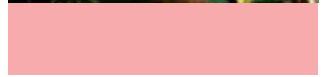
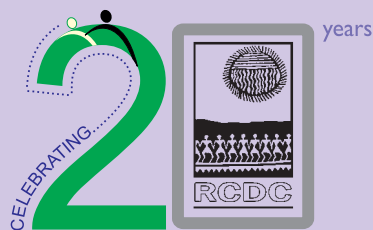




Planning Sustainable NTFP Management





partnership in development



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PLANNING SUSTAINABLE NTFP MANAGEMENT



NTFP: definition and implication thereof

Non-Timber Forest Products/Produces (NTFPs), otherwise mentioned as Non-Wood Forest Products/Produces (NWFPs) in the west and as Minor Forest Products/Produces (MFPs) in India usually referred to the secondary production in the forest in the timber-centric management approach. During the colonial period, their list included all kinds of forest products other than timber and firewood, ranging from fruits/flowers/leaves to minerals and wildlife products such as feathers. The term did not pose any significant legal threat as such, and hence was loosely used by different forest managers/owners. However, with the enactment of PESA Act in 1996 the legal implication of the term MFP became quite obvious and clear as this Act provided for ownership rights for the Grama sabha (and Panchayats at appropriate level) in the Scheduled Areas over the MFP. However, the Act did not define either 'ownership' or 'minor forest produce' which became an inherent weakness. Taking advantage of that, various states, which were concerned over the implications of such ownership rights as that threatened their forest revenue and the very stake of the Forest Department along with secondary concerns for possible destructive harvesting, tried to define MFP in their own ways. The Secretary, Ministry of Environment & Forest, Government of India wrote to the Chief Secretary, Madhya Pradesh in 1998 that "minor forest produce is the forest produce other than timber harvestable on a non-destructive basis". The Government of Madhya Pradesh then added to this definition that MFP should not include minerals and wild animals or their derivatives (quoted in Rath, 2010). The Odisha government notified a resolution in 2000 that defined MFP as a list of items specified by the government from time to time, and has so far included 69 NTFPs in this list that excludes vulnerable items such as bark, root, etc..

The Forest Rights Act (FRA), 2006 however overturned this position on the legal front by giving for the first time a comprehensive and reasonable definition of MFP, as under:

“Minor forest produce includes all non-timber forest produce of plant origin including bamboo, brushwood, stumps, cane, tussar, cocoons, honey, wax, lac, tendu or kendu leaves, medicinal plants and herbs, roots, tubers and the like.”(Section 2-i)

This definition challenged the provision in the Indian Forest Act, 1927 that treats bamboo at par with timber. Moreover, it included stumps in the list. While it clarified that MFP should mean all kinds of NTFP of plant origin, it did include items such as honey, lac and tassar that are indirectly of plant origin and directly of animal origin. It is significant to note here that this definition took care to avoid any harm to wildlife by not including wildlife derivatives in this list except but honey, lac and tassar. The FAO(Food & Agriculture Organization) definition for NTFP as 'goods of biological origin other than wood, derived from forests, other woodland and trees outside forest' (quoted in Rath, 2010) was thus limited to products of plant origin in the FRA definition of MFP so as to save wildlife.

PESA Act provides for ownership rights over MFP only in schedule areas, whereas FRA provides for such ownership rights in all areas of the country provided the MFP is 'traditionally collected' and the forest rights are recognized. This means that for those items not collected traditionally, the Forest Department may also claim ownership if it so desires.

Both PESA Act and Forest Rights Act simultaneously speak of the conservation and management of the resources. In other words these laws do not allow unsustainable and destructive harvesting/ use of the resources. As such, it is the responsibility of the concerned 'owner' communities to ensure sustainable management plan and practices for their NTFP resources.

Limitations of traditional conservation and management systems

In the good old times when the pressure of commercial extraction was much less than now on the forest products, particularly the non-timber forest products(NTFP), following factors helped in conservation and sustainable harvesting of the resources although there were not much direct arrangements to ensure sustainability:

↪ **Socio-cultural taboo:** Casteism played an important role in channelizing the resource use, and people of one caste usually did not venture into the profession of other caste as that would have meant a social violation and a religious set back. This in turn limited the pressure on resource use. For instance, in Odisha only a particular community known as Lakhara used to collect and process lac. After independence these taboos gradually lost their hold on the society, and professionalism no more followed the casteism with but few exceptions. Hence, the pressure on lac was increased as people of other communities also wanted now to do the business.

↪ **Religious restrictions:** There were some protocols for extraction of herbs, like first one has to perform the puja so as to evoke the power in the plant and also to seek permission(of the plant-deity) to extract, on a prescribed time only. This way the protocols did not allow herbs extraction as and when pleased.

- ↪ **Customary practices:** Certain practices or taboos were commonly followed by all castes which also contributed to the sustainable use. Like, Indian plum or ber was to be enjoyed only after the Saraswati Puja was over. During this puja ber is offered as bhog, and by this time the fruit ripens which means that enjoying it would not be much harmful than its unripe form, and ripen fruit means mature seeds for regeneration. In some tribal areas of Chhattisgarh mango was being enjoyed in a similar manner, but when commercial interest dominated and the customary practice was ignored to collect immature mango for making amchur powder, the regeneration was affected (source: LEAF, Jagdalpur).
- ↪ **Restrictions under feudal rule:** Most of the forest areas belonged to the feudal regime prior to independence, and the rulers were very strict in implementing forest rules. Hardly any one dared to violate these rules. After independence people got the freedom and the feudal regime was discontinued. Taking advantage thereof, there was a rampant exploitation of forest resources, including hunting.

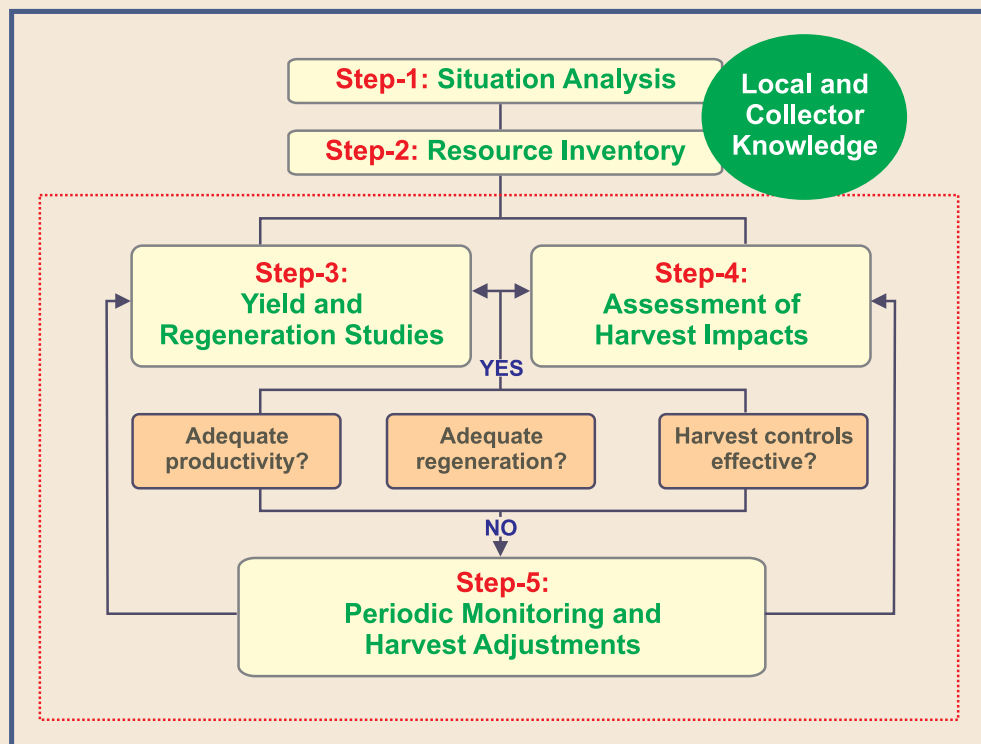
When villagers faced acute scarcity of forest products in their local forests that had been drastically degraded (the degradation was partly due to the government-approved commercial working of forests in many areas), some of them started protecting the forests. Although archival evidences suggest that community forest protection started in Odisha as early as 1940s or even before, the protection activity became widespread during 1970s and 1980s*. We now have a very established system of community forest protection and management (CFM) in Odisha as well as in other parts of the country, but protection is not exactly management. In many CFM systems, the protection activity dominates and little of management elements are in place. Whatever management protocols are there, these are mostly timber-centric and there is hardly any focus on NTFP except but few items such as bamboo, that too in limited cases. Forest development activity is almost ignored, and gender & equity concerns are hardly taken into account properly.

It is high time that the focus should shift from 'protection' to 'holistic management with resource development' particularly in view of the fact that climate change is threatening the production of NTFP, and size as well as quality of many forest products have been found deteriorated. Further, communities who get titles for community forest resources are required to adopt proper and sustainable management plans for 'their' forests as per the mandate of the Forest Rights Act, 2006; and hence isolated thinking in terms of mere harvesting protocols needs to be replaced with an approach for sustainable management, recalling the experience that a protocol of harvest may itself not be so effective or feasible if other associated factors are not favourable. For instance, if the production capacity of a species is already dwindling because of natural reasons, then mere practice of restricted harvesting may not help much unless there is an effort for assisted natural regeneration or artificial regeneration. "High grazing, low fires, open canopy, poor soils and many other factors may contribute to the status of the NTFP" (Varghese, undated). We shall therefore discuss in the next section the methodology of preparing community-based sustainable NTFP management plans.

* Elsewhere in India community forest management systems evolved more or less in parallel (such as the Van Panchayats of Uttarakhand) under various circumstances.

Steps to prepare community-based sustainable NTFP management plans:

Forest protecting communities and/or forest-right holders may follow a 5-step methodology to prepare a meaningful and practicable sustainable management plan for NTFP resources under their control, as explained in the following schematic diagram. The same process may be adopted more or less for preparing the forest management plan or even the ecosystem management plan of which the NTFP management plan can be a part.



(Source: Presentation by Tony Cunningham, People and Plants International at IFC-2008, Kotagiri)

Step-1: Situation analysis

We need to first make a systematic and formal appraisal of the NTFP resource use, like what are the NTFPs collected and by whom (which class, such as poor, women, tribals, vulnerable tribal groups, etc.), who (community/group/individual) is dependent on the same (item-wise), why and how critically; do they have any legal/customary rights/privileges/concessions for this; if this collection adversely affects or is going to threaten the species itself and/or the forest as a whole; if there are some NTFPs that remain unharvested and if so the reasons of their unharvesting; etc.. The objective of this analysis is to identify if there are some important concerns to influence the management plan.

Step-2: Resource inventory

We now need to assess the NTFP resources, like what are the forest products available (irrespective of collection/use) locally, what is the status of the species (product-wise) thereof (very small plants, or big trees, or trees of medium size; productive/unproductive; young/old, etc.); what is the

approximate productive capacity of each such species per annum (in numbers/kg/quintal/ton; if in bundles, then the size of the bundle and number of the item in each bundle); which item is collected for commercial purpose, which ones for domestic consumption, and which ones for both; which species (number of trees)/production has increased or decreased during the last 20/30 years and to what extent; which has become extinct, or rare, or endangered, or vulnerable; etc.. This will help us identify which species need special attention in the management plan for sustainability in future.

It is important to note here that right identification and naming of the species may not always be possible in the conventional/traditional way for there may be different plants with the same/similar names and same plants (species) under different names. Therefore, scientific names are required to denote the exact species. The properties of a plant may vary with a change in the species even if they belong to the same genus (like, *Rauvolfia serpentina* and *Rauvolfia tetraphyla*), and some times with a change in agro-climatic conditions even if the species remains same.

Step-3: Yield & regeneration studies

In this phase we have to assess and analyse the regeneration capacity/potential vis-a-vis the production potential of particularly those NTFP species that have been identified during the previous exercise as 'species of concern' or 'priority species for management focus' given their threat status or extraordinary socio-economic importance. Like, if harda (*Terminalia chebula*) is available in the local forest and has a good market demand, but the production is dwindling; then how many plants of harda are young enough, how many are of medium size and how many are old; what is the proportion of regenerated ones (seedlings) against the mature ones; what is the average production potential of a harda tree; how does the regeneration take place; etc. (because for some other species the regeneration may take place quite in a different way, like through root suckers or coppicing; and that dynamics is to be properly understood). If the number of seedlings is quite low as compared to the number of mature trees, then this becomes a concern as it indicates a poor rate of regeneration threatening the future sustainability. If the species is bamboo, one has to see, along with the number of fresh shoots, if the root stock is under sufficient and consolidated soil cover as exposure of the root stock inhibits the production of shoots. Flowering in bamboo has to be carefully considered as that leads to 'death' of the clump along with several other serious complications. Hence, the flowering cycle of local bamboo species needs to be recorded. In case of coppice species, if there are high stumps then these are to be cut just above the ground so as to facilitate good growth because high stumps do not coppice well. Some plants like anantamul/sugandhi (*Hemidesmus indicus*) may be growing quite in a scattered manner and in this case one can estimate the average number of such plants per square meter (or any other feasible size of plot). If the availability of a particular species is essentially seasonal, then we have to make a seasonal assessment so as to identify which season/period has the least availability so that the restriction can be imposed for that season/period.

Step-4: Assessment of harvest impacts

Now we will assess the differential impacts of harvest on different NTFP species, at least the prioritized species. In case the kendu/tendu (*Diospyros melanoxyton*) leaves, the bush cutting operations have a positive impact as they help enhance the qualitative production. In case of bamboo, mature culms if not harvested will lose strength and become vulnerable to forest fires,

so the harvesting is beneficial; but unsustainable harvesting of young culms and shoots hamper the regeneration and healthy growth of the clump. Unsustainable harvesting of bark made many species such as *Litsea glutinosa* and *Persea macrantha* critically endangered in many parts of the country. Similarly, *Rauvolfia serpentina* was severely affected because of overharvesting of roots. Some climbers suffocate the tree growth and hence their removal may be preferable while some may be quite useful and may not harm the growth of supporting trees which is why their removal during silvicultural operations is to be restricted. Hence, which harvesting practice leads to what kind of impact on the species itself as well as on the forest/neighbourhood (like, impact on other species/wildlife such a food scarcity for certain animals/birds and if human-animal conflicts have increased because of this, because overharvesting of plant parts that are important in the diet of wild animals may lead to such conflicts. Traditional harvesters have knowledge regarding the animals that depend on these plant parts and these need to be documented), and also on the local stakeholders (like, if the lac cultivation fails to do proper business due to transit restrictions of the Forest Department; or if the Panchayat is getting some revenue from the license fees on NTFP trading; or if a processing unit has been established or a self-help group/cooperative has emerged to do collective trading in particular NTFP; etc.) has to be determined.

In climate change context, identification, conservation and propagation of climate hardy species, that can withstand extreme weather phenomena, should be given special attention.

Step-5: Periodic monitoring and harvesting adjustments

Now, if the previous steps helped us identify that such and such adverse impacts are seen on a particular species, or existing the production/regeneration is not sufficient for future sustainability then we will have to consider necessary harvesting adjustments through imposition of relevant protocols or restrictions the basis of which shall be discussed under a following section. In case the restriction would not be sufficient enough to revive/sustain the species population, then artificial regeneration or plantation activity also has to be considered. All these should be supplemented with an effective monitoring mechanism that will help the forest managers understand to what extent or how the restrictions/protocols have been effective/useful, and in case not so effective/useful then a review is necessary so as to identify the reason of this failure and to revise the strategy accordingly. Monitoring may be quite differential according to species variability, i.e. for sal (*Shorea robusta*) leaf a quarterly monitoring may be useful as the collection continues almost round the year whereas for tendu leaf it may be once in a year (seasonal). Moreover, feasible forest development activities including nursery and plantation programmes would help for better sustenance of the resource.

Points to be remembered

In context of this plan, the concerned communities need to pay due attention to the following points:

- We need to decide from the beginning whether we will go for a study of all the species of NTFP available or only for those of conservation concern or socio-economic concern. If our human- and financial resources are limited, then we can focus on few prioritized species.
- The plan should be a feasible and practicable one given the limitations of the community in respect of time, money, and human resources.

- ↪ It should preferably in the local language, with simple descriptions that the community can understand. There can however be an executive summary in English.
- ↪ Although the plan is made for forest land, it can also focus on important species that are available outside forests too. Tamarind and Kusum trees may be found in non-forest lands and for those on private lands special consideration may be necessary.
- ↪ If the legal requirements suggest something additional to be considered, then that has also to be adequately placed in the plan.
- ↪ The plan should essentially be made in a participatory manner, using indigenous knowledge and experience of community resource persons who have developed expertise in forest collection. Necessary scientific approach also has to be adopted at the same time. This means that all relevant knowledge, be it scientific or indigenous, has to be used if that helps us to be precise, meaningful, and practicable.
- ↪ Although the five steps have been described one after another, in actual practice(at field) two or more steps may in fact be simultaneous. However, for writing the report the sequence is to be maintained as that would help in reaching a proper conclusion.
- ↪ The Forest Department may be requested for necessary technical guidance, such as scientific names of plants, etc..
- ↪ Although the estimates may be approximate, the report should present on an average a justified, factually reliable, and realistic plan.
- ↪ Photo-monitoring may be employed in some cases. Like, photograph of today showing number of *Rauvolfia serpentina* plants in a particular patch, and photograph of the same patch after, say, six months to see what change has taken place.

Besides technical information, the plan should contain some general information regarding the village and its forest, map thereof, objectives of introducing sustainable management practices, who (agency/organization/individual) would be responsible for implementing this plan, whether he/it has necessary competency/capacity for that and if not then what is to be done to increase/develop the capacity, what prioritized species the plan focuses on and why, and how the monitoring is to be effected.

Basis of NTFP harvesting protocols

NTFP harvesting protocols may be developed on the basis of two elements: 1) the natural properties/limitations of the product/species, and 2) the local situation including legal compliances. Moreover, the following things need to be considered while formulating these rules:

- ↪ This should ensure sustainability of the dependent livelihood(bonafide).
- ↪ Social justice like gender & equity principles should be complied with.
- ↪ It should not violate the law(ultimately the Constitution).
- ↪ It should have an integrated/holistic approach considering all important aspects of the dynamics.
- ↪ It should have a scope for necessary revision/modification/updation from time to time.
- ↪ It should ensure that ecological resilience is not tampered with and the forest health is not compromised

The harvesting protocols may be formulated according to the part of the plant to be harvested, in the following manner:

- ↪ If the whole plant is to be harvested (such as brahmi or kalmegh), then it can be allowed after the seeds are naturally dispersed. In case this is not feasible one or more plants may be left in every square meter (say) of the plot (Rath, 2008). If the plant is a major part of any wild animal's diet then care must be taken to leave aside a certain area/region unharvested for the animals. For instance, Phoenix palms are an important component in the diet of elephants and Gaur. Areas where the palms grow are also important habitats for flagship species like the tiger (personal observation, Keystone Foundation).
- ↪ In case of roots & tubers, a part of the tuber or the tap root, that could regenerate the plant, has to be left or properly covered under the soil. In case of plants like sugandhi where the roots are so thin that the whole root is to be harvested, one or more plants may be left in every square meter (say) of the plot (Rath, 2008).
- ↪ If leaves are to be collected, then leaf buds and other such tender leaves plucking which will significantly retard the growth of the plant are to be spared. Goats prefer such buds and tender leaves, and hence are regarded as quite harmful for forests which is why there is often a restriction on goat grazing in the forest (Rath, 2008).
- ↪ In flower collection, the buds and some flowers are to be spared here and there (different directions) in the plant so that there can be production of seed (Rath, 2008).
- ↪ In fruit collection (if the fruit is to be plucked from the tree itself) some fruits are to be left here & there for regeneration purpose (Rath, 2008).
- ↪ In case of bark collection, maximum one-fourth of the surface area that too in the vertical direction can be extracted because a circular extraction would detach the link between the roots and the leaves which would mean that the tree will die without food. The system of girdling is adopted therefore to kill trees first so as to cut it as a dead tree (Rath, 2008).

Deep cutting of the trunk is to be avoided. After the bark is extracted the exposed portion should be covered with banana leaf or hay as the exposure makes the plant vulnerable in many ways. For plants that extrude gums, the exposed part may be covered with fresh cow dung or mud (Rath, 2008; Keystone Foundation, 2009).

- ↪ For gum extraction one has to remember that extraction beyond the normal capacity of the plant not only reduces its vitality but may also affect the quality of the gum. Those who have seen the brutally criss-crossed genduli (*Sterculia urens*) trees almost in a dying condition can well understand this. For a sustainable gum collection the tree-health has to be maintained. Mainly during the winter season the collection has to start. According to silviculturist Santosh Kumas Das, one has to make an incision at a height more or less equivalent to his own on the tree trunk preferably on the side facing east and then on the opposite side but at a height about 2.5 feet higher or lower than the first one. The incision can be 1 to 1.5 inches deep. While the morning sun is supposed to activate the first one, the setting sun is supposed to recharge the second one (quoted in Rath, 2008). One can continue the collection every day till the quality and quantity of the natural extrusion remains more or less normal; but once there are signs of deterioration in quality (like, the gum may become thinner and the amount of flow getting smaller day by day) it has to be stopped. The tree would now require rest for some period that can be determined from the thumb rule that till the existing cuts are healed it should not be disturbed.



- ↪ Genduli or Gum Karaya is the most important forest gum, and as such one has to understand the dynamics thereof. The collection should be done only when the tree attains a minimum girth of 3 feet. The incision is to be made at least 3 feet above the ground, and the number of incisions depends on the girth; like, for a girth of 3-4 feet 2 incisions may be made, for 5 feet girth 3, for 6 feet girth 4 and for girth size still greater incisions at a gap of 18 inches can be made. The shape of the cuts can be semi-circular with the lower width about 6 inches and the depth within 2 inches. In the 2nd and 3rd years incisions may be made about 5 c.m. higher from the previous ones, but if the old ones are still in a stage of healing or recovery then they should no more be disturbed. It has also been seen that trees with reddish bark yield more gum than those which whitish bark(Kachabo Gums, undated).
- ↪ For other species the methods may be a little different, but the basic principles remain the same(like, the number of incisions according to the girth size).

Guggul (*Commiphora wightii*) doesn't attain the girth of 3 feet, but the extrusion is in high demand. In such case application of improved taping techniques such as the use of special instruments like the Mitchie Gollodge knife may help reduce the risk for the plant (Nair, undated). Ethephon is a chemical substance and plant growth regulator that stimulates gum extrusion and is used to enhance the production while maintaining the vitality of the plant as well as helping for quicker healing of the 'wound', but being an artificial substance that is injected into the stem we do not advise for its regular use. If a plant is in a very weak state because of unsustainable tapping then ethephon may be applied to revive its strength.

- ↪ In honey collection the part(chamber) of the comb that contains the eggs and/or larvae are not to be cut. Further, the queen is not to be harmed, and some honey should be left on the hive for use of the bees. This will help them rebuild the structure soon. Only mature hives, that are indicated by capping(with wax) of the cells, are to be harvested; but not all the hives in a cluster. If about 90% of the hive is capped, then it is ready to harvest (Morrison, 2010). The honey portion is indicated by the bulge which is to be cut. However, for people who dare a hanging collection from flexible ladders, these rules can't be imposed as it would not be practical for them.

For harvesting cane, tassar, lac, and mushroom etc. there are different protocols. It is however not necessary to wait for scientific protocols always because some local expertise, based on rich experiences, can also be very useful in identifying the ways of sustainable harvesting.

Eco-sensitive forest products

Some living organisms are so sensitive to the ecology that if the subtle ecological balance is disturbed then they may not survive even if external circumstances appear to be more or less intact. Lac insect is susceptible to wide fluctuations in temperature, and mushroom, lichens and moss are among the highly sensitive NTFPs. Lichens consume nutrients from the air, and air pollution may kill them. Fresh moss growing on the trees inside forests even during the summer suggests that the temperature is cool enough inside. Mushrooms indicate high level of moisture. In other words these NTFPs indicate the micro-ecological health of the forest or ecosystem, and hence if they cease to grow then it is to be understood that the forest health has been adversely affected. A careful review would therefore be necessary so as to see what went wrong if the forest appeared to be well-conserved externally.

However, one has to remember that only imposing norms or introducing harvesting protocols may not be enough to ensure sustainable production of NTFP because there are some other factors that may have impact on it. Wildlife plays a vital role in forest growth, and their extinction may inhibit such a healthy growth. Some insects facilitate pollination, as do other animals in seed dispersal. Many times seeds that are processed through the gut of animals or birds show better germination. Low regeneration of *Terminalia chebula* in the wild can be attributed to lack of ruminants in the area (unpublished data, Keystone Foundation). On the other hand, the lac crop may get damaged due to extreme weather phenomena or the tassar production may be affected due to certain diseases. Although climatic conditions may be out of our control, we can at least ensure a favourable ecological set up that would help the biodiversity survive and grow. Plantations of Eucalyptus or Acacia (exotic variety) may be harmful in such a set up, so also the use of chemical fertilizer & pesticides, powerful mobile- and/or electric(transmission) towers, mining operations particularly on hills, and polluting industries, etc.. For instance, electromagnetic radiations from mobile towers have been found to have affected honey bees. Bees may collect nectar from mustard flowers in the surrounding agricultural fields, and use of pesticides or other such toxic chemicals may affect both the bee and the honey. That is to say, we also need to consider environmental protection instead of physical protection of the forest only. Further, the ecology of important species are to be understood; like which plant is a shade bearer and which one is a strong light demander, which is a true mangrove species and which is just a mangrove associate. Some useful species such as the broom grass varieties thrive in open areas, so tree plantations in that area may affect their production (here however one has to see if the open forest species can be allowed at the cost of forest density because many such species including kendu bushes actually mark forest degradation and one may still opt for not restoring the forest density of a minimum of such area only if the open forest species appear to be quite important for local purposes). Forest tubers that are preferable can be domesticated and propagated which helps not only in conservation but also for a change in quality.

Control of forest fire must form a part of the management plan. Some people set fire to kendu leaf bushes so as to get good production, some others burn the undergrowth or litter under mahua trees during the harvest times. All such practices that lead to forest fires have to be checked, and there should also be a mechanism to immediately act in case a fire is reported.

Grazing control is another part of forest management. The extent of such control depends on the size and stage of the forest growth. Like, if the forest is large but still reviving then grazing may be confined to a particular patch on rotation basis. If the forest is a small and young/regenerating one, total restriction on grazing may be necessary.

Thinning and other such silvicultural operations may lead to destruction of medicinal plants or other useful NTFP species if care is not taken to preserve them. Too much clearing may even attract invasive weeds.

Last but not the least the management system would remain incomplete without ensuring the optimum utilization of the forest product. This is particularly important where the produce is not collected on an individual basis but on a collective basis, because if the outcome of so much care and effort remains unutilized for public benefit and instead goes waste then that would be discouraging. Hence, it needs to be seen if the products for domestic use are harvested at the right time, and if the product is for sale purpose then how the best income can be ensured. Wherever necessary and feasible, processing units and product conservation measures such as godowns may be incorporated in the plan. Such comprehensive & holistic approach can make the management really useful for future generations. In fact, this helps maintain and improve resilience of the resources against climate change.



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PHOTO-CLUES TO NTFP RESOURCE MANAGEMENT



A suffocating climber. For healthy growth of timber trees such climbers are normally cut down, but from biodiversity perspective their natural occurrence may still have relevance. (Inset) Siali (*Bauhinia vahlii*) is one such aggressive climber that is a preferred NTFP species because of its bark-fibre and leaves, and it can regenerate after the stem is cut at the base.



Non-destructive climbers such as this medicinal plant should not be harmed. Many valuable species such as Piper longum (pippali) use trees as their support, without causing any hindrance to the growth of the host plant. Timber-centric silviculture operations must be holistic enough so as to honour this symbiotic ecological relationship.

Poor regeneration in high stump sal. Coppicing, if practiced scientifically, can provide multiple benefits such as in case of sal trees whose fresh leaves become easily accessible from the young shoots. Old plants, if capable of coppicing, can be cut down for use as well as for rejuvenation. For best results, the stem is to be cut near ground level or the base, unlike that seen in this image. It has to be remembered however that the coppicing capacity may be low in some species, and in their cases the shoots need to be protected as well as the frequency of coppicing should be reduced.





A patch of broom grass *Badhun* (*Aristida setacea*) in a community-protected forest. This apparently open patch is not advisable for tree plantation as the profuse growth of this variety of broom grass, that has considerable socio-economic importance in western Odisha, is possible in this open area.

Scattered growth of sugandhi (*Hemidesmus indicus*). Sporadic occurrence of valuable species requires a special attention in management, and assessment surveys should ensure their adequate representative samples. If such plants are annual herbs, then a seasonal monitoring may be essential.



Mahua plants in agricultural fields. This suggests that a forest patch was cleared for agricultural expansion, but mahua trees were retained because of their importance. Such examples not only have significance as an indigenous agro-forestry practice, but also suggest that the resource management plan can include resources outside forests.

Inset: Mahua flower.

Plantation of pruned Arjuna (*Terminalia arjuna*) trees used to rear tassars. Human interventions such as pruning help increase the quality and quantity of production. Pruning or pollarding is opposite to coppicing in the sense that the tree branches or the upper parts of the stem are cut to produce new, tender branches providing food for the sustenance of some NTFP producer insects such as the lac insect.



Tassar cocoons spread uniformly on a raised platform. Standard post harvest management practices such as this help retain and/or enhance the quality of the produce for necessary storage, value addition, and marketing. This in turns helps get the best value of sustainable harvest.

Epiphytic orchids like this may have medicinal uses, and do not cause any harm to the host tree as they collect their nutrients from the aerial roots. While epiphytes need to be distinguished from the dangerous parasitic plants like *Cuscuta relexa* (nirmuli), such apparently or currently obscure species also need to be paid attention in management because they may actually be useful in one way or the other, even in future, if not now.





If sal leaf is made into platters and cups then the time consumed in it will reduce the pressure on forest than in case of raw trading as one has to divert time for this processing which fetches a better income. The pressure on forest will be further reduced with an enhanced income if the hand-made plates are then processed in machines to cut the edges to a circular shape followed by pressing to form more attractive and convenient plates & cups.

Kendu bushes produce quality leaves in good quantity after bush cutting. Fire in the old bushes can also produce this effect more or less, but on one hand that is destructive to the local environment and on the other hand doesn't generate the employment in bush cutting.



The 'Flame of the forest' flower (palas) can be a natural source of dye. Economic potential of many such ignored resources, if properly harnessed, can reduce pressure on regularly used resources thereby helping in sustainability.

Inset: Herbal gulal made from dry palas flower(juice mixed with arrowroot powder followed by shade drying).

Forest tubers domesticated in a tribal village of Odisha. Tubers are hardy crops. Crops that can tolerate extreme weather conditions are to be identified. For instance, khair (*Acacia catechu*) is drought hardy, bani (*Avicennia alba*) is frost-tolerant, and sal is fire hardy.



Forest tuber



Acacia catechu



Avicennia alba



An uprooted bamboo clump. Poor soil cover made it vulnerable to uprooting under a storm. A part of bamboo silviculture therefore consists of mounding the rhizomes with soil followed by the consolidation of the latter. This should be followed with a proper control on harvesting tender bamboo shoots as well as young culms, and also ensuring timely cutting of mature culms.

Flowering in bamboo may be sporadic or gregarious. Bamboo seeds help in regeneration and hence sporadic flowering need not be interfered with. However, in case of gregarious flowering huge accumulation of seeds on the forest floor causes a dangerous population growth of the rodents which may lead to a havoc. Hence, precautionary measures are necessary before such gregarious flowering occurs.





One must be careful to the luring proposals of planting material suppliers to take up this or that cultivation to fetch a high income. This photo shows the so-called black turmeric plantation that turned out to be a commercial failure as the promoters of this plantation cheated the innocent farmers. Safed musli, aswagandha, and many other species have been used by these planting material suppliers in their own vested interest.

Bark harvesting, even as fibrous materials may be quite destructive if not controlled properly. On the other hand, binding hill broom with siali fibre in the traditional way (inset) is not only eco-friendly, but has other advantages unlike the use of plastic materials for this purpose. So, instead of a blind ban on forest fibre collection, those capable of sustainable growth can be allowed.



One of the ways to control forest fire is proper maintenance of fire lines. During the dry season particularly, clearing the biomass vulnerable to fire, such as dried and fallen leaves, as done in a village of Deogarh district(Odisha) can help reduce the risk of widespread fire. This biomass can then be used as a fuel or for making compost.

Plantation of semialata (*Flemingia semialata*) in waste lands can help make lac cultivation women-friendly. It may be recalled that women share a delicate and intricate relationship with forests, and most of the NTFPs are collected by them. Some tough NTFP jobs are usually man-handled, but even these can be made women friendly in some way.

Inset: lac encrustation on the tree



Drawing by: Manas Kumar Biswal, RCDC based on Anonymous (undated)

Improved cutting tools such as the Michie-Golledge knife (for careful debarking and taping) help in sustainable harvesting.

Inset: Tools used in case of lac.

The cane plant may be rare in many areas and the harvesting is to be controlled. Such plants prefer sunlight, so they should be free from deep shadow in forests. Restricting the harvesting to about 20% of the total number of culms available in a clump, and preference to mature culms for cutting on priority basis would be useful for their sustainable management.





A type of lichen photographed by Keystone Foundation. (Inset) Forest mushroom. Presence of such types of eco-sensitive plants and animals suggests a good health of forest as they can't flourish without proper microclimatic conditions.

Soil and water conservation helps revive and sustain forest growth. This drainage channel needs treatment so as to stop soil erosion.

Inset: An erosion control measure by local community.



Non-standardized measurements such as this container may cause exploitation of the primary collectors; so proper weight and measurement is to be ensured in their interest.



The Mahila Kishan Sashaktikaran Pariyojna (MKSP) scheme under the National Rural Livelihood Mission(NRLM), Ministry of Rural Development, Government of India is one of the outstanding examples of a comprehensive outlook and strategy for the development of the target beneficiaries both in the agriculture and NTFP sectors, developed through a series of stakeholder consultations. United Nations Development Programme(UNDP) has rendered valuable support for the successful implementation of this scheme/mission, and Regional Centre for Development Cooperation, a premier non-government resource organization on natural resource governance has been instrumental in effecting this facilitation. This concise manual for guiding community-based NTFP management, developed in technical partnership with Keystone Foundation, Kotagiri has been published as an important output of UNDP's microgrant support for capacity building of some potential applicants under MKSP.



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