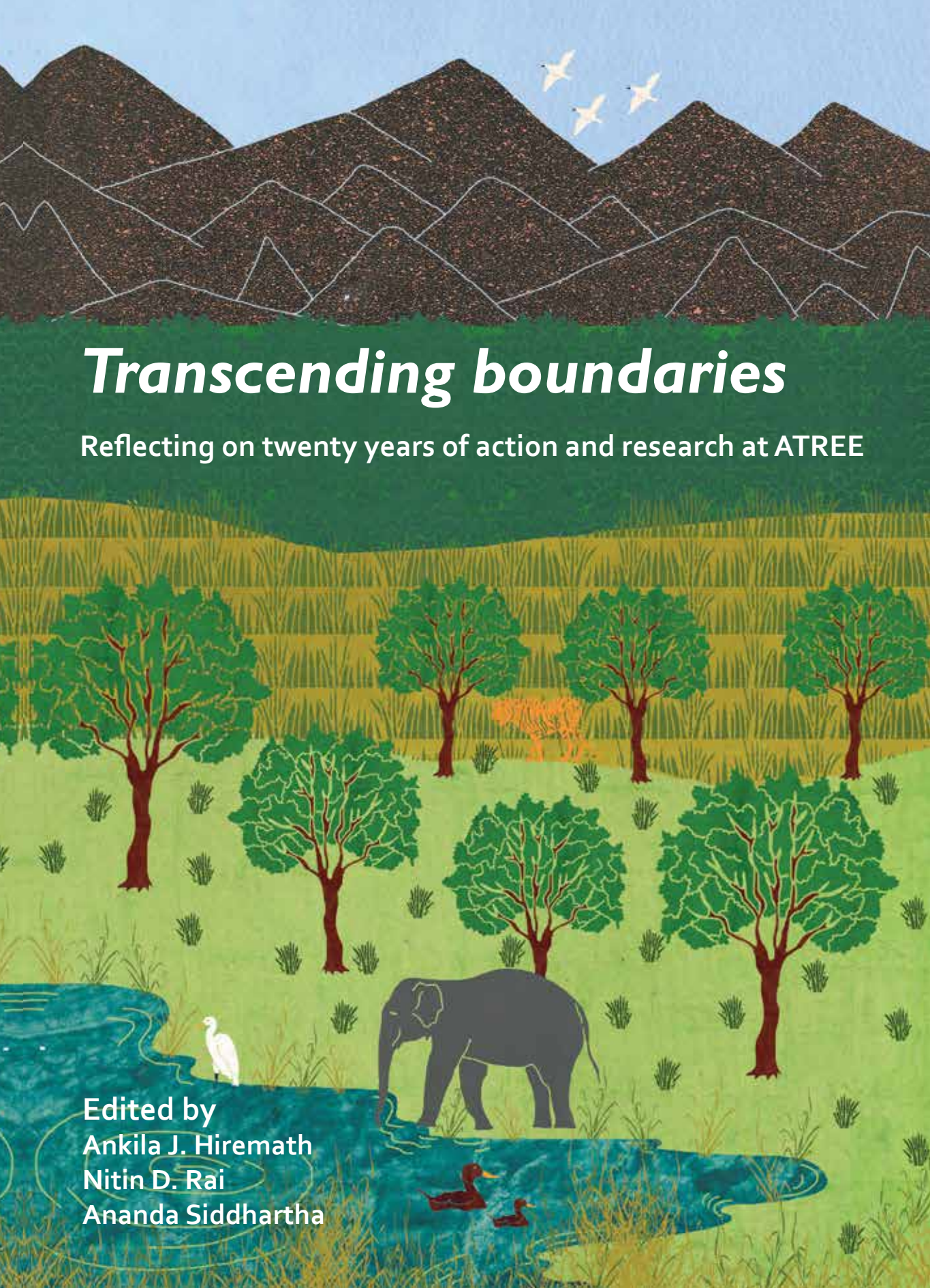

Transcending boundaries

Reflecting on twenty years of action and research at ATREE

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Contents

2 Ecosystems in transition

3 Perspectives on conservation and development

Non-timber forest products, livelihoods and sustainability: What have we learnt?

Siddappa Setty, Sharachchandra Lele and Safia Aggarwal

Sonali Zohra

INTRODUCTION

People have been gathering fruits, nuts, flowers, twigs, leaves, bark and other plant parts from the forest for millennia. Policy attention to such 'minor' forest products dates back to at least the colonial period, when taxing and control of such products became ubiquitous. But the term, 'non-timber forest products' (NTFPs) emerged only in 1989, and it came not from an economic perspective but an ecological one, one that sought to distinguish between 'destructive' extraction of timber and 'benign' extraction of NTFPs. Worldwide, NTFP-focused forest management has been championed as a win-win between meeting livelihood needs and conservation goals.

In India, NTFP collection continues to be a significant part of the livelihoods of forest-dwelling communities, with estimates of the numbers of people involved in it ranging from 100 to 250 million. But the debate as to whether NTFP-focused forest management can be a win-win (as many civil society groups argue), or whether it is in fact a lose-lose as a low-income and ecologically destructive livelihood (as many policy makers continue to believe), is far from settled. The question, therefore, is whether, and under what conditions, can NTFP harvest be ecologically sustainable and also contribute to enhancing rural livelihoods.

ATREE's research over the past 20 years has attempted to answer different dimensions of this question. The research began even before the founding of ATREE, when a team of researchers, led by Kamal Bawa, launched a long-term action research programme—an NTFP-enterprise-based approach to conservation—in partnership with the *Soliga adivasi* community and the Vivekananda Girijana Kalyan Kendra in the Biligiri Rangaswamy Temple (BRT) Wildlife Sanctuary, Karnataka. Over time, a number of researchers from ATREE and several collaborating organisations have deepened the work at this site, while studies in other parts of the Western Ghats and central-eastern India have expanded the scope. We present a broad-brush picture of the key insights from this body of work along the twin dimensions of ecological sustainability and livelihood enhancement.

ECOLOGICAL AND SOCIAL CONDITIONS FOR SUSTAINABLE HARVEST OF NTFPs

Historically, the use of NTFPs may have been largely sustainable, i.e., maintained productivity and regeneration undiminished, because the quantities of harvest involved in subsistence use were generally small. The challenge comes when NTFPs are being harvested for sale, because this can lead to much greater intensities of harvest. Can harvesting at such intensities also be sustainable? Under what ecological conditions—such as harvest magnitudes and methods, other management practices, and exogenous factors? Under what social conditions—such as knowledge levels and tenure arrangements?

Impact of harvest

Much of the research on NTFP sustainability has focused on the quantity of harvest, in the belief that this variable is most likely to affect future productivity of the harvested individual, and future regeneration of the species. Across several NTFPs, however, ATREE research has shown that harvest levels have less of an impact as compared to harvesting methods.

One of the most important NTFPs in BRT is *amla* (Indian gooseberry). There are two species of *amla, Phyllanthus emblica* and *P. indofischeri,* both of which are harvested. Monitoring of the populations of the two species over a 3 year period in 10 0.1 ha plots indicated that seedling and sapling mortality of *P. emblica* was higher than that of *P. indofischeri*, despite the fact that the harvest at landscape levels of the former was lower (29%) than that

of the latter (60%)[1]. Further, the size-class distribution—an indicator of population sustainability—of *P. emblica* was similar to that in the Mudumalai Wildlife Sanctuary (Tamil Nadu), where there was minimal harvest of *P. emblica*[2]. It was clear that factors other than harvest had an impact on *amla* regeneration, corroborating earlier observations[3].

A detailed analysis of 10 years of monitoring sample populations of these two species was carried out to assess the effects of harvest[4]. There was a difference in harvesting levels between species: 55–65% of fruit produced for *P. emblica* (which occurs in the moister regions), and up to 88% for *P. indofischeri* (which occurs in the drier region). But when other factors were controlled, both species of *amla* showed good recruitment of seedlings, regardless of the level of fruit harvest. Also, a ban on harvesting that had been imposed from 2006–2009 did not affect recruitment levels or population growth rates of the two species.

On the other hand, if, while harvesting *amla* fruit, large (primary) branches of trees are cut—which harvesters sometimes do for convenience—it significantly decreases fruit production of those trees in the following years[5]. Conversely, if, while harvesting *amla*, harvesters prune mistletoe hemiparasites—an infestation that is common in BRT and has the potential to kill *amla* trees (see below)—this can restore fruit production of those trees[6]. In other words, the method of harvesting can have negative or positive effects on future productivity.

The role of exogenous ecological factors

When NTFP availability declines, it is almost invariably attributed to harvest levels or harvesting practices, prompting demands for imposing harvest restrictions. ATREE research, however, highlights the importance of several 'exogenous' processes, i.e., processes that are not the result of, or triggered by, NTFP harvesting that may influence NTFP availability. These include plant invasions, mistletoe infestations, fire, and grazing by wildlife or cattle.

Lantana (*Lantana camara*), an invasive plant that is now present in many Indian forests, appears to have a significant impact on vegetation dynamics in BRT, reducing the richness and abundance of native species, including that of NTFP species. For example, populations of amla trees declined by 16% over a 10 year period in areas that were heavily infested by lantana[7]. Lantana has negative effects on *amla* both directly and indirectly: where it is present, it stifles the growth of *Phyllantus* seedlings and saplings; but even where it is absent, *Phyllanthus* populations experience higher levels of grazing by wildlife, presumably because unpalatable lantana now occupies such a large fraction of the landscape.

[1] Setty, RS. 2004. *Ecology and productivity of studies on some non-timber forest products of Biligiri Rangaswamy Temple Wildlife Sanctuary*. Ph.D. Thesis. University of Mysore, Mysuru, India.

[2] Ganesan, R. and RS. Setty. 2004. Regeneration of Amla, an important non-timber forest product from southern India. *Conservation and Society* 2(2): 365-375.

[3] Sinha, A. and KS. Bawa. 2002. Harvesting techniques, hemiparasites and fruit production in two non-timber forest tree species in south India. *Forest Ecology and Management* 168(1-3): 289–300.

[4] Ticktin, T., R. Ganesan, M. Paramesha, and RS. Setty. 2012. Disentangling the effects of multiple anthropogenic drivers on the decline of two tropical dry forest trees. *Journal Of Applied Ecology* 49(4): 774–784.

[5] Setty. 2004. (see footnote 1)

[6] Setty, RS., KS. Bawa, T. Ticktin, and CM. Gowda. 2008. Evaluation of a participatory resource monitoring system for nontimber forest products: the case of Amla (Phyllanthus spp.) fruit harvest by Soligas in South India. *Ecology and Society* 13(2): 19.

[7] Ticktin et al. 2012. (see footnote 4)

Mistletoe can also affect NTFP productivity and sustainability. Mistletoe (*Taxillus tomentosus*) is a hemiparasite that is found on more than half the *amla* trees in BRT, and particularly on mature reproductive trees that are important for population persistence[8]. Mistletoe infestation significantly reduces fruit production—according to harvesters by as much as 50%. Several studies confirmed a negative correlation for both species of *amla*[9]. Furthermore, mistletoe presence is correlated with declines in fruit and seed weights[10], which may reduce viability of seeds, further affecting population sustainability.

Fire—whether natural or anthropogenic—is also an important exogenous variable that potentially affects NTFP sustainability. The effect of fire on forests in general has been a matter of great controversy in India. While controlled burn experiments have not been possible in BRT, studies using oral recall[11] or remote sensing[12] to estimate historical fire frequency have concluded that infrequent and therefore intense fire is deleterious to the vegetation and its sustainability, whereas low intensity ground fires may be harmless or even stimulate regeneration. It is also observed that low intensity fires destroy the mistletoe on *amla* trees[13].

Overall, ATREE's research in BRT has shown that it is not so much the 'harvesting intensity' as the 'method of harvest' that has an effect on NTFP populations. Moreover, other factors, such as invasive species and mistletoe, seem to play an equally significant role in NTFP dynamics. Thus, active management of invasives and mistletoe may be necessary to sustain NTFP harvest. As a result of ATREE's outreach, when *Soliga* harvesters began pruning mistletoe while harvesting *Phyllanthus* sp., the productivity of those trees increased in subsequent years[14].

Ecological knowledge: traditional and modern

Given the complex role of exogenous ecological factors, harvest levels, and harvesting methods, in determining NTFP sustainability, the immediate social question is whether harvesters possess adequate knowledge of these ecological dynamics. Several ATREE studies have examined the extent and validity of traditional ecological knowledge (TEK) about NTFPs. In one study, TEK was compared with modern knowledge in the context of mistletoe infection on amla trees[15]. It was found that knowledge regarding primary host species, mistletoe distribution across forest types and

[8] Rist, L., RU. Shaanker, EJ. Milner-Gulland, and J. Ghazoul. 2008. Managing mistletoes: the value of local practices for a non-timber forest resource. *Forest Ecology and Management* 255(5-6): 1684–1691.

[9] Sinha and Bawa. 2002. (see footnote 3)

[10] Setty. 2004. (see footnote 1)

[11] Sinha, A. and S. Brault. 2005. Assessing sustainability of non-timber forest product extractions: how fire affects sustainability. *Biodiversity and Conservation* 14(14): 3537–3563.

[12] Nayak, RR., S. Vaidyanathan and J. Krishnaswamy. 2014. Fire and grazing modify grass community response to environmental determinants in savannas: implications for sustainable use. *Agriculture, Ecosystems & Environment* 185: 197–207.

[13] Setty. 2004. (see footnote 1)

[14] Setty et al. 2008. (see footnote 6)

[15] Rist et al. 2008. (see footnote 8)

*Nelli, or amla (*Phyllanthus sp.*) being harvested by a Soliga NTFP collector in MM Hills Wildlife Sanctuary. (Photo: Siddappa Setty)*

within the *amla* population, and mistletoe phenology and optimal growing conditions matched well. Additionally, harvesters provided quantitative estimates of factors such as prevalence of infection in considerably less time, and at a fraction of the cost, when compared to conventional scientific investigations. TEK also extended current knowledge in one instance, regarding mistletoe's bird dispersers. However, there were some discrepancies between the two types of knowledge, most notably for secondary host species, dispersal mechanisms, the different susceptibilities of the two *amla* species, and the differential effects of infestation on them. Similarly, another study comparing TEK with scientific data regarding lantana invasion and its impacts on the forest also found a high degree of agreement regarding factors contributing to the spread of lantana, changes in forest composition, and the effect on local livelihoods[16].

It is possible that, when NTFP harvest reaches commercial proportions, TEK, which tends to be qualitative, may not be enough for the kind of adaptive management that will be required. ATREE's action research team has, over a 10 year period, tried to develop a participatory resource monitoring approach, involving mapping and monitoring of *amla* fruit production, harvest, and regeneration in partnership with the *Soligas*[17]. They found that visual estimates of fruit production made by harvesters were very similar to estimates obtained using standard scientific monitoring protocols. They also found that the *Soligas* were quite keen to participate in monitoring to estimate production (because it helped them identify areas to harvest, and to estimate the quantity to be tendered more accurately). However, they were less keen to participate in monitoring regeneration, because the time involved was much more, and the benefits uncertain, given the lack of long-term tenure. This highlights the interaction between tenure and the willingness to generate the knowledge needed for sustainable management.

Resource tenure for sustainable harvest

One of ATREE's early contributions was to show that access and tenure are not the same thing— tenure is a superset that includes rights to exclude, manage, and sell. Analysis across southern Karnataka, including BRT, showed that forest-dependent communities, even when they are given access to NTFPs, did not engage in resource management because they lacked tenurial security and managerial rights[18]. The government made *adivasi* communities form cooperative societies known as LAMPS (Large-scale Adivasi Multipurpose Societies), which were given rights to harvest NTFPs. But these 'rights' were in the form of 2 year leases, the renewal of which was uncertain and time-consuming, making

[16] Sundaram, B., S. Krishnan, AJ. Hiremath, and G. Joseph. 2012. Ecology and impacts of the invasive species, Lantana camara, in a social-ecological system in South India: perspectives from local knowledge. *Human Ecology* 40(6): 931–942.

[17] Setty et al. 2008. (see footnote 6)

[18] Lele, S. and RJ. Rao. 1996. *Whose cooperatives and whose produce? the case of LAMPS in Karnataka. In: Rediscovering cooperation* (ed. Rajagopalan, R.). Volume 2. Pp. 53–91. Anand, Gujarat: Institute of Rural Management Anand.

them highly insecure. Furthermore, although exclusively assigned to the *adivasis* on paper, other communities could not be prevented from harvesting these resources. Most importantly, these harvest rights did not include any say in NTFP or wider forest management. The Forest Department even decided where and when harvest would be permitted.

An extreme illustration of tenurial insecurity came in 2004 when the government officially banned NTFP harvest because of a particular interpretation of a Supreme Court order. This was 8 years after ATREE had initiated the enterprise-based conservation programme. Apart from its livelihood impacts[19], the ban was a major setback to the idea of community-based conservation.

However, in October 2011, the *Soligas* succeeded in claiming Community Forest Rights for 25 *Soliga* villages under the Forest Rights Act of 2006. This has, in theory, changed things dramatically, giving them secure statutory tenure and a mandate for sustainable management. It remains to be seen whether, and how, this potentially radical shift plays out on the ground.

ENHANCING LIVELIHOOD GAINS FROM NTFP HARVEST

Much before the idea of promoting NTFP based livelihoods for their ecological sustainability became common, policy makers were engaging with the question of how forest-dependent communities could get better returns from NTFPs. Two measures were typically advocated: improving market access through scaling up via cooperative marketing, and capturing more of the final value through onsite value-added processing. ATREE's policy research on cooperative marketing across multiple states, and our action research on value-added processing, have provided important insights vis-à-vis these measures.

Tenure and livelihoods

Resource tenure matters not just for ensuring sustainability, but also for maximising livelihoods gains from NTFPs. In its simplest form, the lack of resource ownership reduces NTFP harvesters to wage labourers. A multi-state study[20] showed that many forest-dependent communities still do not have rights to valuable NTFPs, since many Central Indian states have historically 'nationalised' the high value NTFPs

[19] Sandemose, P. 2009. *Local people and protected areas: the ban of NTFP collection for commercial use and effects on cash incomes and livelihoods of the Soligas in BR Hills, India.* M.A thesis. The Norwegian University of Life sciences (NORAGRIC), Aas, Norway.

[20] Lele, S., M. Pattanaik, and ND. Rai. 2010. NTFPs in India: rhetoric and reality. In: *Wild product governance: finding policies that work for non-timber forest products* (eds. Laird, SA., RJ. McLain, and RP. Wynberg). Pp. 85–112. London: Earthscan.

such as bamboo, *tendu* (*Diospyros melanoxylon*) leaves, and *sal* (*Shorea robusta*) seeds, thereby tightly controlling their harvest, sale and trade. The states have historically extracted large profits from these products. For instance, the *tendu* leaf, which is used in wrapping tobacco to make the *bidi* (Indian cigarette), fetches a royalty of over Rs.1.5 billion annually for the state of Odisha alone[21]. Primary collectors/growers, in the meantime, are compensated only for their labour, often being paid at less than the state's minimum wage. Even where states have, in the mid-2000s, moved to sharing an official zero-royalty policy, a significant slice of the sale price of the *tendu* leaf can end up with the state agencies, such as in Madhya Pradesh, with the *tendu* leaf harvesters still getting a low 'wage'[22]. And even where states have not 'nationalised' the produce, as in Karnataka, they were, for many decades, charging LAMPS significant royalties in exchange for harvesting rights.

At the micro-level, even if harvesters have harvesting rights, if these rights are not coupled with rights to regulate harvest, not only is sustainability jeopardised, even returns from NTFP harvest can be reduced. The most telling example emerged from a study of wild honey harvesting in BRT. When certain honey resources (cliffs or trees) were left open-access (especially trees/cliffs with one or two bee colonies), competition amongst harvesters led to premature harvest of the honeycombs, resulting in lower honey yields and higher levels of larval loss that could potentially affect the numbers of the next generation of bees[23].

[21] Lakshmi, P. 2013. *Linked social and ecological dynamics in a managed forest ecosystem: Kendu leaf extraction in Baisipalli Sanctuary, Odisha*. M.A. thesis. Ambedkar University Delhi, Delhi, India.

[22] Lele, S., V. Ramanujam, and J. Rai. 2015. *Co-operative procurement and marketing of tendu leaves in Madhya Pradesh: image and reality.* Bengaluru: Ashoka Trust for Research in Ecology and the Environment. Environment and Development Discussion Paper no. 3.

[23] Setty and Lele. unpublished manuscript.

Cooperative marketing

If harvesters of NTFPs pool their resources and market them collectively, they should be able to obtain better prices in the market than if they sold the product individually. This has been the logic behind the forced cooperativisation of *adivasi* NTFP harvesters starting in the 1970s by most states in India. The state also lent funds to these cooperatives with the idea of loosening the control of NTFP contractors who also acted as money lenders. Unfortunately, such forced cooperativisation, even if well intentioned and heavily subsidised, has not worked much in favour of the NTFP harvesters.

In Karnataka, even after 15–20 years of operation, the NTFP harvesters obtained only marginally better prices than what the traders offered. The LAMPS, instead of passing on most of the price obtained in auctions back to the harvesters, maintained high margins and still showed high losses. Short-term loans provided to the harvesters began to be controlled by intermediaries between the LAMPS and tribal settlements. The government-appointed officers of the Department of Cooperatives operate as secretaries of the LAMPS, who then call all the shots. In some cases, forest officers have become Presidents of the LAMPS. The size of each of the LAMPS, spread over an entire *taluka* or more, makes democratic functioning almost impossible. In short, lack of autonomous control over the cooperative by its members has led to inefficient and exploitative outcomes[24].

The experience from an even bigger cooperativisation effort in Madhya Pradesh is not much better[25]. In the late 1980s, the state imposed a three-tiered cooperative system (primary cooperatives, district unions, and state-level federation) for all NTFPs including the lucrative *tendu* leaf trade. Although harvester wages jumped sharply in the first year after cooperativisation, the gap between the average auction price and the price earned by the *tendu* leaf collectors slowly widened again. The state began to extract a slice for so-called development funds, also delaying some part of the payment (so-called bonus payments) by 12–14 months. Auction prices are lower than those obtained in neighbouring states. The reason for all this is again that the state has not handed over real control of these 'cooperatives' to the harvesters, allowing them to be run as extensions of the Forest Department and under the influence of NTFP contractors. Most 'members' have no knowledge of cooperative functioning, elections are rarely held, and harvester returns are fixed by bureaucrats and ministers, rather than by the cooperatives themselves.

[24] Lele and Rao. 1996. (see footnote 18)

[25] Lele et al. 2015. (see footnote 22)

It seems that another 'tenurial' problem is at work here, even as harvesters are ostensibly given control over the resource, the forced, and state-managed cooperativisation means that they do not really control the organisation through which the product is brought to the market, i.e., the channels of market access. The Forest Rights Act has given full rights to forest-dwelling communities over NTFPs, and could potentially override the earlier legislations that 'nationalised' these NTFPs. However, most states have not allowed this rollback yet, and the experience from Maharashtra[26] suggests that an abrupt withdrawal by the state will re-expose harvesters to the vagaries of NTFP markets. What states need to focus on is capacity building of the harvesters to engage successfully with the markets.

Value addition of NTFPs

One oft-repeated suggestion for increasing returns from NTFP sale is for harvesters to also engage in 'value-added processing' instead of selling the NTFPs in 'raw' form. The NTFP-enterprise based approach to conservation, which marked the start of ATREE's work in BRT, was an experiment along these lines[27]. It involved setting up a processing unit for pasteurising and bottling raw honey, making pickles from *amla*, and powdering soapnut (*Sapindus laurifolius*) and *shikakai* (*Acacia concinna*). In spite of a huge financial subsidy and managerial and technical support over many years, it can at best be called a limited success when measured against the goal of increasing returns for the harvesters and

[26] Lele and Aggarwal. unpublished manuscript.

[27] Bawa, KS., S. Lele, KS. Murali, and B. Ganesan. 1999. Extraction of non-timber forest products in Biligiri Rangan Hills, India: monitoring a community-based project. In: *Measuring conservation impact: an interdisciplinary approach to project monitoring and evaluation.* (eds. Saterson K., R. Margolui and N. Salafsky). Pp. 89–102. Washington, D.C.: Biodiversity Support Program, World Wildlife Fund.

Participatory resource mapping by the Soliga community in BRT Tiger Reserve as part of a community-based conservation initiate. (Photo: Siddappa Setty)

empowering them to manage such enterprises themselves[28]. There were several reasons for this. Processing itself is not very labour intensive and was centralised in one location, thereby not generating enough jobs, or enabling broad-based participation. Members continued to view the enterprise as another wage-earning activity, and the quality of management even after many years has been highly variable. Learning from this experience, a recent project has adopted a strategy involving much more decentralised treatment centres and low capital investment. This could potentially benefit a much larger cross-section of the community.

However, the processing unit and larger project were able to 'indirectly' benefit the *Soliga* NTFP collectors substantially, by offering higher purchase prices to the LAMPS for the raw produce on the condition that it pass on the higher price to its member-harvesters. In other words, the *Soligas* were, with ATREE's help, able to use the enterprise to exert pressure on their LAMPS to perform better.

The overall lesson is that the net margin in value-added processing is rather low, and requires many other skills and investments (processing technology, complex financial management and record-keeping, marketing) as compared to the handling of raw produce. It should be attempted only after communities have maximised the return from the harvesting and sale of raw produce, and thereby built their capacity for collective action and learning.

Sharing of livelihood gains

The action research also points to a number of challenges in ensuring that gains from collective management of NTFPs are fairly and equitably distributed within the NTFP collecting community. First, there can be a lot of variation in the nature and extent of NTFP dependence. When the project began, the share of NTFP in total household incomes varied from 50–60%, and in some villages non-collector families were close to 35%[29]. Some held salaried jobs, while others were primarily engaged in wage labour. Even amongst harvesters, many harvested only *amla* (a short-season activity requiring little skill) while a few specialised in other products such as honey that required sustained effort and skills. But when cooperatives such as LAMPS have all *adivasis* as members, pressure gets created for sharing of profits across all members, although they are generated by the harvesters. Second, the creation of cooperatives, if not grounded in broader community mobilisation, can provide ample opportunities for rent-seeking through collusion between a few enterprising members or between such members and externally appointed managers. Even the processing cooperative was not able to avoid such problems entirely—women workers never achieved managerial status, and managers themselves frequently misappropriated funds. In other words, the internal challenge of building and maintaining truly democratic and just communities comes sharply into focus after the state devolves resource tenure to the communities.

NTFP RESEARCH: WHERE DO WE GO FROM HERE?

ATREE's research on NTFPs has highlighted the complex ecological dynamics of NTFP species, the importance of harvesting methods and also several exogenous factors, and the link between tenure, institutions, knowledge, and harvesting practices.

In a context where over a 100 million people are still involved in NTFP harvest, and where the Forest Rights Act of 2006 now has the potential to give secure and substantial tenure to local communities (over 40 million ha of forest), this research can provide a valuable starting point, but will have to be expanded in many directions—across many more species, eco-regions, management practices, and social and market conditions, incorporating impending climatic changes, and including relationships between NTFP species and the broader ecosystem. It promises to be an exciting time for NTFP researchers.

Acknowledgements

This article draws upon the work and contributions of a large number of colleagues with whom we have interacted over the last 20 years, only some of whom are cited in the footnotes. Equally invaluable is the support we received from the local communities, particularly the *Soligas* of BRT. We were also benefitted by receiving support from various agencies, such as the state forest department, and donors, again too numerous to mention individually.

Further Reading

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Laird, SA., RJ. McLain, and RP. Wynberg (eds.). 2010. *Wild product governance: finding policies that work for non-timber forest products*. London: Earthscan.

[28] Lele, S., KS. Bawa, and CM Gowda. 2004. Ex-Post evaluation of the impact of an Enterprise-Based Conservation project in BRT Wildlife Sanctuary, India. In: *The commons in an age of global transition: challenges, risks and opportunities,* 8th Biennial Conference of the International Association for the Study of Common Property. Organised by International Association for the Study of the Commons at Oaxaca. Mexico. August 9–13, 2004

[29] Bawa et al. 1999. (see footnote 27)