
Translating Dry Data for Forest Communities: Science Offers Incentives for Conservation

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Introduction

Results of scientific research relevant to forest communities rarely return to the forest. Effective translation of scientific data for rural residents requires a significantly different set of skills and expertise than the gathering and analysis of the data. The end product of forest-based research, thus, often remains a scientific paper, leaving community ‘give-back’ a dangling rather than integral part of the research process. In this context ‘give-back’ means to return relevant information or a useful product to a community in which research was conducted and differs from ‘feedback’, which connotes a response. Therefore, the community might give feedback, commentary, criticism or praise, about the give-back. Products of scientific research, however, are most frequently designed and aimed not for people who live with and near trees, but for people who live amongst desks and paper.

Although results of scientific research may inform public policy, many forests lie beyond the influence of political arenas. Within such forests the fates of individual trees are decided daily by the people that live there and use them. Consequently, research results illustrating concrete benefits of conservation are useful in rural communities as well as in scientific ones. In many regions, few research projects aimed at diminishing deforestation offer explicit, relevant results to forest residents.

An example of this dilemma is the current discourse on non-timber forest products (NTFPs). One proposed alternative for promoting forest conservation focuses on the market potential of non-wood forest resources. Research supporting NTFP initiatives concentrate principally on products with widespread commercial potential. The few products that may possibly reach the medicine chests or dinner tables of First World households are preferred candidates for research over the thousands of plant species utilised on a daily basis by rural communities. While

underscoring the economic potential of NTFPs for the world's future, such a preference obscures the actual subsistence value of extractive products within rural households today.

This article describes a research and education programme on the ecology and utilisation of non-wood forest products conducted along the Capim River in eastern Amazonia. The overall objective of the programme was to demonstrate the value of standing forests to local communities and to assist them in generating a forest management plan. In this article, our purpose is to relate the methods by which results are being returned to communities, rather than to report on the scientific results of the research. We describe strategies to give back data to communities, including interactive workshops, travelling shows and illustrated booklets. Lastly, we offer examples of how data give-back can lead to conservation of forest resources.

Study Site

Our research was conducted at the invitation of The Rural Workers Union of Paragominas. We worked in two *caboclo* (rural peasant farmers of mixed descent) communities along the Capim river. Focal villages lie approximately 220 km upstream from the Amazonian port city of Belem and consist of 124 families, 45 of whom participated in the study. Families fashion a living by combining subsistence agriculture with extraction of forest resources, hunting and fishing. During the last two decades loggers have penetrated the river basin offering one of the only means to acquire a lump sum of cash. Both farmers who own individual forest lots and communities who hold forest in common, have engaged in a succession of timber sales that have diminished the number and diversity of trees and game throughout the river basin. To assist the villagers in managing their remaining forests, the Rural Workers Union sought technical assistance.

Objectives

The research objectives included inventorying the fruit, game, fish and medicinal plants consumed by 45 families over the course of one year, and determining the population ecology (density, distribution, regeneration, production/yield) of four community-selected NTFPs.

Educational objectives included: demonstrating the economic contribution of NTFPs to the economy of family households, offering an assessment of the sustainable commercial extraction of selected NTFPs and developing participatory methods for the collection and return of NTFP data to communities.

Methods

Our interaction with the community began through discussions and forest walks. During forest walks we identified the most widely utilised extractive products and acquired a general idea of the distributions and densities of economic species. Based on these interactions with the community a research design was developed. The ecological component consisted of linking over 200 trees representing three fruiting and one medicinal oil species (selected by the communities) with a 40 km trail network. Trained and accompanied by researchers, community members mapped the trees and monitored phenology and fruit production over a three year period. We used satellite imagery as a shocking visual aid to help the community recognise the rapid loss of forest resources in their region. Using the imagery we located the agricultural plots of individual families and distinguished areas of intact primary, explored and secondary forest.

Utilisation of NTFPs was measured using illustrated notebooks of household consumption. Each family participating in the study was equipped with scales to weigh game, fish and fibre products. Medicinal plants and fruits were recorded in units. A village monitor was selected by the community to assist families in the recording of data. We checked reported folk remedies and local uses of plants with the nutritional, phytochemical and pharmacological literature available.

Educational methods consisted of small group meetings, whole community workshops, cross community exchanges, technical assistance, forest theatre and the creation of illustrated booklets. Translation of data to communities was conducted in a clear and entertaining fashion using low cost, no-tech, rustic, multi-media methods. In workshops, sophisticated ecological or economic analyses were deliberately not attempted. The scale, focus and outputs of conventional economics and ecology signify little for the day-to-day livelihood of a forest-dependent household. Thus, rule one was to offer locally appropriate, relevant content.

As a result, give-back of data to communities often entailed conducting separate data analyses. For example, in considering fruit production of primary forest species we found that forest residents think not in yields per hectare but in yield per tree. Our illustrated posters, therefore, feature production per tree. Similarly, as money is a rare commodity we discovered that economic assessments of the value of non-wood forest resources were best understood when values were expressed not in monetary terms, but in terms of the main agricultural commodity, sacks of *farinha* (cassava flour).

A second guideline we followed was to visit communities by invitation. A request from a community signified that concern about the forest resource already existed. Programmes were tailored to respond to these community concerns, thus ensuring local interest. If additional technical assistance, such as for forest inventories, was requested, a substantial investment of time and energy was required on the part of the community. In the following sections we describe the specific methods used to disseminate data. These included workshops, experiments in commercialisation, travelling shows and illustrated booklets.

Education

Workshops – Data Give-back

Due to a largely non-literate population, written give-back of results to many rural Amazonian communities is an ineffective mechanism for the transmission of information. Therefore, we designed interactive workshops in which community members presented data by means of posters, theatre, games and songs. Data were presented after six months of collection and again after one year. General rules for presentations were that they should be clear, succinct, interactive and attention-getting. Topics had to have concrete relevance for a majority of community members. Depending on the amount of material to be presented, workshops lasted from two hours to two days. To be successful, a period of one hour to one day prior to the workshops was required to train residents who would present data. In some cases, presenters were self-selected, in other cases, they were chosen by researchers based upon their knowledge of game, forest fruits or fish. An attempt was made to include old and young, men and women.

Fruit, game and fibres

Production data generated from the population ecology study of the forest fruit trees were used to compare the potential income from wood with the potential income from fruit production. We designed posters showing a log with the price attached and beside it a pile of fruits representing the market value of one tree's average annual fruit production (Fig 1). Community residents took on the roles of logger, *caboclo* and fruit merchant with acumen. The logger spoke of his high costs, tractors, personnel, gasoline, the *caboclo* of his sick son and the costly medicine he was in dire need of. For a few dollars per tree, a deal was closed.

Next, a fruit vendor passed by looking to purchase fruit of that forest species. Based on the adjusted value of wood as sold by the community the previous year (\$2.00 per tree), the potential monetary value of fruit was absurdly higher for each of the three species. For example, only 7 fruits of *bacuri* (*Platonia insignis*) needed to be sold to earn the \$2.00 that could be earned by selling the entire tree. Depending on the species, selling half of one tree's average annual production (discounting half for family consumption and predation) can range between \$15-50. One sack of fruit brought 10-20 times the value of one sack of *farinha* for one tenth of the time. These numbers had a powerful effect on the community who implicitly understood that alive, fruit trees offer a net present value of many harvest years while the sale of wood is a singular event offering a trivial amount of money. In addition, hunting stands and traps are frequently placed next to fruiting trees as they attract prized game species such as paca, armadillo and deer.

To demonstrate the value of forest products, posters were designed with the name of a family and month on one side. The other side showed the amount (in kg) of game, vine products or fruit consumed during that month and the corresponding price in the nearest town. The audience was asked to estimate how many kilogrammes of product each family had eaten and its cost. Estimates might be based on whether the head of the family was a proficient hunter or on whether the month represented was a good one in which to capture game or to collect fruits. For example, Protazio's family consumed approximately 40 kg of game during July. If purchased in town he would pay close to \$100 – roughly one tenth of the annual income of many Capim families.



Figure 1: Poster representing the market value of one tree's average annual fruit production.

The extreme number of fruit consumed monthly by well-known community members (over 1,000 fruit/month/family) created an uproar among participants. Differential consumption of fruit was noted between communities. The average annual monetary value of fruit per family consumed in one community, which guarded primary forests, was as high as \$600. In a neighbouring community, where forest was divided into individual lots and where extensive logging had occurred, the economic value of fruit consumed annually per family was equivalent to only

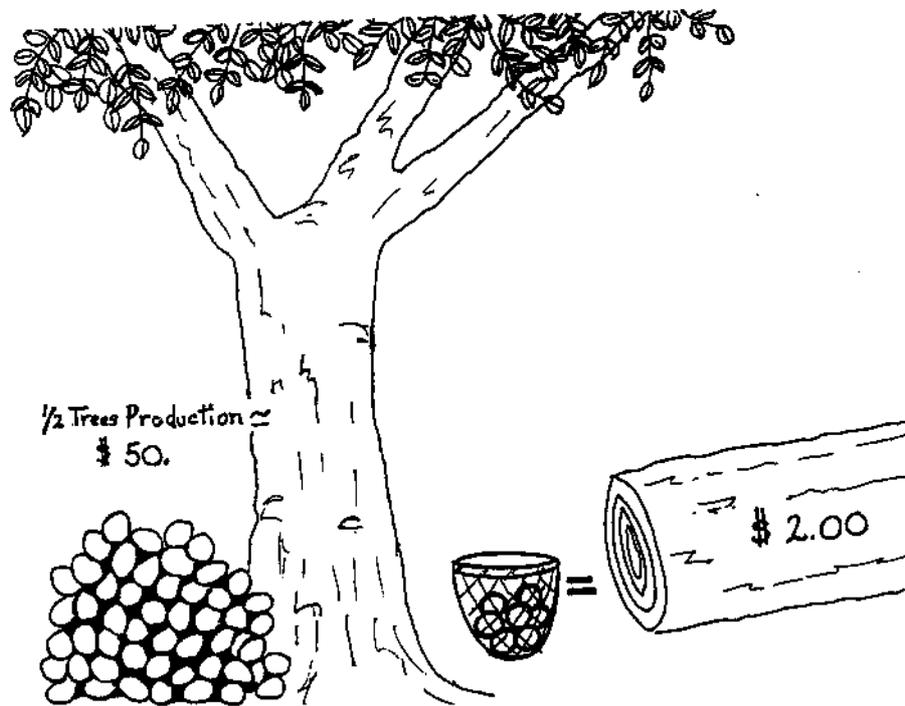


Figure 1: Poster representing the market value of one tree's average annual fruit production.

\$150. Residents noted that during the season of forest fruit their families were rarely sick, possibly due in part to the rich nutritional content of the native fruit. Few family members could even vaguely recall how much game, fruit or fish they had consumed during a particular month. Regarding prices, contact with the market is so slight that residents had little on which to base their estimates. Consequently, estimates of the consumption levels of fruit, game and vines, and of market values for these forest resources, were extremely low.

Medicinal plants – forest theatre

Over the last two decades, a wave of enthusiasm for pharmaceutical preparations led many rural Amazonian families to disregard traditional plant preparations in favour of purchased pharmaceuticals. However, the high prices of pharmaceuticals is prohibitive for many rural and urban Brazilians. For many populations, medicinal plants remain the sole material recourse when sickness strikes.

To demonstrate the importance of medicinal plants for rural communities and to offer phytochemically sound recipes, skits were performed. One community member acted out a common ailment such as diarrhoea, worms, head lice or rheumatism, while another, a dispenser of drugs, attempted to sell her a common pharmaceutical remedy for that particular illness. The salesperson uses common tricks to lure in his ailing customer, but having no means to pay, she leaves. A herb lady enters: ‘My dear, do not listen to that trickster. Come here and learn of nature’s remedy, I have a plant that can cure your ill.’ She adeptly shows a bark or leaf, describes the plant’s characteristics and carefully dispenses a recipe. After the skit, prices were displayed of commonly purchased pharmaceuticals which serve for the same ailments. Prices of allopathic medicines for the ailments described above ranged from approximately \$3 to \$15.

To respond to chronic health complaints, we met with villagers and ascertained the most common ailments and the plants used to counter them. Through a process of community meetings, literature searches, market surveys and interviews with phytochemical and pharmacological authorities, 14 plants were selected and a forest pharmacy created. Each woman became responsible for the collection of a particular bark, root or oil. Shelves were constructed to house the various plants. Community members who recalled medicinal oil extraction techniques from their childhood offered technical assistance for others. Collection of botanical resources encouraged a rich exchange of information on plant identification (‘that vine is

Veronica?'), sustainable harvest ('you know it has been 20 years since I tapped that *copaiba* tree, at what height should I drill?'), and correct dosages ('Oh, I should only drink half a cup of this tea just twice a day?').

Experiment in Commercialisation

Historically, distance to market, lack of river transport and insufficient market experience made commercialisation of non-wood forest products amongst the Capim communities an uncommon event. However, the opening of logging roads during the last decade created a more direct route for villagers to get to market. Presentation of data from the production/yield study, combined with a profile of market prices of forest fruit, served to inform communities of the relative monetary value of fruit compared to wood, and awakened them to the possibility of an alternative source of income during the 4-5 month season of forest fruit. Prior to exposure to the ecological and economic data, many villagers had little notion that the fruit which occur abundantly in their forests offer compensatory prices in regional markets.

Due to interest on the part of residents, a few modest attempts at commercialisation of forest fruit transpired. Numerous problems continued to hamper their efforts, including transport, packaging, rotting fruit, illiteracy and lack of market expertise. Nevertheless, after each sale the community shared lessons concerning the obstacles and opportunities. Lessons included tips on selection and gathering of fruit, packaging in cushioning leaves, using baskets and small boxes instead of plastic sacks, choosing advantageous locations in the marketplace, setting prices and advertising. Benefitting from these lessons, each sale brought greater profit, the fourth sale by the mothers' club being especially gainful resulting in the purchase of used clothes, lye for soapmaking and a small pig. Profit from this fruit sale has not yet been fully realised since the pig has put on considerable weight and the mothers are expecting a lucrative profit.

Travelling Shows

The sole visitors and information sources for many isolated rural communities in eastern Amazonia are river vendors, ranchers and loggers. The tendency of each of these tireless players is to devalue the economic worth of the forest and its products. Lacking economic information on forest value, forest communities throughout Amazonia continue to sell timber rights and land for meagre sums.

Through a network of farmers' unions, womens' clubs and extensionists, we received invitations to present our findings to communities outside of the Capim region. In response to these requests, we preferentially chose to serve regions in which logging activity was either already present or imminent. These workshops used ecological and utilisation data generated in the Capim region as a springboard to demonstrate forest value locally. A team consisting of one researcher and two community residents, who had worked with the research team, jointly directed the workshops. We found the inclusion of women on these teams offered an unusual and powerful educational link with new communities. Rural women in Amazonia maintain enormous household and agricultural workloads, are infrequently included in development efforts and rarely leave their own communities. As a result, the presence of rural women in community-exchange workshops gave a voice to the unheard and carried the power of the unexpected.

Based on a community's particular social and ecological conditions such as size of forest holding, species composition, utilisation patterns, interests and needs, we adapted the workshop content concerning fruit, medicinal and game species. Information concerning market prices, preferred economic species and local management practices was gathered through informal conversations and forest walks prior to workshops. Based on this information, posters, songs and theatre were modified to reflect the plant and animal composition of each locale. Depending on the needs, interests and dedication of a community, further extension assistance was possible. Additional technical assistance has included forest inventory techniques, mapping, market surveys and guidelines for the creation of community forest reserves.

As a result of our visits, an additional theatre piece was created: 'How I was fooled by the logger'. Individuals acted out scenes as they had occurred with loggers and ranchers. These included the trade of logging rights to 20 hectares of primary forest for a stove, the rights to log 1,000 hectares of forest in exchange for construction materials for a small building, deals in which the logger promised to return and pay and instead left the village and 'went on a walk, a long walk alright, have never seen his face again'. The abundant laughter and head-shaking which accompanied each scene revealed an all-too-familiar, shared recollection by the audience. The bare honesty of the skits offered a comic outlet, thus creating space for open recognition and dialogue concerning ill-advised, sometimes tragic, land and timber deals.

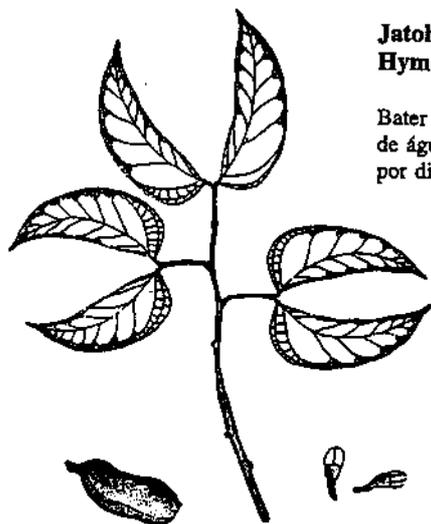
Illustrated Booklets

Although the written word is little understood, we found that illustrations depicting potent messages have the power to influence the thinking and behaviour of populations toward their forests. Choosing primary and secondary plant species widely utilised and distributed throughout the Amazon basin, we are creating booklets with relevant ethnobotanical, ecological and market information.

We have completed one booklet on medicinal plants and are working on another on the ecology, utilisation and management of native forest fruit species. The booklets respond to many of the common inquiries we received regarding the utilisation and management of native plants. Within the communities in which we worked, it was not unusual to find close to 80% illiteracy. Therefore, the medicinal plant booklet, *Recipes without Words: Medicinal Plants of Amazonia* was designed to be 'read' by the illiterate. In the booklet, 14 medicinal plants, the ailments for which they serve and recipes are depicted by illustration. On one page a plant is pictured together with a person suffering from a common sickness such as rheumatism, flu, fever, diarrhoea or head lice. The next page features preparation techniques and dosages. For example, the recipe for *Jatoba* (*Hymenaea courbaril*) reads: Take three fingers width of bark, boil in one litre of water. Drink half a cup three times per day (see Fig 2). The native fruit tree booklet includes information on fruit tree densities, production, regeneration, market value, recipes for jams, soaps and oils, and tips on planting and management. Songs with ecological messages and references to locally valued fish, game and tree species are included at the beginning and end of the booklet.



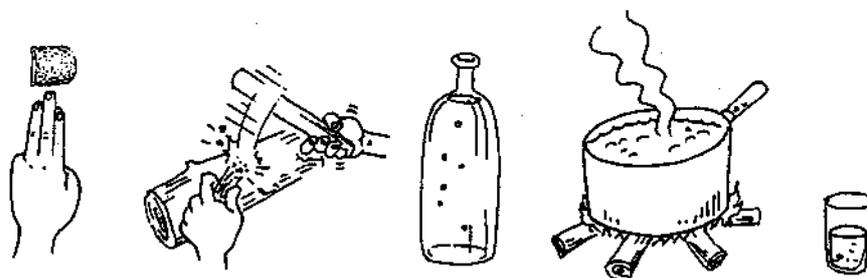
Figure 2: Sample page from *Recipes without Words: Medicinal Plants of Amazonia*



Jatobá
Hymenaea courbaril

- gripe
- fortificante

Bater 3 dedos de casca (20g) e ferver em 1 litro de água por 20 minutos. Tomar 1 copo 3 vezes por dia.



3x ☀

Figure 2: Sample page from *Recipes without Words: Medicinal Plants of Amazonia*

Community Utilisation of Data for Forest Conservation

The data presented in the workshops described above served communities in a number of concrete ways. Data quantifying the consumption of fish, game and fruit were presented in a public hearing to contest the installation of a proposed mining operation in the river basin. Information generated by mapping the densities and distributions of fruit trees was used in negotiations with loggers and aided in delineating areas for future community forest reserves. Oil trees identified through the forest inventories were tapped to obtain a valuable medicinal oil for the community 'forest pharmacy'. A mothers' club was founded on the profits made from the sale of forest fruit, and recipes using native plants for medicines, jams and soaps were rescued from one community and shared in the next. A number of individuals and communities who participated in the workshops opted not to sell timber and created forest reserves. Communities who were already guarding tracts of the forest shared their management guidelines for community forest reserves, thus reinforcing and strengthening the conservation efforts of isolated populations.

Conclusion

Forests throughout the Amazon basin continue to be felled, in part, because of lack of information of their actual worth by residents. Forest inhabitants sell forests due to desperate economic necessity. However, short and long term damages, both ecological and economic, accompany these quickly made decisions. Extension/education programmes which alert forest communities to the subsistence value and commercial potential of wood and non-wood forest resources can offer practical economic and concrete management alternatives. Scientific data that affirm and expand upon traditional notions of forest worth, can help give rural communities reason for pause before entering into disadvantageous land and timber deals.

Furthermore, greater immediate payoffs from the substantial monetary investments made in scientific research may follow if results are given back locally. The odds of catalysing forest conservation or policy change through the publishing of scientific data are remote. By contrast, although geographically limited, local use of relevant data can offer immediate conservation gains.

Educational workshops on forest worth cannot change the underlying

socioeconomic mechanisms which drive deforestation. Educational programmes will also not remove the substantial barriers that exist to the fair marketing of forest products. Nor will extension programmes eliminate the grinding poverty that underlies many land and timber transactions. Nevertheless, if forest communities enter negotiations with a stronger information base regarding the value of their forest resources, they may increase their opportunities for more just outcomes.

The case study reported above offers one small reminder that conservation projects launched through the biological sciences can profit from greater proximity to and understanding of the lessons learned from decades of field-based work in the social sciences. Many of the guidelines and methods we clumsily discovered as natural scientists are classic lessons in the fields of rural development, anthropology and popular education. To effectively undertake this type of conservation project, groups must draw on a multitude of disciplines in the natural and social sciences. In addition, although ethical obligations to communities in which research is conducted have been elaborated upon and recently reassessed by botanists and anthropologists, less attention has been paid to this crucial topic by other scientific disciplines.

Effective forest conservation education programmes can be low-cost, incorporating and training local populations as the heart of the teaching team. Traditional ecological knowledge is thus valued and expanded upon while helping to ensure a multiplier effect. Although rural regions such as Amazonia create obvious geographical difficulties for dissemination of information, isolated areas also afford profound educational advantages for rural extension programmes. Vastness of territory signifies a sheer lack of visitors to far-off forests. Whoever arrives, whatever is said, is well remembered.

Acknowledgments

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