SUSTAINABLE HARVEST OF MEDICINAL PLANTS : AN INITIATIVE IN SOUTHERN INDIA

WINFRED D. THOMAS*, N.M. GANESH BABU, UTKARSH GHATE AND K. RAVIKUMAR

Foundation for Revitalisation of Local Health Traditions (FRLHT), Bangalore (Karnataka).

Introduction

Besides software and biotechnology, Indian development in 21st century would also be spearheaded by herbal medicinal sector currently valued at about Rs. 4,000 crores (Chakraborty and Varshneya, 2001) generating 4 million person days employment and speculated to grow manifold as per the Planning Commission estimates (Anon., 2000). This value is generated from over 800 species of medicinal plants traded as raw drugs annually across the country, valuing just Rs. 120 crores at source (Shankar, 2002). More than 80% of these traded medicinal plants are collected from forest lands as raw drugs often destructively (involving bark, root, etc.), without any regulation (Ved *et al.*, 1998). Though about 300 medicinal plants are traded in each state, only about 30 of these are mentioned in approved species of Non Timber Forest Produce (NTFP) as revealed by a recent study sponsored by Oxfam (Anon., 2003). Proper recording and regulation of this trade is the most pressing challenge for forestry sector, village level gatherers and industry to ensure long term resource availability.

Already 93 medicinal plants i.e. about 30% of 300 traded species collected from the wild in Southern Indian states of Karnataka, Kerala and Tamil Nadu have been threatened with high or low extinction risk according to red listing criteria formulated by the Internation Union for Conservation of Nature (IUCN) as concluded by Conservation Assessment and Management Plan (CAMP) workshops organised by FRLHT and Conservation Breeding Specialist Group (CBSG)-India anchored at Zoo Outreach Organisation, Coimbatore (Ravikumar and Ved, 2000). Four CAMP workshops conducted at Bangalore during 1995 to 1999 involved nearby 100 field botanists, including forest officials, trade experts and local healers and synthesised their perceptions of population reduction and/or fragmentation about each taxon. Trade affects nearly 70% of the threatened species, in addition to pressure of habitat loss (encroachment) and degradation of quality (fires, grazing, etc.) that affect all taxa.

As most of the threatened species are trees, production requires decades of waiting, which makes their cultivation impossible on farmlands. Eco-restoration of degraded forestland through contract farming by industries, with farm labour from neighbouring villages is the only option for medicinal tree crops. Further, agro-technology of threatened species is

*Department of Botany, The American College, Madurai (Tamil Nadu).

limited and commercial cultivation of even herbs will not increase, unless incentives such as buy-back guarantee, venture capital funds, tax sops, etc. are provided. This explains the need for sustainable harvest of the medicinal plants from the wild and substitution of threatened species by options suggested in the pharmacopoeias. Such recorded practices of sustainable harvests from the wild will also be required for the growth of exports, where markets are incresingly demanding "good sourcing practices" or "eco-friendly wild-crafting" and "forest stewardship" certificates (Laird, 1999).

Over-harvest results from "distress sale" by collectors who earn low remuneration, compared to the 10 times industrial raw drug procurement prices *i.e.* "mark up", as middlemen corner the intermediate profit (Handa, 1992). Tenurial insecurity also triggers careless harvesting, as forest plant gatherers lack legal or user's rights in the goernment owned forest lands (Bawa *et al.*, 1999). Sustainable harvests would thus require higher equitable benefit sharing with gatherers, and long-term security of harvesting rights. To operationalise these suggestions, Foundation for Revitalisation of Local Health Traditions (FRLHT) promoted a co-operative venture named Gram Mooligai (Village Herbs) Company Ltd. (GMCL) with the support of Danish International Development Agency (DANIDA) and Ford Foundation. GMCL focussed on trade in medicinal plants gathered from non-forest public lands, as it was substantial and easily accessible. GMCL enrolled medicinal plant collecting villager groups viz. Sanghas as shareholders, to provide them assured returns in an equitable fashion.

FRLHT also commissioned a study to local college researchers from known earlier studies (Chakraborty and Varshneya, 2001; Thomas *et al.*, 1998). This study focussed on the top 6 species in Madurai Medicinal Plants Trade Zone (MMTZ) comprising Madurai, Virudunagar, Nattam and Tuticorin markets (Table 1) viz. *Mollugo cerviana* Ser., *Evolvulus alsinoides* L., *Boerhavia diffusa* L., *Tribulus terrestris* L., *Trianthema portulacastrum* L. and *Cassia auriculata* L. The first five of these species are herbs while last one is a shrub. Traders in MMTZ have been procuring these species over a decade from village collectors, primarily women. Convenant Centre for Development (CCD), a Madurai-based NGO, facilitates women savings and micro-credit Self-Help Groups (SHGs). GMCL federated SHGs for medicinal plant procurement, as shareholders.

The study conducted during 2000-01 on the GMCL's collection catchment area comprising 28 villages spread over about 240 km^2 from Narikudi block, Virudhunagar District (located at 10-11°N, 78-79°E) in the Ramnad plains, Tamil Nadu State in southern India. The climate is semi-arid with average annual rainfall of about 500-700 mm during monsoon (Aug.Nov.) and temperature ranging from 8° to 40° C. Rain-fed agriculture is the main occupation in this ill-connected and under-developed region, which has no industries or infrastructure. Yet, charcoal and medicinal plants collected from this region are exported to countries like Japan providing supplementary employment to the rural poor. The Thevar and Scheduled Community (@40% of population each) mainly inhabit the area, who are agriculturists or labourers.

Table 1

Species-wise and collector village-wise recorded harvest 2000-01

Botanical and Vernacular names, Habitat	Parts collected	Season months	Collector villages	Quantity (tonnes p.a.)
Mollugo cerviana "Pappada pullu" Weed in ground nut fields	Whole plant	*Maasi Chithirai* (Jan.-Mar.): 3	Kumilangulam Utchanenthal Avarankulam Alagapuri	10 20 5 4
Evolvulus alsinoides "Vishnu kiranti" Dried ponds	Whole plant	*Purattasi-Markazhi* (Aug.-Nov.):3	Kumilangulam Alagapuri Utchanenthal	30 1 10
Boerhavia diffusa, "Vatta saaranathi" Fallow fields	Whole plant	*Aani-Karthigai* (May-Oct.): 6	Alagapuri Parapathi Utchanenthal	2 2 11
Tribulus terrestris "Nerunjil" Roadside, wasteland	Fruits/ Whole Plant	*Purattaasi-Thai* (Aug.-Dec.) : 5	Utchanenthal Parapathi	10 1
Cassia auriculata "Aavarai" Roadside, wasteland	Flowers	*Karthigai Chithirai* (Oct.-Mar.): 6	Avarankulam Utchanenthal	1 5
Trianthema portulacastrum "Saaranathi" Around habitations	Roots	*Aadi-Aavani* (Jun.-Jul.)	Utchanenthal	1

Valayar community traditionally specialised in hunting, constitutes the minority (~5%) who are principally the ones engaged in medicinal plants gathering. Agricultural labourers, primarily women, collect medicinal plants during unfavourable agricultural season (Feb. - May) and sell it to local traders for daily wages.

Methodology

The medicinal plants sustainable harvest study had the following objectives:

(a) *Estimate present levels of harvest* – to plan future sustainable harvest
(b) *Identify instances and causes of unsustainable harvest* – to minimise such instances
(c) *Suggest measures to promote sustainability* – for continued implementation.

Ample literature exists on

methodology, primarily biometric, to assess and monitor NTFP both in the region (Uma Shankar *et al.*, 1996) and world wide (Peters, 1996) primarily from perennial plants, which ignores wild harvesting annual herbs from non-forest areas. Thus, this exploratory study employed not only ecological (transects and monitoring plots) but also participatory (participant observations, individual and group discussion) methods to also evolve a monitoring system anchored in the collectors. In this participatory approach, data gathering tools were adopted while the ecological techniques included. Species-wise collection spots and the trade routes were mapped during collection tours and 123 women gatherers from 28 villages were interviewed including semi-structured questionnaires.

Using ecological techniques, the availability of each species was estimated along 96 transects each measuring 500 m long and 10 m wide (0.5 ha.) across 6 vegetation types (wasteland - 30, cultivable fields - 20, fallow fields - 10, field-bunds - 10, roadside - 20, dried ponds - 6). Number of shrubs and herbs were recorded in 20 quadrats measuring 5 x 5 m, at every 25 m respectively (total 500 m^2 per transect) and 1 x 1 m (total 20 m^2 per transect). Each quadrat was placed at every 20 m of each transect, totalling 0.5 ha for shrubs and 0.2 ha for herbs in the entire block. These exploratory transects were marked using coloured pegs and planned to re-census them in the next year. To experimentally estimate prospects of sustainable harvests in relation to species biology, 15 monitoring plots measuring 5 x 5 m each were marked in 3 centrifugal zones of 1 km^2 each, in 3 villages with highest gatherer population. The experimental zones identified by peculiar peg colour were (a) green - ongoing collection methods (b) yellow - suggested sustainable technique zone (c) red - control (no harvest) zone. Village meetings were conducted to explain the gatherers the need of ecological study and probable sustainable harvesting techniques (e.g. leaving intact 10% of the plants from sustainable harvest plots, not cutting branches for flowers or uprooting the plant for fruits or collecting immature products or before seed set, *etc.*).

Results

The plot monitoring could not continue as pegs had vanished even after a week as the collection spots were over 3 km away from the villages, making other gatherers' intervention easier. Hence, this note relies on participant observations of collection process, transects and monitoring plots, besides collectors' perceptions while full analysis awaits additional data.

The collection spots mostly consist of fallow fields and croplands. Women, the primary medicinal plant collectors, travel about 2-10 km per day for collection and 10-100 km for selling their produce after a few days. There is no marked territory of collection sites for individual village though each group in a village selects a collection spot and visits regularly the same spot throughout the collection period and refuse to share it with other groups except by chance/ignorance. majority (90%) of the gatherers interviewed (123) resided in 6 villages (Aavaarangulam - 33, Alagapuri - 9, Ananikulam - 8, Kamilangulam - 32, Parapathy - 24, Utchinenthal - 14). Table 1 depicts the current collection quantities of these species in each of these

villages. *Mollugo cerviana* and *Evolvulus alsinoides* constitute the highest share, about 40 tonnes p.a. each.

The impressive turnover of medicinal herbs is not entirely from local resources as traditional gatherers sometimes go even to far off (>100 km) places in Nagarkoil district on collection camps. Correct estimation of local plant production availability based on transects is difficult as (a) gatherer groups initially did not keep proper record as it was found cumbersome and unrewarding, (b) species availability vary considerably across months and years, (c) gatherers supply the produce not just to GMCL but also to other traders dependign upon the available orders and better quick remuneration. Thus, it is difficult to correlate human hours spent and distance traversed for collection with areas and quantities and number of plants to dry weight ratio.

Important collection spots of each species are recorded in Table 2. The top 6 collection spots with number of gatherers visiting are: Senkulam - 32, Alagapuri - 30, Nankoor - 22, Ulathymadai - 21, Ulakudi - 16, Vayalchari - 14. These 6 spots contribute much of the total harvest of about 400 tonnes p.a. of all medicinal plants from the block of which GMCL traded less than 25%. Extraction at higher levels was recorded the same collection spots before 3 years, but lowered due to increasing unavailability of species of late, as depicted in Table 2. The 6 species have together lost 65% of their habitat area in 14 villages, but the loss of total potential production from the entire area is only 25%. Most of the species are still abundantly collected from new areas (18 spots). Thus, harvested species are not yet threatened with local extinction, except *Trianthema portulacastrum*, as per the IUCN red listing criteria (Ravikumar and Ved, 2000). Though extinction threat is not imminent, reduced population at erstwhile collection spots has compelled gatherers to travel long distances.

Increasing non-availabilty of the target species results from several factors, including (a) rainfall variation, (b) habitat loss due to encroachment for resettlement or agriculture, (c) habitat degradation due to grazing or weeds or other harvests, (d) improper harvest of focal species. Cattle grazing and collection of *Aristida setacea* L., (Broomstick grass) by womenfolk and growth of weeds such as *Parthenium hysterophrous* L., etc. hamper associated medicinal plants such as *Evolvulus alsinoides*. Destructive collection methods also threaten some focal species e.g. *Cassia auriculata* traditionally collected for its flowers by hand plucking, is now being increasingly collected by axing flowering branches. The prickly fruits of *Tribulus terrestris* were traditionally hand picked, after covering hands with protective clothes. The recent entrants in collection business are uprooting the whole plant for quick returns. Traditional conservation practices such as leaving some patches un-harvested as in Utchanenthal village are eroding gradually.

Increasing improper harvesting in recent times is promoted by :

(a) competition amongst gatherer groups who have overlapping and flexible territories, promoting maximum instant harvest than sparing any stock for others;
(b) erratic fluctuations in the market demand or prices and consequent

Table 2

Present collection spots and those with reported declining availability

Sl. No.	Species #	Current Collection Spots	Spots with loss* of % habitat area and yield (t/yr)	
1.	*Mollugo cerviana* 39, 7, 16%	Alagapuri, Avarankulam, Irujirai, S. Nangur	Kurandi Manakulam Anaikulam Sengulam*	(100%, 2), (60%, 1), (80%, 2), (100%), 2)
2.	*Evolvulus alsinoides* 41, 15, 28%	Almost all villages	Panaikudi* Sengulam*	(100%, 5), (10%, 10)
3.	*Boerhavia diffusa* 15, 8, 30%)	Ezhuvani, Irunjirai, Kallangulam, Manakulam, Periyaalangulam, Sengulam, Siruvanoor, Uzhathimadai	Alangulam Kumilangulam* Maraikulam Parapathi	(30%, 1), (100%, 4), (20%, 1), (50%, 2)
4.	*Tribulus terrestris* 11, 3 (20%)	Almost all villages	Kallangulam Mukulam Panaikudi Sengulam	(50%, 0.5), (50%, 0.5), (20%, 0.2), (70%, 2)
5.	*Cassia auriculata* 6, 1 (16%)	Mudukangulam, Mukulam, Nalur, Sengulam	Alagapuri Avarankulam Idayapatti	(50%, 0.3), (50%, 0.5), (70%, 0.3)
6.	*Trianthema Portulacastrum* 1, 3 (75%)	Kallangulam, Palayam	Kumilangulam* Sengamadai*	(100%, 2), (100%, 1)
	Total (114, 34, 20%)	18 (28 - altogether)	14	(65%, 34)

botanical name, current harvest t/yr, loss t/yr, % loss
* loss of habitat area or production imply no local extinction, but non-viable collection.

insecurity triggering quick gains when demand exists i.e. "distress sale";

(c) market demand during unfavourable life history stage such as before fruiting;

(d) misplaced hopes of natural replenishment of species population, and

(e) collector's ability to move to new resource, if one is exhausted.

GMCL is gradually trying to promote sustainable harvesting by assuring the gatherers seured returns from proper and quality harvests. GMCL has helped collectors by providing storage units, thereby avoiding wastage. Distribution

of annual dividends by GMCL has surprised gatherers and also assured them of bonus from good business. Brief discussion of these results in the GMCL annual general meeting during 2002 has motivated Women Gatherer Groups from 3 remote villages (Kuraiyur, Marthangudi and Utchanenthal), with long term stake in medicinal plants gathering, to volunteer for further monitoring of sustainable harvests. Subsequent monitoring through youth volunteers has begun in 6 remote villages to record visual impressions/data. GMCL and CCD staff are monitoring and collating the data during monthly meetings on :

(a) Species and part(s)
(b) Collection place(s) dates
(c) No. of persons, time (day/hr) and area (ha/distance) covered
(d) Seasonal stage (after/before flowering/ fruiting)
(e) Quantity harvested kg/ headloads (fully/partly)
(f) Leftover population % patch names (not wastage)
(g) Other threats (rainfall vagaries, grazing, other harvests, encroachment, other collectors, etc.

FRLHT is guiding the effort and sponsoring external intervention of monitoring and recording through fellowships to village youth. Gatherers have not sought any compensation for the 5-10% of plants left un-harvested as they are happy to earn higher price for the good quality produce harvested using right time and technique. Gatherers are also motivated to teach these wise practices (Box 1) to their children and other gatherers from other villages, eventually resulting in a training course and methodology manual which could earn the gatherers "recognition and reward". Best gathering practices ranked on parameters in Box 1, will also be awarded and publicised in local cultural gatherings.

Discussion

Only a "soft", qualitative and participatory, step-wise and not quantitative, rigid approach to sustainability is feasible. For, sustainability cannot be ensured by any consttant magic quantity or formulae (say<70% of the yield); due to enormous variability in productivity, cause by varying rainfall, habitats, species natural dispersion etc. across places and times. It is wiser to practise sustainability as adaptive management, which is responsive to feedback of monitoring. Traditional resource management practices that were largely sustainable, also used bundle of thumb rules evolved on an adaptive, 'trial and error' basis (Gadgil and Berkes, 1991). The present study is an attempt to institutionalise such an adaptive management that would enhance or reduce subsequent harvest levels and methods based on observed impacts (on regeneration and stock), earlier harvests along with pre-harvest yield predictions using bioclimatic indicators. Evolving management is also necessary in view of changing demands in terms of requirement of whole plants instead of fruits (e.g. *Tribulus terrestris*); which cannot be answered through knowledge on permissible fruit harvest level. Whole plant (Rs. 6/kg) yield lower price than the fruits (Rs. 15/kg). Quantitative inputs such as mathematical modelling of costs and reproductive success can help in guiding gatherers as to what proportion can be entirely harvested and what proportion can be harvested only for fruit. Further,

Box 1

Suggested "thumb rules/wise practices" for Sustainable Harvests

Operational tips given below can be used by gatherers or Forest Department Officials or certification agencies or monitoring NGOs to rank between 0 to 10 the different gatherers/collection batches as being "eco-friendly" or not. Best collection practives need to be encouraged through higher price and/or awards and the rest be discouraged/ regulated. Each practice is indicated as T (Traditional) or M (Modern) or both. Traditional practices are easy to encourage, as people known them. These guidelines are based on the premise that:

(a) Quality of produce more important than quantity, as it is priced more (M)

(b) It is wiser to apply these logical "precautionary practices", than await evidence.

General Harvesting Thumb Rules to Choose "Right":

(1) *Area* - as per traditional texts/ knowledge/ practice, which represents typical habitat of the species, where best quality produce is available (T), spare some area unharvested (T, M), shift area of collection in alternate years/ leave some area unharvested after 3-4 years (M).

(2) *Time* - when the product is mature, yields best quality & high price (T).

(3) *Method* - (a) pluck/pull from plant/pick from ground (T), than cutting branches; (b) spare every 4-5th plant from harvest (i.e. 20-25% of population) for regeneration, wildlife (M); (c) minimise damage to associated plants/ animals/ habitat features (termite mounds etc.) (M).

(4) *Post-harvest techniques* - (a) transport in gunny bags to avoid wastage (M), (b) sun-dry roots, bark etc. to avoid fungal attack, but shade dry leaves, flowers to retain colour and fetch good price (M), (c) provide non-traded parts to folk healers and/or other users (M), (d) remove adulterants, sort grade & label the produce as "quality" (T), (e) Document properly collection area, time, method, post harvesting parameters (T), (f) Lable each harvest pack as "eco-friendly" with above collection details, to fetch good price (M).

(5) *Understanding/agreements* with neighbouring area gatherers/buyers for co-operation (M).

Contd...

Part-wise Collection Tips

(i) *Stem* - (a) Collect only herbs/climbers thicker than thumb/traditional standard (T), (b) cut only 1 stem from multi-stemmed climbers leave the rest intact (T).

(ii) *Bark* - Strip bark vertically along 2 opposite sides to minimise damages (T+M).

(iii) *Gum/Resin* - Make 3-6 cm incisions, 6-10 cm apart to minimise damage (M).

(iv) *Leaf* - (a) gather fallen leaves and do not axe, as feasible (b) avoid infested leaves (M).

(v) *Flower* - leave few flowers un-harvested on the plant (T+M).

(vi) *Fruit* - (a) do not cut branches (b) leave few fruits un-harvested on the plant (T), (b) throw seeds during transport (M).

(vii) *Root* - (a) Uproot herbs after seeding as far as possible, uproot them fully so that underground portion is not wasted and other plant need not be uprooted for equivalent quantity (M), (b) for tuberous plants, leave few bulbs underground for sprouting (T), (c) uproot herbs after seeding is over so that the seeds fallen on ground can regenerate the next year (T+M) and (d) remove few roots on opposite sides in case of trees (M).

whole plant harvest is not necessarily destructive, as it may enhance subsequent yields under low harvest intensities (<50%) in medicinal weeds such as *Sida cordifolia* L. (Murali, 1997). Lastly, if the whole plant is harvested after seeding so that seeds fallen on ground can ensure regeneration next year.

Simple suggestion of providing higher price to collector for less, sustainable harvest is difficult to implement in a multi-actor market, where most collectors, traders and consumers have scant regards for sustainable resource use. Competition forces every collector and trader to ignore sustainability; and meet not only local but even global demands. Thus, ensuring sustainability would require that all the harvests and gradually self-regulated by the gatherers using thumb rules as above. Self-regulation by suppliers would force other traders to procure only sustainable harvested material. This may also become possible partially from demand side requirements of eco-certification, especially in export markets (Laird, 1999). The domestic market is also increasingly becoming quality sensitive, with the emergence of Good Manufacturing Practice (GMP) regime that has forced industry to seek high quality raw drugs. GMCL trade comprises over 10% of total volume in MMTZ but within 3 years of existence, GMCL has begun trading with 20% of MMTZ traders. At this rate, GMCL could soon begin influencing quality and prices.

Besides such voluntary efforts and market incentives, ensuring sustainability would also require legal and policy support so that actor like GMCL that do not trade in the contraband are not disadvantaged

against reckless competitors. Government of India has simply banned the export of 29 endangered medicinal plants species vide PN 47, except if from cultivated source (Anon., 2000) in line with Convention on International Trade in Endangered Species (CITES). But the ban is both scientifically flawed (Ved *et al.*, 1998) and is practically ineffective (Chakraborty and Varshneya, 2001) as some of the banned species are exported under the guise of even packing material and there exist no illustrated identification keys or training courses to customs authorities to identify species based on traded parts and regulate banned species. Further, export of 114 plant species derived from the wild sources was later banned unless accompanied by a Legal Procurement Certificate (LPC) from the concerned forest official (Sharma, 2000). However, this non-statutory order without any LPC specification cannot be implemented unless notified through amendments to rules under respective State Forest Act rules for harvest regulation. Effective implementation of such harvest regulation would also require preparation of training material to identify raw drugs (root, bark, flowers, fruits etc.) derived from threatened species and to check if thumb rules of sustainable harvests are followed.

Cultivation of several of the banned species, majority of them being from Himalayas, is difficult due to :

(a) lack of technology or
(b) investment or
(c) lower cost-benefit ratio of farming than investment-free wild harvests or
(d) lack of farmer-trader-industry tie up etc.

Efforts have fortunately begun to reverse this trend, and Indian Biological Act, 2002 has "rehabilitation" provisions that can be used, besides to regulation of threatened species. Medicinal Plants Board is encouraging cultivation in general, which can also sponsor restoration of degraded forestlands with threatened medicinal plants species. GMCL has already launched cultivation drive in the area, which is picking up well, with organic practices and gradually growing ethnic branding in mind. Enhancing such rural employment in the handicrafts sector through forestry programmes, is key to sustainable national development by ensuring :

(a) sustainable use of biodiversity,
(b) equitable benefit sharing to generate rural livelihoods,
(c) minimise rural migration to urban areas.

These efforts form a part of the medicinal plants programme in Peninsular India, which have been recognised as the one of the first and best 27 "Equator" awards for projects world-wide distributed at World Summit on Sustainable Development (WSSD). We hope that this attempt would motivate several forest officials to conduct such an assessment in their jurisdiction, as a first step towards regulation, as initiated by the progressive Chhattisgarh Forest Department (Kinhal *et al.*, 2003). Ashoka Trust for Research in Ecology and Environment (ATREE), a Bangalore based NGO had launched an analysis of NTFP potential in the Western Ghats, under the Millennium Ecosystem Assessment programme while Oxfam GB sponsored CCD coordinated NGO network in Peninsular India an exploratory study of medicinal plant availability and "fair trade" potential (Anon., 2003).

Conclusions

Forestry sector can enhance contribution to national development by promoting recording and sustainable harvest of traded medicinal plants, generating 40 million person days of rural employment and herbal industry worth Rs. 40,000 million. Gram Mooligai (i.e. Village Herbs) Company Limited (GMCL), a co-operative enterprise provided higher income to gatherers to promote sustainable harvesting from the non-forest wild lands around Madurai District in Tamil Nadu State in Southern India. PRA revealed that traded species have become scarce by 25% of earlier availability, but is difficult to attributed to overharvests, due to significant impact of other driving forces:

(a) natural population dynamism,
(b) rainfall variation,
(c) habitat encroachments,
(d) grazing,
(e) other species harvests.

Rather than any magic, rigid quantitative threshold, sustainable harvesting can be initiated as adaptive management based on :

(1) monitoring of past harvests and other factors affecting the yield,

(2) a bundle of harvesting "thumb rules" or "wise practices" or do's and don'ts" tips; so as to choose the "right"
   (i) area
   (ii) time
   (iii) method
   (iv) post-harvest
   (v) user agreement.

Such wise practices are being increasingly preferred by the high quality-high prices regime of eco-certification regime and Good Manufacturing Practices (GMP). Forest Departments can fruitfully initiate such assessments at least in existing NTFP circles.

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SUMMARY

Urbanisation and scientific rediscovery is increasing the demand for herbal products, whose overharvest threatens 30% of the traded species. Sustainable harvest traditions are eroding due to (a) poor prices paid to the raw drug gatherers, (b) competition between, (c) market insecurity, (d) many youth gatherers and (e) vehicular mobility to new collection areas. To revive traditions through equitable benefit sharing, Gram Mooligai (i.e. Village Herbs) Company Limited (GMCL) was established, with gatherer's groups as shareholders in Tamil Nadu state in Southern India. Sustainable Biometric experiments could not continue or help in predicting yield but participant observations and "memory harvesting" revealed that focal species have become rare amongst 25% of their earlier collection areas. Major pressures other than harvest include (a) scarce or untimely rainfall, (b) habitat encroachments and

(c) grazing. To earn more better price and sustained business demand, GMCL gatherers maximised not quantity but quality through thumb rules ("do's and don'ts") of sustainable harvesting practices: (a) appropriate habitat area (b) maturity timing (c) less damaging methods (d) proper post-harvest treatment (e) user (buyer, co-harvester) agreements.

औषध पादपों की दीर्घकालिक फसलकटाई : दक्षिण भारत में किया गया एक अध्ययन

विनफ्रेड डी० थामस, एन०एम० गणेश बाबू, उत्कर्ष घाटे व के० रविकुमार

सारांश

नगरीकरण और वैज्ञानिक पुर्नाविष्कार जड़ी-बूटियों से बनी वस्तुओं की मांग बढ़ा रहे हैं जिनकी अति फसल-कटाई व्यापार में व्यवहृत 30% पादप जातियों के लिए खतरा बन रही है । दीर्घकाल तक चल सकने वाली परम्पराएं (अ) कच्ची औषधियां इकट्ठा करने वालों को दी जाने वाली कम कीमतों (आ) आपसी स्पर्धा, (इ) बाजार की अनिश्चितता (ई) अधिक युवा संग्रहकर्ता होने और (उ) नए संग्रह क्षेत्रों तक वाहनों के आ जा सकने की सुविधा के कारण समाप्त होती जा रही हैं । साम्यतापरक लाभ विभाजन द्वारा परम्पराएं पुनजीवित करने के लिए ग्राममूलिगई कम्पनी लि० स्थापित की गई जिसमें दक्षिण भारत के तमिलनाडु राज्य में संग्रहकर्ताओं को हिस्सेदार बनाया गया । जैवमात्रिक संपरीक्षण प्राप्ति को पहले से नहीं बता सके या उसमें सहायक नहीं रहे परन्तु भागीदारों के प्रेक्षणों और 'स्मृति दोहन' से पता लगा कि अपेक्षित औषधियां पहले के संग्रह क्षेत्रों के 25% भाग में दुर्लभ बन चुकी हैं । कटाई के अलावा उनपर पड़ने वाले मुख्य दबाव (अ) कम मात्रा में या असमय होती वर्षा (आ) प्राकृतावास छिनना, और (इ) चराई रहे हैं । औषधियों की अधिक कीमत प्राप्त करने और निरन्तर मांग बनाए रखने के लिए ग्राम मुलिगई कम्पनी लि० के संग्रहकर्ताओं ने उनकी मात्रा को अधिकतम नहीं बनाया बल्कि कुछ मोटे-मोटे नियम बनाकर (ऐसा करो और ऐसा मत करो) निरन्तर चल सकने वाली कटाई से गुणवत्ता को अधिकतम बनाया जैसे (अ) समुपयुक्त प्राकृतावास क्षेत्र लेना, (आ) प्रौढ़ता समय का ध्यान रखना (इ) कटाई की कम हानि पहुंचाती रीतियां अपनाना (ई) कटाई के बाद समुचित उपचार करना, (उ) उपयोगकर्ताओं (खरीदार, सहकटाईकर्ता) के साथ करार करना ।

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