourage sustainable tourism throughout the area.

4. Backing political demands

In Bolivia and Peru's case studies, certain measures were taken to support local communities' political demands. In Bolivia, for example, researchers provided a copy of the maps generated to the Great Tsimane' Council (which is the major organization representing the Tsimane'), San Borja's Mayor's Office (a municipality on which the Tsimane' depend), and the Universidad Mayor de San Andres's Herbal Documentation Centre (this project's Bolivian counterpart). These counterparts will be able to use the information generated by this project as a basis for feasibility studies in protected areas, as well as in local management plans.

However, among the case studies, the clearest example of political support regarding social demands is the aforementioned ethno-cartography project in Peru, which was done in response to FECONACO's indigenous peoples' demands against the petroleum industry's activities. The spreading and assimilation of the data generated during our research was considered essential for communities and indigenous leaders to politically pressure and obtain changes in operational practices performed by oil companies, while guaranteeing their rights. Oil companies' concessions, known as oil block 1AB (initially 2,222.416ha and currently 497.027ha) and oil block 8 (initially 6,593.156ha and currently 182.348ha), were established in late 1960 entirely occupying the basins of rivers Pastaza, Corrientes and Tigre. Currently there are severe impacts and high pollution derived from oil activities in both oil blocks. Analyses performed by the Environmental Health Agency (DIGESA) found that 66.21% of the child population exceeded the blood lead levels established by the World Health Organization (10ug Pb/dL of blood) and 98.65% ex-

ceeded the cadmium blood levels established by the ACGIH, Deutsche Forschungsgemeinschaft and Lauwerys and Hoet among people who were not occupationally exposed (<0.1 ug Cd / dL) (Orta-Martinez et al., 2007). These results reinforced the idea (suggested by FECONACO) of developing an "indigenous system to map and monitor the oil spills occurred on the region" based on the particular application of ethnocartography methodologies (Orta-Martinez et al., submitted). Ethnocartography was viewed as the most appropriate method because it rests upon indigenous knowledge of the territory, as well as on their everyday practices regarding territory use and occupation. The project's database, with information concerning impacts of the oil activities in the area, was sent to the Peruvian mass media, the Peruvian public administration and oil companies. Thanks to this initiative, information is being used by indigenous leaders in the negotiations with oil companies, or public administrations to demand a better control and supervision of their operations, remediation of polluted sites, changes in operational procedures (for example, the renewal and maintenance of oil pipelines), and even a change in oil company's general discourse, forcing them to admit the environmental and social damage they cause. For instance, the burning of oil spills was common practice in the area, although it was never legal or openly admitted by the company involved. Visual documents of this practice, however, forced the company to take measures and eradicate such procedures. Images of the oil spills recorded by indigenous monitors with videocameras were used for the TV series "Amazon" produced by BBC (Robinson and Brandon, 2008).

Limiting factors in the cooperation between local population and researchers

The described experiences show how research projects can be approached and implemented considering local populations, not only as receivers, but as active collaborators. Nevertheless, local participation in projects such as these materializes on different levels according to the economic and human resources researchers are provided with, the flexibility and objectives of funding institutions, and the availability and interests of local people to participate in the actions that we support. In some cases it is possible to design the research program in a collaborative way with communities and local NGOs involved, as in Peru and Morocco. However, when time and resources are limited, and the funder's priorities have nothing to do with participation or with collaboration mechanisms

between local people and researchers, it is possible only to incorporate locals in the implementation of previously designed research tools which, therefore, may be far from their immediate interests. Also, the changes in the criteria regarding the priority areas and fields for cooperation according to the funding institutions' view might not enable researchers to present projects that are product of an intense participation with communities themselves as a result of previous interactions. In this way, the lack of previous knowledge regarding the social-ecological context of those local communities may distort the goals of the established cooperation actions and minimize their impact.

Collaboration opportunities between locals and researchers

The cooperation actions carried out in the five discussed case studies have encouraged four different processes promoting human development and biodiversity conservation.

First, individual and collective learning processes have been generated to promote knowledge and skills acquisition on the management of communal lands. This has been attained through local training in, for example, participatory mapping.

Second, participatory action-research processes have been encouraged. These have enabled local populations to cooperate with researchers in the decision making process, from research design in some cases to, in other cases, the implementation of data-collection tools, the design of educational materials or human and infrastructural development and cooperation actions. This has fostered positive feedback in the research process itself to continue improving results in terms of products and impact. Such participatory process of action-research should start since the very beginning of ethnoecological studies –as we have already mentioned above–by obtaining previous, free and informed consent to appropriately fulfil the project's expectations. In Mexico, for instance, the research team provided the local authorities with a document explaining the objectives activities and products to be attained. The document was distributed –in assembly meetings–among the population holding agrarian rights to get their approval. In fact, only land owners may make decisions regarding activities which take place in their land. Every community established a cooperation agreement with the researchers where they put forth collaboration rules regarding the project (actions to be performed, local people to be hired, giving back conclusions and results).

Third, our projects have also promoted processes to enhance the value of local biodiversity in people's eyes, and collective learning of traditional management of temperate and tropical forests, home-gardens and pastures, handling these in sustainable ways. Specifically, in the Moroccan tourist sector, support has been granted to local ecotourism programs to promote sustainable tourism and provide greater protection while reinforcing local culture by joint action with other communities.

Last, cooperation actions in some cases have started political processes, getting to provide institutional legitimacy for traditional natural resource management, thus, reinforcing them. An example of this is the current involvement of Vall Fosca's town council in the seed sponsorship project and its work with different gardeners in the valley to encourage seed exchange. We may find examples such as these also in projects with Latin American indigenous populations. Territory is considered by most indigenous peoples to be the foundation on which the rest of their resources depend, both natural and cultural; for their health as well as for the actual exercising of their political and cultural rights (Surrallés y Garcia-Hierro, 2004). Although legal land ownership is something that is not in the researchers' hands, training and educational activities carried out in Bolivia contributed to raise awareness of territorial recognition and resource management's importance, as well as provided an empirical basis for the Tsimane's territorial claims; exposing the need they have of land and how it affects their welfare. In Peru's case, the research databases are serving as a foundation for legal actions against companies to demand a compensation for environmental damaged affecting indigenous communities. To certain extent, this information may produce meaningful change in relation to the existing power asymmetry between indigenous groups and multinational corporations operating in the area.

Conclusions

The Ethnoecology Lab's experiences in the aforementioned projects show how awareness and cooperation actions, which are always the result of previous research, are coherent with the studied communities' ethno-ecological reality. Given that actions are embedded within research projects, actions can be directed towards addressing very realistically local problems or fulfilling people's specific needs. This was the case in Mexico and Bolivia, where participatory mapping was done to fill a gap in the local cartographic information, and the Tsimane's case, supporting their struggle to obtain formal ownership of their land. In both cases, gaps were

identified by the Ethnoecology Lab members thanks to previous research and carried out successfully thanks to the intimate relations built through the latter. Thus, if the people's and territory's realities are studied and understood in depth, there are more probabilities for awareness-raising and successful cooperative actions that answer to true local needs and interests. Hence, research projects conceived in this participative and collaborative manner may be better received by local people than those which are designed without taking closely into account the ethno-ecological context.

The discussed projects range from practically individual initiatives of the researchers, as the PhD thesis entailing dissemination and education actions in Vall Fosca, to larger projects involving several professional researchers and graduate students. Some also include NGOs' participation and greater funding, as is the case with the Moroccan and Latin American projects. Regardless the project's size, the Ethnoecology Lab's experience proves that actions may be carried out to –at least—return valuable information to the region's populations in the attempt that the project has a real impact on a local level.

Unfortunately, and in spite the scientific recognition of the value of traditional ecological knowledge and of community-based natural resource management systems towards rural or indigenous peoples' well-being and local biodiversity conservation (Berkes et al., 2000; Benton et al., 2003; Blondel, 2006; Berkes, 2004), these systems are in fact being swiftly eroded. At the foundation of such a erosion we find two factors that hinder the ties between research and cooperation. The first is related to a lack of financial backing in order to perform actions that can support the objects of our researches that have demonstrated to be of the interest of local livelihoods and environmental conservation. In general research funding agencies are not open to fund development actions, which they perceive as foreign to their goals. Therefore such actions greatly depend on the creativity, will and level of implication that researchers are willing to commit to as individuals, in regard to the local populations they are working with. They, thus, revolve around potential formulas which may redirect resources in that sense, within the forceful administrative limitations that are often imposed by funding agencies. Similarly, cooperation agencies often reject funding projects with a high degree of research involved. The Ethnoecology Lab's strategy has been, to a large extent, to search supplementary funding to reach both goals. This obviously entails greater short term efforts dealing with writing, executing and managing more –but smaller- projects, but could be beneficial in the long term as the previously discussed experiences show. The solution would be to

obtain grants that truly consider action-research as the central goal and, therefore, the necessary funds to perform these actions would be increasingly raised.

Secondly, facts established by scientists are many times used only partially by decision making agents (politicians, administrators, etc) in the management of natural resources, without necessarily incorporating the local communities' main preoccupations and the most pressing environmental priorities. A possible reason for this disengagement is the use of inadequate channels to disseminate information by scientific research programs. Academic articles are rarely read by politicians and decision makers. However, fieldwork actions, which have a direct impact on the population due to the generation of management tools, are more visible to the eye of local and regional politicians. Therefore it is more probable to create interest and local action in this way, establishing dialogue and debate between politicians and local communities, thus obtaining better conditions and positive changes for local life strategies. For example, this has been evidenced by the negotiations conducted between the indigenous federation, public administrations and oil companies in Peru, in order to make the latter admit the environmental and social damage.

The presence and impact of many research projects does not go beyond obtaining financial backing. Nevertheless, the Ethnoecology Lab's projects which incorporate cooperation as part of its own methodology turn out in meaningful relations at the same time as in alliance strategies with local actors. To sum up, we would like to highlight the fact that awareness-raising and cooperation actions carried out by the Ethnoecology Lab which are being, or have been appropriately used by rural populations, not only to create a well justified and pertinent change to improve local people's quality of life and the sustainable use of their environment, but favour their culture and traditional ecological knowledge and disseminate them beyond their territory, both in the scholarly field and among the general public.

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