An Ethnobotany Research Training Workshop in Madagascar

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Abstract

A consortium of conservation groups organized by the Missouri Botanical Garden in 2005 responded to a call for development of conservation areas in Madgascar that would include human communities within them by arranging for a training workshop on ethnobotanical research methods. The authors developed and implemented the workshop with sixteen participating Malagasy researchers. The content of the workshop and analyses of classroom and field components is provided. The workshop participants concluded that the process was very useful for their work in conservation of biological diversity and determined to continue to develop their skills in ethnobotanical research as a group of collaborating scholars.

Introduction

In September, 2003 at the Fifth IUCN World Parks Congress, the president of Madagascar, Marc Ravalomanana, announced that his country would be tripling the amount of protected areas and would do so primarily though conservation of land with people living on it and using its resources. This was fundamentally a different model of conservation than had been used in the past to establish protected areas in Madagascar. Furthermore, this strategy requires implementation of ways to deal with humans as part of the conserved landscape rather than being a species to be excluded from the landscape. The major conservation organizations working in Madagascar began to develop means to work within this kind of mandate. Among these efforts was development of training workshops in ethnobotany research methods for indigenous researchers. This paper describes one of these efforts.

During the period of March 21-April 4, 2005, the authors led an interdisciplinary field methods training workshop sponsored by the United States, National Institutes of Health (NIH) and Conservation International (CI). A consortium of conservation organizations, and research and educational institutions operating in Madagascar were interested in using tools of ethnobotanical research in their work. To this end, the authors were contacted in 2003 by a representative of the Missouri Botanical Garden (MBG), a workshop sponsor, and asked to prepare a two week training course for 2005. The workshop included ten full days of lectures, discussions and hands-on practice. This was followed by four days of field experiences working in two villages on the Northeast coast of Madagascar. The classroom portion of the workshop was held in the capitol city, Antananarivo, in a conference room provided by Centre National d'Application des Recheres Pharmaceutiques (CNARP). The field practicum was based in the coastal town of Mahavelona (Foulpointe), and the inland forest region of Analalava. Sixteen participants with PhD or MS degrees, each with prior experience conducting systematic and botanical and/or ecological field work, participated in the workshop (Table 1).

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Table 1. Workshop participants.

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Workshop Methods

Class organization and topics

The workshop materials were prepared using a combination of lectures previously developed for graduate student courses at the University of Hawai'i. The instructors drew from their respective backgrounds in botany and pharmacology (McClatchey) and medical anthropology and ethnography (Gollin) to emphasize that ethnobotany has moved from a descriptive to an analytical science and applied field in which research is increasingly focused on questions generated by local communities to address socio-economic, and environmental concerns. Participants were encouraged to consider research questions that go beyond pharmaceutical drug discovery (the orientation of the ICBG program) of broader impact to conservation, ecology, and health.

Content of the workshop also drew heavily upon the broad experience of the WWF/UNESCO/Kew People and Plants, Inc.(P&P) that has hosted many workshops led by Gary Martin, Tony Cunningham, and others. P&P produced a large body of works on research methods. Specific examples, data, and readings were drawn from these. Table 2 is a list of the major background references used with many chapters from these provided to the students as readings each evening for discussion on the following day.

Table 2. Important reference sources for research methods discussed and applied within the training workshop.

Category of methods and theories	Reference sources
Anthropological	Bernard 2002, Spradley 1980 Werner & Schoepfle 1987
Botanical	Wormersley 1976
Ethnobotanical	Alexiades 1996a Balick *et al*. 1996 Berkes 1999 Berlin 1992 Campbell & Luckert 2002 Cotton 1996 Cunningham 2001 Laird 2002 Martin 1995

The workshop was planned in advance to consist of ten days of intensive training that combined activities in communities with class room training (Appendix 1). However, an opportunity emerged to hold part of the workshop in the capital city of Antananarivo and part in a rural forest area. Therefore, all of the readings, in-class and in-community activities were distributed across a six day marathon teaching session with participants practicing a variety of research methds each day in preparation for field research elsewhere. Each day of the six day classroom phase of the workshop included an eight hour class session with a mix of discussions, group activities, and lec-

tures using Power Point. Lectures introducing theory and methods in ethnobotany were presented in the morning session, followed by a group activity and discussion before lunch, and lecture and hands-on 1-2 hour individual or group project, followed by 1-2 hours of discussion, data entry and analysis, after lunch. The instructors repeatedly returned to these themes:

- Role of scientific questions (Platt 1964) and community needs in structuring research (Werner & Schoepfle 1987)
- Participatory methods (Campbell & Luckert 2002, Cunningham 2001, Spradley 1980) & community benefits (Cunningham 2001, Laird 2002)
- Role of appropriate technologies in research and development
- Statistical analysis of data for evaluation and decision making
- Conservation benefits and community empowerment using local ecological knowledge (Berkes 1999)
- Importance of training parascientists as full research partners (Cunningham 2001, McClatchey *et al.* 2004, O'Fallon & Dearry 2002)
- The basic value of ethnobiological classification systems as first approximations of local biological diversity (Berlin 1992, McClatchey *et al*. 2004)

During the classroom sessions, the participants practiced a variety of methods including: development and analysis of simple survey instruments (Appendix 2), identification of hypotheses to test from a body of existing literature (Appendix 3), determination of the appropriate level of information to investigate in order to address an hypothesis (Appendix 4), and development of researcher orientations and ethical standards for conducting research (Appendix 5). In each of these cases, the instructors provided examples and the participants discussed the merits of these in light of research priorities and cultural norms in Madagascar before developing their own versions.

By the conclusion of the classroom session, the participants had read about and practiced a range of ethnobotanical methods that emphasized ethnographic and ecological analyses of human interactions with plants. Because the participants all had very strong backgrounds in botany and were experienced plant collectors, aspects focused on botany were only briefly discussed.

Field practicum organization, protocol, and topics

The field practicum was conducted in Analalava where the MBG is developing a relationship with villages to establish community participatory conservation projects. The workshop participants stayed in the coastal town of Mahavelona, making day trips to the nearby inland villages, Sahamamy and Murarano. The participants began each field day with a breakfast planning meeting where they would divide into research groups for the day organized to address specific hypotheses (Table 3). They then traveled to the field sites and spent six to eight hours in and near the villages collecting data and voucher specimens before returning in the evening. In the evening, the participants worked together putting the plants in presses, and otherwise preparing the vouchers for taxonomic identification. After dinner, each group would report on what they had done that day, what worked and what didn't work, and propose a strategy for the next day. The instructors' would provide their observations of the day's research and make recommendations on next steps. On the final evening, McClatchey presented a closing power point presentation of images from each day that served as a basis for discussion of the overall workshop and research experience.

Before commencing their research, workshop participants used an informed consent protocol that they had developed and practiced during the workshop. A community meeting was held in both of the villages wherein the project participants talked about their personal and professional backgrounds, the training workshop, the sponsors, the goals of the training projects, and the expected

Table 3. Hypotheses developed and examined by the workshop participants in Analalava, Madagascar.

• Use of plants as construction materials in houses is a major negative impact on forests.
• Plant resources being taken to regional markets from the forest represent important sources of income and negative impacts on the forest.
• Folk classification of vegetation use areas/zones will reflect resource management strategies.
• Plants are used as indicators and reminders of important ecosystem processes.
• Medicinal plants and health concerns are being addressed using resources from forests. Conservation of the forests is linked to maintenance of health care options.
• Gathering wild foods from forests and marshes is conducted in unsustainable ways that are resulting in erosion of the plant resource base.
• Children acquire botanical knowledge through usage of plants as toys, for games, and as snack foods.
• Transects of the forest of Analalava will include large numbers of plants that are essential for local cultural practices that are not found in transects of adjacent anthropogenic and non-forest vegetation zones.
• Critical diseases are being treated with medicinal plants from the local forests.
• Native forests and other ecosystems are important sources of materials for production of crafts that are used locally and sold in markets.

roles of community participants. Communities were asked if they were willing to allow photographs to be taken, and if interested individuals would work with the workshop participants on their individual and group projects. It was explained that this was a training project that would lead to further work that would be more intensive, and have far fewer researchers working over a longer period of time in the months and years to come. Villagers were also asked what were their most critical areas of concern, and what they would like to see come out of a long-term collaboration.

The first field day the participants tried out a few of the methods they had learned in the class. They decided to divide into two groups, each group focusing on a different topic (Appendix 1). The village of Sahamamy was chosen to begin preliminary fieldwork. Group 1 conducted a baseline study of ethnobotanical species found in a forest near the village, by interviewing people in the village. Group 2 analyzed the importance of forest plants for local healthcare by interviewing two healers using a forest path and adjacent plants to produce parallel response data. During the evening discussion of the first day of research, participants decided that working in large groups/teams was cumbersome, and possibly uncomfortable for villagers (to have so many researchers descending on one village).

The first day was a difficult transition from discussing and practicing methods in the classroom to implementing them in a real community. Although Appendix 1 appears to imply that the results of the day were not very good, the learning process that took place led to rapid improvements in methodology over the following days. In this case, more was probably learned through failure than would have been learned through success.

The second field day, participants again broke into two groups. However, one group went back to Sahamamy, and one group moved on to a village five kilometers up the road, Murarano. In the morning planning session, participants selected projects they could pursue as individuals or in smaller groups of 2-3 researchers (Table 3), so as not to overwhelm villagers.

The third field day, participants continued their individual and small group projects, and spent the evening writing up the results of their preliminary research.

On the final day, after church on Sunday (when villagers are most often available for community gatherings), participants returned to Sahamamy and Murahrano for closing meetings with the members of each community. The purpose of these meetings was to thank villagers for their involvement, report the results of students' findings, and to discuss future collaborations with the community. During the meetings, each workshop participant, or an appointed leader for one of the small research groups, presented their findings and solicited corrections from community members. This served as a review process, in which community members were active consultants/collaborators in preparing the reports published in this journal, and subsequently disseminated to Analalava communities.

Field project hypotheses

During the field phase of the workshop, group projects were conducted testing the general hypothesis that: villagers living subsistence lifestyles extract substantial volumes of plant materials from forests and these quantified traditional activities account for at least some of the loss of forest cover in Madagascar over the last century.

Workshop instructors and students chose this hypothesis because it reflects a basic assumption on the part of all participants that loss of forest cover is a major environmental reality and concern in Madagascar, and that this is at least in part due to traditional forest usage practices. As such, the groups' research explored this question using quantitative ethnobotanical methods to determine: (1) volumes of plant materials regularly used by members of a community living adjacent to a forest, (2) estimated growth or recovery rates for plant species being used, and (3) likely changes in impacts over time due to changing socio-economic activities of the community.

In the case of the general hypothesis, one of two major possibilities was expected:

a) Traditional human activities of using forests and forest products have over time resulted in the destruction of most of the forests of Madagascar. (This is the dominant perspective expressed in the conservation literature although there does not appear to be quantitative evidence to support the statement. Rather, this is likely based upon observations that local peoples are using forest resources, periodically burning forests for agricultural lands, and that there has been a dramatic reduction in forest size.)

b) Traditional human activities are not the actual cause of deforestation, but it is instead due to some other activity such as logging, mining, lightning caused fires, etc. and human impacts are quantitatively too low to have resulted in the magnitude of change that has happened.

The authors/instructors chose to frame the work using the former option because it is the status quo. However, based upon our experiences in other countries, we think it likely that the latter is actually the case.

Workshop participants, either as individuals or groups, identified hypotheses (Table 3) to direct each of their field projects over the second and third days of the field research.

Results and Discussion

Village protocols

Village meetings held at the outset and close of the research practicum in Sahamamy and Murarano were characterized by two themes: (1) community members are interested in how the forest can be conserved and, (2) over-exploitation of the forests is considered to be the act of outsiders from Mahavelona, not villagers in Analalava. In community discussions, "conservation" was framed in terms of rice (**vary**); rice being of paramount cultural significance, and wetland and dryland swidden (**tavy**) cultivation dominating much of the landscape in Madagascar. Working in these villages, we heard variations on the Malagasy proverb, "Without the forest there is no water, and without water, there is no rice". During the initial meeting on the first day, the village leader commented that what would be most beneficial for Sahamamy would be if the MBG and visiting researchers could help construct a diversion ditch for the rice fields. In the final wrap-up meeting in Murarano, the village leaders spoke of stalled development projects. Villagers have grown weary of government and non-government groups coming to the region and promising assistance of various types and not following through, even beginning development projects and then abandoning them. In Murahrano, in particular, villagers emphasized that continuity was critical to a meaningful collaboration between MBG and local communities.

Workshop field project results

Individual and groups of workshop participants prepared reports in Malagasy on their research during the field portion of the workshop. These are reported as short articles within this issue of Ethnobotany Research and Applications as: Lehavana *et al*. 2005, Rabarison & Ramanitrahasimbola 2005, Raharimalala 2005, Rakotomalaza *et al*. 2005, Rakotonandrasana 2005, Randrianaivo 2005, Ranjevasoa 2005, Ratovoson *et al*. 2005, Razafindrabeaza *et al*. 2005, and Velosoa 2005.

Each of these should be perceived as a limited, initial study that serves as a starting point for future research. For most of the authors, this is their first work in ethnobotany and the methods for data collection and analysis will require more practice and thought.

Lessons Learned

Participants' Evaluation of the Workshop

A participant evaluation was conducted at the close of the workshop. One of the participants, Etienne A. Raicotobe (the director of CNARP), gathered general impressions and recommendations from the group as a whole (in group discussions), and by interviewing individuals (Table 4). The general consensus was that the workshop was **tsara** 'good'. Participants stated that they gained a deeper understanding of the complex interrelationships between people and plants. One participant commented, "You have asked us to take an approach [to ethnobotany] that is both broader and more precise than we have taken in the past."

Key in the participant evaluations of the workshop were the following "take home messages":

1. Ethnobotanical research is much wider than the study of medicinal plants and the development of pharmaceuticals and natural products (a bias found in ethnobotanical inquiry in Madagascar);
2. Ethnobotany draws on multiple disciplines/fields to answer questions about how humans interact with their environment;
3. Ethnobotanical approaches can be applied to issues of critical concern in Madagascar, conservation and development, and can be used to work with community stakeholders and policy makers;
4. Participatory methods can be used to involve local communities at every phase of a project; and
5. Ethnobotanical methods can be adapted and adopted for other studies (i.e., ethnozoology, ethnobiology). For example, one of the participants was a zoologist working with local communities on turtle conservation and she felt that she would be able to use similar methods and ways of working with communities to address her research on animals.

Participants agreed that one of the key strengths of the workshop was the 4-day field practicum conducted in Analalava. The practical field course gave participants an opportunity to test methods, and "stimulated more discussion" that built on the classroom portion.

Participants reported shortfalls of the workshop including:

1. The language of instruction should be in Malagasy or French. While all of the participants were proficient in English, French is still the language of higher education in Madagascar, and easier to follow for most of the students than English. Participants were divided on whether Malagasy or French should be the language of instruction. Most participants converse primarily in Malagasy, and minimally in French. However, French (and increasingly, English) is the language of academic instruction and publication.
2. The course should be longer. In particular the second week (the field practicum) was not long enough to gain more than a superficial view of the interaction of plants and people in two villages. Three to four weeks was suggested as an appropriate time for the second part of the course.
3. More examples should be provided from Madagascar. The instructors' examples were drawn primarily from Asian and Pacific Island cultures, reflecting the research experiences of the instructors. Participants

Table 4. Workshop evaluation as compiled by Dr. Etienne A. Raicotobe from interviews with the workshop participants. This report is only a simple compilation of the answers given by the participants to the questions: 1) How well did this workshop function and what are your general impressions of ethnobotanical field work, and 2) What did you learn that could be applied in the future?

General Impressions and feelings on the workshop
• The workshop was good," tsara", in the first theoretical part as well as in the practical one in the field. • The practical teaching was found to be good by those who didn't have the opportunity to follow the theoretical teaching. • The practical teaching in the field is better than the theoretical expositions because there are more possibilities for more discussions. • Everything was all right despite the use of the English. (French is the official language that is used for the teaching at the university although English is becoming much more common.). • All the Malagasy national participants found the workshop to be too short
Some remarks and viewpoints on the workshop contents or about the methods of ethnobotany
• This workshop brought very new but precise knowledge that lead participants to consider new ideas. • It is clear that ethnobotanical studies are more than simple botanical field work. It is a wider approach than the limited knowledge of only medicinal plants. • Ethnobotany is a fundamental science that uses several disciplines in order to study the relationships of man with his environment and more precisely the interactions of people and plants. It gives a wide and accurate vision of true interactions between man and plants. • Ethnobotany is an essential and basic approach to contribute and bring issues to the problems of development and conservation from the field stakeholders to policy makers. Therefore, the exploitation of the results and their valorization is essential to Madagascar. • Ethnobotany does not act simply through the scientific approach of some scientists but also through involving the rural community in a complete contributively and participative manner. • Ethnobotanical methods could be adopted and adapted for other studies.
After the workshop and the future of ethnobotany in Madagascar
• It is necessary to quickly make a determination of the state of ethnobotany research in Madagascar in order to know what is lacking in particular about keys sites concerned by the realization of the Durban vision. • In the future, training would benefit from examples drawn from Madagascar. This would allow us to point out the problems of conservation and to catch sight of expected solutions. • A national network of ethnobotany needs to be developed with the participants in the workshop playing the formative role. This national network will be connected permanently to the formative foreign nationals as well as their respective institutions. • The workshop established links between, on one hand, ethnobotany as we have learned it during this workshop and, on the other hand, the projects of conservation and of development. • Now it is quite obvious that the results of such research projects constitute very useful basic tools for many things, among others, the management and the conservation of the environment. It is therefore necessary to go farther through the analyses of the results from the surveys and restore the local community the fruits of its own knowledge. • Ethobotanical studies are failing in Madagascar whereas they are primordial to our understanding of why changes are happening. Making a systemic approach of the programs dealing with conservation and sustainable development with this integrative and participative vision of the ethnobotanical methods is needed. In order to initially quickly move in the right direction, one could initially use the existing ethnobotanical or similar university departments in Madagascar in order to dispense some basic lessons about ethnobotanical knowledge and research methods at the university level. Eventually this should be extended to include teaching of ethnobotany to all the levels of school education without forgetting the formation and the information of the local population.
Findings
• This first workshop could be considered as the formation of the formative future of teachers and consulting managers in ethnobotany. • It is essential to establish tighter links without lingering in order to keep contact among the members of this first pioneer group, then between them and the formative teachers with their institution. • It is necessary to establish quickly a program of education in ethnobotany for all with the concourse of the instructors.

would have liked to have more discussion of problems specific to Madagascar.

Participants' post-workshop agenda

The workshop participants developed a 'to do' list to address conservation and environmental concerns and expand the potential of ethnobotany in Madagascar. Ethnobotanical projects can be used to aide in the realization of the goals of the Durban Vision Initiative[1]. As such, participants agreed to play a formative role in (1) establishing a national ethnobotany network, and; (2) expanding ethnobotany courses at the college level, as well as creating environmental education for elementary and middle schools that integrates local ethnobiological knowledge into the curriculum.

Instructors' evaluation of the workshop

Class room portion:
The participants have obtained most of their education from "rote-memorization," a legacy of the French colonial era educational system wherein teachers provide instructions and students follow them exactly. In this case, the instructors did not provide step by step instructions, but rather a suite of theoretical perspectives and methodologies from which to select when designing a field project. While no simple or singular formula for research was provided, instructors' repeatedly emphasized that ethnobotanical studies are driven by a strong research question, hypotheses, methods, and, increasingly, community generated questions and involvement in all phases of research design and implementation. Participants were repeatedly challenged to come up with their OWN approaches, both inside and outside the class room during hands-on exercises (e.g., pile sorting exercises, survey of local market in Tana), and the field practicum. Participants faced recognizing and addressing the ambiguity that is part of conducting fieldwork and community participatory research.

Participants responded very positively to this pedagogical style. Initially quiet/shy, as the course progressed participants became increasingly vocal, inquisitive, and active in discussions and group projects. They also commented that being required to increase their analytical skills (versus being an empty receptacle for memorization) could be awkward for some students in Madagascar, but that the workshop participants were really excited by the opportunity to think on their feet.

Field portion:
Normally, research would not be done in such a short period of time, nor with such a high ratio of researchers to village consultants. Why did we use this immersion approach given the time available for the field practicum? The instructors and workshop sponsors wanted the participants to have a field experience, realizing that there would not be time to gain, in the words of one of the participants, "more than a superficial view of the interaction of plants and people in two villages." The instructors feel that — however initially haphazard — this intensive practicum allowed participants to go through the research process including the main components of a field project (asking for community consent, trying out field methods, confirming/correcting data with community, returning results back to the community, publishing preliminary research). Participants drew from the tool kit of ethnobotanical interview techniques presented in the class room to conduct their preliminary projects.

The instructors (and participants) were constantly aware of, and monitoring, the responses of Sahamamy and Murarano residents to our research presence in the villages. We wanted to make sure that people were not feeling overwhelmed, put upon, or taken away from their daily work for too long. Participants bought crafts from the villagers , and brought food and drinks to share with villagers each day (an highly appreciated and culturally significant way of fostering a collaborative relationship in villages in Madagascar). Perhaps more importantly, villagers and researchers enjoyed a fruitful and often entertaining exchange of information, and the atmosphere was generally festive. Based on comments made in the village before and after research protocols, and during the research, the reaction to the workshop researchers in Analalava was quite positive.

A critical issue observed by the instructors was that there was a disjunction between the collection of plant voucher specimens and the interview questions. In some cases, participants collected plants in advance and never had the time to present specimens to community members for verification. In other cases, participants collected ethnobotanical/ethnobiological data in structured or semi-structured interviews, but did not link the taxa mentioned in interviews to specimens by collecting vouchers through informant verification of vouchers. This is mainly an artifact of researchers being pressed for time. However, the instructors wanted to ensure that participants identify the gaps in their preliminary studies, seek to correct those gaps, and recognize the importance of defining a realistic scope of a project in the future.

We feel one of the strongest teaching techniques used in the field was asking the participants to review their work with members of the community. This method underscored

1. The Durban Vision Initiative (DVI) is a network of protected areas recently created by the Malagasy Government and a consortium of international actors including donors and environmental NGOs that meet with the Malagasy Government on a monthly basis to review progress in the environmental arena and to determine future funding priorities. The development of ecotourism as a means of ensuring conservation 'pays its way' is a core theme of the DVI.

the importance of employing participatory approaches, in particular, ensuring that projects foster co-learning, and that results are disseminated in a way meaningful to the community (O'Fallon & Dearry 2002). It also functioned as a village review process in which preliminary findings were refereed by community consultants, an eye-opener for some of the workshop participants. During the research phase, participants struggled with the issue of adding their own prior knowledge to the data, such as plant names and uses, folk classification, and so on. Again, this is an artifact of the participants having such a short period in which to complete their preliminary studies. It was tempting for some participants to fill in missing information from their own wealth of ethno/botanical knowledge based on the assumption that fellow Malagasy in Analalava may share the same ethnobiological terms and concepts already familiar to the researchers. This assumption is not necessarily true, as language and culture in Madagascar is much more diverse than is commonly acknowledged.

Conclusions

Although the participants in the workshop were taught to use complete cycles of research that begin the development of good research questions and hypotheses, move through sets of methods intended to clearly address the hypotheses, use analytical methods to evaluate the results, and generate theories and new hypotheses based upon the results, the time allotted for the field aspects of the workshop did not allow for completion of the cycle. Although some interesting data on human-plant interactions was collected, no hypotheses were truly evaluated through this workshop.

Other ethnobotanical researchers are actively working in Madagascar. It is expected that many of us will be involved in training and development of research infrastructure that will more clearly address needs of the Malagasy people and international conservation issues within the country. Development of longer period training, perhaps through one or more university programs, is needed as a component of a long-term approach to management of natural resources under the commitments of the president of Madagascar, Marc Ravalomanana.

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Appendix 1. Workshop topics and organization.

Day 1: Introduction to ethnobotany	
Topics:	The science of ethnobotany
	Data collection, hypothesis testing & quantitative analyses
	Origins of plant uses, mythology as truth
	Transported landscapes
Group discussion:	Development of questions about people's interactions with plants
Project:	Collection of demographic data and use of a database for analyzing human responses
Methods:	Anonymous demographic questionnaire with ten simple questions about personal usage of plants as foods, medicine, and fuels. (Appendix 1)
Readings:	Alexiades 1996b, Ford 1994a,b, Salick *et al*. 2003
Additional handouts:	Examples of theories from Economic Botany (Appendix 2)
Day 2: Ethnographic interviews and research ethics	
Topics:	Ethnobotanical interview techniques
	Ethics & researcher behavior
	Developing surveys and questionnaires
	Informed consent & related protocol
Group discussion:	Interviewing individuals & groups
Project:	Individual and group interviews about plant taxonomic and nomenclatural knowledge
Methods:	Development and application of informed consent documents, development and application of closed and open-ended questions within a survey.
Readings:	Cunningham 1996, Posey 1990
Additional handouts:	Example consent forms (Appendix 3)
Day 3: Addressing hypotheses about cultural knowledge of biodiversity	
Topics:	Knowledge distribution in cultures
	Ethnobiological classification
	Uses & informant consensus studies
Group discussion:	Free listing, card sorting & classifications
Project:	Collection and analysis of botanical knowledge data across a demographic range of age, gender, and social status
Methods:	Free listing, card sorting & classification analysis. Cluster analysis
Readings:	Berlin 1992 chapter 1, Dupre 1999, Zent 2001
Day 4: Addressing hypotheses about home gardens and markets	
Topics:	Community economies
	"Values" of plants and resource accounting
	Measuring community & household economies
Group discussion:	Group resource accounting experiment
Project:	Measurement of biodiversity within a local market using ecological community analysis
Methods:	Site selection, species inventories, establishment and measurement of field plots, and informal interviews. Ecological community analysis of anthropogenic systems.
Readings:	Bye & Linares 1983, Nguyen 2005, Peters *et al*.1999

Day 5: Addressing hypotheses about food and senses	
Topics:	Taste & foods
	Sensory perception and ethnobotany
	Food diaries
Group discussion:	Foods & cultural Identity
Project:	Food diary
Methods:	Food diaries, analysis of perceived vs. actual interactions (intensity, diversity, importance) with foods.
Readings:	Gollin 2004, Martin 1998
Day 6: Addressing hypotheses about human activities and artifacts	
Topics:	Material culture
	Documentation of artifacts
	Material input analysis
Group discussion:	Useful forests
Project:	Tree conversions/equivalents
Methods:	Site selection, establishing and using transects in forests, artifact analysis
Readings:	None assigned
Additional handouts:	Artifacts analysis checklist (Appendix 4)
Day 7: Addressing hypotheses about community health and medicinal plants	
Topics:	Community health and medicinal plants: Ethnographic theory and methods
	Community-based participatory research: Linking ethnobotany, conservation, and health
	Ethnopharmacologic implications of foods as medicines and medicines as food
	Ethnopharmacology of poisons: toxidromes
Group discussion:	Selecting plants based on diagnoses
Project:	Rapid community health survey
Methods:	Rapid community health surveys, rock ranking, free listing, pile sorts, and phylogenetic (PHYLIP, Hennig) analysis of diseases and treatments
Readings:	Phillips 1996, O'Fallon & Deary 2002, Sithole *et al.* 2002, Zent 1996
Day 8: Addressing hypotheses about patterns of spatial distributions	
Topics:	Community resource mapping
	Traditional resource usage zones and natural ecosystems
Group discussion:	Time-activity studies
Project:	Community mapping of resource usage zones
Methods:	GIS analysis, GPS tracking and measurement of plots/transects, interview guided zonation analysis
Readings:	Cunningham 2001 chapter 6, McClatchey *et al.* 2004

Day 9: Addressing hypotheses about ecology and biodiversity	
Topics:	Ecosystem services from cultural perspectives
	Human ecology
	Using simple models
Group discussion:	Density, diversity, and ecosystem structure
Project:	Measuring elements of small ecosystems
Methods:	Economic assessment of ecosystems, modeling of human benefits from ecosystems
Readings:	Berkes 1999 chapter 4, Pearce 1993, Turner *et al*. 2003, Veeman & Luckert 2002
Day 10: Political issues and conclusions	
Topics:	Differences between participant observation studies and interviews
	Intellectual property rights
	Data collection standards & databases
Group discussion:	Ethnobotanical knowledge and policy making
Project:	Workshop evaluation and feedback
Methods:	Open discussion and overview of course.
Readings:	Colchester 2004, MacKay & Caruso 2004, Stepp & Thomas 2005
Additional handouts:	Researcher orientations for maintaining high ethical and scientific standards (Appendix 5)

Appendix 2. Anonymous demographic questionnaire with ten simple questions about personal usage of plants as foods, medicine, and fuels.

Basic Demographic Questions

1. Participant #_____ (or) Name:_____
2. Participant Age _____
3. Participant Gender _____
4. Participant Religion_____
5. Participants Highest Level of Education
6. Number of Children (under 18 years old) in Participants Household _____
7. Number of Adults (18 and older) in Participants Household _____
8. Participants Home Language _____
9. Participants Ethnic Identity _____

Ten simple questions about personal usage of plants as foods, medicine and fuels.

1. What plant foods have you eaten in the last three days?
2. Which of the plant foods eaten in the last three days were grown locally?
3. What are the most important plant foods that are eaten during festivals?
4. When members of your family are sick, where do you seek advice and treatment? Do you seek help from a doctor/health clinic, a traditional healer, or do you use home remedies?
5. If you use home remedies or are a traditional healer, what kinds of sicknesses are regularly treated? What kinds of plants are used in to treat each sickness?
6. What other plants are used on a daily basis for health care?
7. When cooking food or heating your home what do you use for fuel?
8. If fires are made with wood or other plants, what are the best fire making materials in your area?
9. Does your family grow any plants for food, medicine, or fuel? If so, what kinds of plants are grown for food, medicine, and fuel?
10. For plants reported as being grown, which are grown inside the home, in a home garden, or in places away from your home?

Research instrument evaluation

Strengths:
- Simple, may be asked of anyone
- Reference practical uses of plants
- Cover three of the four most important uses of plants
- Other

Weaknesses:
- Most of these questions are “leading”
- Requires good memories for details
- The questions may be too general
- The questions may not be a good samples of “average” activities
- Other

Appendix 3. Examples of hypotheses or theories derived from ethnobotanical research published *Economic Botany* as interpreted by W. McClatchey & K. Bridges. These are not necessarily supported or "true" but do emerge from the results of the research.

- Excessively complex technologies used with plants may persist as traditions long after they are necessary. Plant populations may be artificially enlarged due to human activities. *Economic Botany* 22:178-190.
- Forced immigrants (slaves) carry intellectual technologies to new homes and use new materials for old purposes. *Economic Botany* 22:289-292.
- Effects of psychoactive plant consumption may result in consistent types of imagery. *Economic Botany* 24:062-068.
- Labor and time consumption is so high in processing some plants that it would be a major hindrance in everyday use. *Economic Botany* 24:069-072.
- Local people prefer to be treated by European medicine first and use traditional plant medicine when the situation is hopeless. *Economic Botany* 24:279-282.
- Migration and settlement patterns are influenced by plant distributions AND plant populations are influenced by human settlement patterns. *Economic Botany* 25:063-104.
- Stabilization of plant dyes may be the result of certain cultural practices and lead to wider usage. *Economic Botany* 28:061-062.
- Decomposition of manioc leaves is responsible for the black color on treated gourds. *Economic Botany* 29:242-244.
- Displaced people may be able to develop substitute plants for certain kinds of usages, but medicinal plants may be very difficult to replace and require adopting another medicinal system. *Economic Botany* 31:340-357.
- Retention of archaic methods in the face of modern agricultural techniques is an important self identification pattern. Transfer of knowledge from a culture's primary crop to an introduced crop may occur even if the logic of the donor culture's growing techniques is different. *Economic Botany* 33:298-310.
- A taxonomy based upon chemical analyses may reflect other taxonomic criteria important to people who use the plants. Perineal agro-ecosystems are more energy efficient and conservation oriented than those associated with annuals. *Economic Botany* 34:068-085.
- Some wild species populations show evidence of former domestication activities. *Economic Botany* 38:065-082.
- Tree species that are considered sacred are more likely to be sources of edible fruits. Wild foods are important in the diet, particularly during seasons when other products are not available. *Economic Botany* 41:375-385.
- Application of generic level folk names positively correlates with saliency and cultural importance. *Economic Botany* 42:177-194.
- Diversity in home gardens does not correlate with age where people move often and gardens are young. Garden diversity is high in detribalized/market influenced/much acculturated people. Home gardens are maintained as convenient places to obtain otherwise unavailable plants. *Economic Botany* 45:166-175.
- Across the range of a species, its importance will vary, even among communities with the same cultural origin *Economic Botany* 46:305-309.
- Wealthy people make less use of wild resources. Wild plants are a larger share of household income among poor households. Yearly opportunity cost will be similar in communities with different incomes. Sustainable extraction is a result of the ability to extract, process, and transport, the availability of substitutes and intended use. Costs of extraction of non-timber forest products (NTFP) increases with increasing species richness. Increased commercialization of NTFP leads to depletion which promotes domestication or deforestation. *Economic Botany* 47:215-219.
- Inclusion without displacement is common when new cultivars are introduced to small farmers. The role of maintaining crop diversity is a future but undefined need (packrat model). *Economic Botany* 50:026-039.
- There are gradients of resource exploitation away from sites of human settlements. *Economic Botany* 52:320-336.
- Garden plants are generally more important than plants collected outside of the community. There is a value to newly introduced taxa in a community. The value of a plant can be seen from its place in an indigenous classification system. *Economic Botany* 53:144-160.
- Older people know more uses of trees than younger people in the same community. Formal education is not predictive of knowledge level about trees. Men tend to know more tree species/uses than women. *Economic Botany* 54:328-343.
- Indigenous communities are linked to higher levels of biodiversity than are non-indigenous communities in the same location. Non-indigenous communities have a higher interest in direct uses of plants whereas indigenous communities have a higher interest in indirect uses of plants. Indigenous people value forests for multiple uses, especially indirect ones, whereas non-indigenous communities value forests most as targets of logging. *Economic Botany* 55:555-565.

Appendix 4. Artifacts checklist.

Levels of documentation	Elements of documentation
1. Plant list	Species of plants Parts of plants used Condition (age, etc.) of plants and parts used
2. Components list	Principal components Secondary components (Accessories) Tertiary components (Processing materials)
3. Artifact component roles	Form Function Meaning Application range/restrictions
4. Artifact construction ramifications: Quantification	Complete component list Artifact life expectancy and replacement periodicity Artifact: population ratio Environmental impact assessment
5. Artifact usage ramifications: Quality of life assessment	Identification of all uses and roles Identification of alternative artifacts/technologies Qualification of effects of loss of knowledge Cultural impact assessment (positive)
6. Artifact technology ramifications: Artifact position in cultural technology scheme	Identification of all artifacts produced with artifact in question Identification of all processes conducted with artifact in question Identification of alternative artifacts/technologies Qualification of effects of loss of technology on other technologies Cultural impact assessment (negative/loss)
7. Artifact reconstruction by analogy: Archaeological experimentation	Identification of extant cultures with “similar” technologies/artifacts Documentation of extant cultural process (see above) Attempted reproduction of artifact

Importance of interview techniques and data collection about artifacts.

1. Participant Observer
2. Photography, recordings, drawings, etc.
3. Artifact Interview
4. Artifact selection and storage/documentation

Appendix 5. Researcher orientations for maintaining high ethical and scientific standards.

Bennett's Golden Rule for Ethnobotany Field Work: **Use Courtesy and Common Sense**

Characteristics of Good Researchers	**Characteristics of Bad Researchers**
Always truthful. Openly sharing. Considers their own values or religion. Respects others' values or religions. Follows customs. Respectful of elders.	Often deceptive. Selfish. Doesn't have values or religion. Disrespects others' values or religions. Ignores customs. Disrespectful of elders.
Good Researcher Orientations	**Bad Researcher Orientations**
Focus on learning from/with local people. Invest time to get to know people. Intellectual and real property rights matter. Invest more in the community than is taken. Find ways to avoid bribing people.	Focus on teaching/convincing local people. Get work done fast at any cost. Intellectual or real property rights do not matter. Takes more from the community than is given. Give bribes to get their way.
Good Research Practices	**Bad Research Practices**
Embrace collaborations Listen to people and consider their ideas (use ears more than mouth). Contribute to the community before conducting research. Use informed consent. Ask permission. Use reproducible methods. Test hypotheses. Politely ask appropriate questions. Respect secrets. Pay workers fairly. Collect specimens even when known. Offer research results to communities as choices. Clearly present ideas as choices. Share research results as publications.	Avoid collaborations Hear people and tell them what to think (use mouth more than ears). Complete research first then, if time is left, contribute to the community. Do not use informed consent. Assume a right to do research. Work without methods. Gather information without a plan. Rudely, asking nosy questions. Trick people into giving information Pay workers as little as possible. Don't collect specimens if already "known." Present research results to communities as mandates. Use deception to convince people of ideas. Keep research results a secret.

Appendix 6. Methods employed on first field day in Sahamamy, and Instructors' observations and comments.

Group 1 collected voucher specimens and information about 100 species in the forest by following a commonly used trail with a male guide (in his 30s) who was selected by the village leader as being particularly knowledgeable about plants. He was accompanied by an assistant (a 9 year old boy) who could climb trees to retrieve samples. Each plant was marked with a collection number using a permanent felt marker. The group then returned to the village and asked the oldest man in Sahamamy (who is also the village head) to divide the specimens into "use groups" (such as medicinal, construction, food plants, etc.). Students chose this method based on the assumption that the village elder would know the most about plants. The participants did not consider what would happen if a plant was used for more than 1 category, but decided to ask the village elder to sort each voucher into a "use group" according to a plant's most valuable ethnobotanical application. However, the elder stated that he could not follow these guidelines, instead dividing the plants into those he knew a use for, and those he did not. This fundamentally reduced the volume of plants being discussed. The students did not keep track of the plants that were part of this initial pile sort by recording the voucher numbers that fell into the "known" or "unknown" piles.

The students then randomly divided the pile of plants with known uses into five smaller, more manageable, piles. Each student selected one of the piles of plants and took them to a separate part of the village to conduct baseline interviews. The students roughly divided the community into five demographic groups (girls, boys, young mothers, young men, older men and women). Initially the interviews surrounding each plant pile were conducted with individuals, but people rapidly self-assembled into focus groups. Each of these spontaneous "focus groups" was asked to divide the plants into those with known uses and those without clear uses (as the village head had done). Ten questions about basic use of plants for medicines, building material, crafts, and more, had been formulated by the Group 1 researchers prior to arriving at the village. These questions formed the basis of a standardized survey for each group of interviews. The interviews lasted for approximately 2 hours. Group 1 researchers did not rotate the plant piles through all the impromptu "focus groups" so that all interviewees would be interviewed about the same set of plants. Group 1 closed the first day of research by bringing the villagers together (many of whom had given up an afternoon of work to participate in the interviews) to share in food and drink.

Instructor's observations:

- The "transect" employed was not a randomly located transect, but a commonly used trail through a small section of the forest, that may or may not be representative of the surrounding forest ecosystem.
- Vouchers were occasionally insubstantial, collected without fruit or flower, or other identifying features to facilitate plant interviews. However, this is not unusual in ethnobotanical research.
- Record keeping of the voucher numbers in relationship to data recorded was not always consistent.
- No reproducible method was used to sort the plants.
- Respondents did not rotate and receive a chance to be interviewed about each of the plant piles, so there was no comparative data.
- There was minimal communication between the researcher/participants during the research process. This was a missed opportunity to talk about what was working and not working.
- The survey was not really standardized as researcher/participants did not thoroughly review the questions they were asking to ensure that they were the same. Here too, methods of gathering data were not reproducible.
- The researchers were encouraged to apply one of several methods learned earlier in the workshop to quantitatively and reproducibly measure knowledge of plants and the kinds of interactions that the community has with plants.

Group 2 conducted a walking survey of the local forest. Two village guides led the way. The first was an elderly man in his 50's who was identified as the village healer. He served as the primary consultant and was responsible for almost all of the information recorded. The second was a younger man in his 30's who was not a healer but clearly had a good general knowledge of forest species and some of their uses. Prior to beginning the walking survey, the men were told that the researchers were interested in learning about the kinds of medicinal plants that people use from the forest and that the purpose of this was not to learn about new medicinal plants, but to determine the level of importance of forest plants for local health care. The men agreed to share information on this topic. Group 2 walked along a village path to the southeast of the village traveling uphill through savanna scrub lands. At the edge of the forest the interview began. The discussion involved defining what a forest is and is not, and how local community members can tell when they are in a forest (or not). It was determined by the guides, that the forest is defined as not being one of the other land forms recognized. Therefore one is in a forest when one is not in another landscape form. Further clarification seemed to elucidate that the community uses the forest a great deal, but does not think of itself as being of the forest or in the forest.

Beginning at the forest-savanna transition, a voucher specimen was collected of each plant species encountered. While two of workshop researchers were preparing the voucher and recording notes on the plant, two others were asking the primary consultant/guide the following questions:

1. Does this plant have a name? If so, what it it?
2. Is any part of the plant useful? If so, what part(s) are used?
3. If used, what are the uses?
4. [For plants with medicinal uses]
    a. What part of the plant is used?
    b. How much is used?
    c. How often is the remedy needed/prepared?
    d. Is this plant common or rare?
    e. Is there more or less of this plant available now as there was in the past?

A rough trail was followed through the forest. This was a path that appeared to be used periodically, although not frequently. At a number of locations along the path, recently felled trees were noted, usually resulting in an opening in the low canopy overhead. Although the trail being followed began in the village, the guides insisted that the tree cutting activities were not by local villagers but by people from the larger urban area nearby. The trail interview lasted for about 3 hours.

Instructor's observations:

- The questions devised were reasonably effective and the informants were eager to share information. (Some of the researchers lost interest in the interview before the village guides resulting in abbreviated data and many missed opportunities.)
- There was poor division of labor. Each researcher was taking notes on the same informant responses. It appeared that the researchers were following models learned in school where each student records their own notes, rather than employing a division of labor with later sharing of information between researchers.
- The information learned was indicative of a traditional ethnographic/ethnobotanical listing of plant knowledge but was not quantitatively meaningful nor useful for measurement of intensity of interaction with the forest.
- The researchers were encouraged to apply one of several methods learned in the earlier parts of the workshop to produce quantitative, reproducible results that could be compared with other sites and used for analysis of intensity of interaction with the forest.