

CONSERVATION AND SUSTAINABLE MANAGEMENT OF MEDICINAL PLANTS IN INDIA

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THE SETTING

This paper describes efforts related to conservation and sustainable management of medicinal plants in India with specific reference to Karnataka. The conservation models developed and implemented by the FRLHT are discussed with a greater emphasis to sustainable harvesting methodology, designed and developed in two study sites in Karnataka.

ROLE OF FORESTRY SECTOR

Forestry sector plays a vital role in the conservation of medicinal plants, as it is estimated to harbor 90% of the medicinal plants. The overview of the medicinal plants sector in terms of resource conservation, management and augmentation is described below.

- Medicinal plants constitute life-supporting system for rural and tribal communities and over 8,000 species of plants have been estimated to be used in indigenous health system.
- These are traditionally and critically associated with livelihoods of the dependent communities; economic, ecological and social potentials have increased several folds in recent years.

- In India, around 860 species of medicinal plants are traded, 70% of them being collected from wild. The current annual domestic turn over of herbal industry in India is estimated at Rs. 6,000 crores and the export at Rs. 1,000 crores.

FRLHT CONTRIBUTION

Given the fact that FRLHT contribution towards conservation and sustainable management is immense; the prominent models developed and executed are being listed:

- Medicinal Plant Conservation Area (MPCA): model for establishment of *in situ* conservation and gene bank for medicinal plants.
- Medicinal Plants Development Area (MPDA): model to demonstrate eco-restoration of degraded forests by replanting of native species.
- Sustainable harvesting and adaptive management: model to design and develop the sustainable harvesting practices and preparation of adaptive management plants for general acceptance and wider application.

MEDICINAL PLANT CONSERVATION AREA (MPCA) MODEL

The MPCA network is a programme for documenting and studying distribution of medicinal plants of the state/region and to establish *in situ* gene bank for prioritized species. The significant features of the network are:

- The boundary of the MPCA is closed for general operation of forestry, grazing and fire prevention measures should be effectively undertaken.
- Local management committee/village forest committee constituted for management and protection of MPCA.
- Red listed species in the MPCA can be multiplied in the nursery and planted in the vicinity where such species are found.
- The MPCA is a cost effective programme to create a network of *in situ* gene bank, for representative population of the medicinal plants of the region/state. Table 1 gives details of MPCAs established in Karnataka.

Scope/Strength of the MPCA network

The strength of the MPCA network lies in having the greater understanding of diversity of medicinal plants, their ecological, economic status in the region/state. This helps to plan for adaptive management of medicinal plants by the Forest Department in collaboration with community.

- Ethno-botanical studies: It provides details of ethno-botanical information of the study/site area to have greater understanding of correlation of vernacular names of plants to their botanical identities. Most importantly to study inter and intra - specific diversity of the medicinal plants in MPCAs.

- Spatial and temporal studies: the network provides reliable information on the distribution, distribution pattern, phenology and ecology of the medicinal plants across various forest types, over a period of time.
- MPCAs help in associating the relationship between the species with various ecological parameters such as soil type, pH, rainfall pattern, micro and macro habitats, and biotic pressure association, etc.
- The data collected on threat assessment and trade will help to generate gene banks with focus on endemic, red-listed and highly traded species.
- The ecological, botanical and socio-economic information collected from the MPCA is a benchmark / baseline for data assessment of “change” over a period of time.

Table 1 : MPCAs established in Karnataka

SL NO	NAME OF MPCA	FOREST DIVISION	AREA IN HEC	NO. OF SPECIES RECORDED
1.	Brt hills	Deputy Conservator of Forests Wildlife Division Chamrajnagar (Karnataka)	150	259
2.	Talacauvery	Deputy Conservator of Forests Madikeri Forest Division Madikeri, Karnataka	80	255
3.	Savandurga	Deputy Conservator of	280	314

SL NO	NAME OF MPCA	FOREST DIVISION	AREA IN HEC	NO. OF SPECIES RECORDED
		Forests Bangalore Rural Division Aranya Bhawan, 18 th Cross, Malleswaram, Bangalore – 560 003		
4.	Subramanya	Deputy Conservator of forests Mangalore forest division Mangalore, Karnataka	200	220
5.	Charmadi		283	310
6.	Devrayandurga	Deputy Conservator of Forests Tumkur forest division Tumkur, Karnataka	178	140
7.	Kudremukha	Deputy Conservator of Forests Kudremukha Wildlife Division, Karkala (Karnataka)	110	238
8.	Kollur		275	231
9.	Kemmangundi	Deputy Conservator of Forests Bhadra wildlife division Chickmagalur (Karnataka)	310	184
10.	Agumbe	Deputy Conservator of Forests Shimoga forest division Shimoga (Karnataka)	210	270
11.	Devimane	Deputy Conservator of Forests Honnavar forest division Honnavar (Uttar Kannada), Karnataka	210	259
12.	Sandur	Deputy Conservator of forests, Bellary Forest Division Bellary – 583 101, Karnataka	350	238
13.	Karpakapalli	Deputy Conservator of Forests Bidar forest division, Bidar, Karnataka	150	150

Participation of institutions and forest department in conservation activities

The process enabled to build collective and collaborative efforts among various institutions and department to achieve better conservation and regeneration of medicinal plants, more importantly to develop suitable adaptive management plans to streamline the sustainable management into regular forest management.

MEDICINAL PLANT DEVELOPMENT AREA (MPDA)

This model emphasizes on eco-restoration of degraded forests and planning replanting activities of native medicinal plant species (trees, shrubs, herbs and climbers). This is to meet the local pressure on the resources and achieving the zero harvest at MPCA sites. The involvement of local community in the collection of seeds, raising nurseries and replanting activities will reduce the cost. Under JFM, participation of local people can be enabled and sharing of short and long term benefits is possible. However, it needs to train the local community and forest department on technical aspects such as nursery, propagation methods, planting and development of various gardens such as community, school and institutional.

SUSTAINABLE HARVESTING MODEL

The ongoing model for planning and developing methodology for sustainable harvesting of NTFPs/medicinal plants is designed and implemented in Karnataka. The study carried out at two sites, viz., Agumbe (Western Ghats) and Savanadurga (dry deciduous forest) provides the following information on how to design a participatory management model.

Design Elements

Any design for participatory planning of sustainable harvest and use of Non Timber Forest products and Medicinal Plants will need to have several sub-designs within to facilitate effective establishment of a sustainable harvest regime for wild species. The basic sub-designs are:

- ***Design for Local Participation***
- ***Design for Implementation***
- ***Design for Capacity building***
- ***Design for participatory tools***
- ***Design for Dissemination***
- ***Design for Assimilation***

The overall design of such a process is intended to deliver community oriented methodology, so that the local people have ability to prepare comprehensive adaptive management plans for conservation and regeneration of medicinal plants. The significant feature of such efforts is to seek active and willing participation of local community, and build confidence in participatory experimentation for its wider applicability to all natural resources. The design should cater to

- Increased awareness of the JFMC and the Forest Department local staff.
- Strengthening of monitoring, management, feedback system with co-ordination among all the stakeholders.
- Security of future stock and yield.

- Increase in cash income of the gatherers for good quality produce and timely harvest and also help generate savings for health and livelihood security.
- Methods evaluated by relevant stakeholders and recommendations made for management plans.
- Internalisation of the method into management systems such as Micro plans and Working Plans.

Design for Local Participation

This is a very crucial design as all other designs are subordinate to this because any “weakness” at this level of planning is going to affect the effectiveness of all other designs. The basic principle in devising such participatory design is that it should be more “inclusive”, non-discriminatory, equitable and gender sensitive. One caution that needs to be exercised is that any inclusion should not be compulsory and obligatory. That is to say, only those interested stakeholders who wish to be part of the methodology development process should be included.

Concept of Group think

The concept seems relevant for the development of an effective participatory model for natural resource management, to evolve. Group think concept helps to strengthen participatory decision-making process, as it should be the collective action rather than the individual wish, which should dominate the decisions. The process of group think is expected to contribute significantly towards collective management of resources by voicing the concerns of different stakeholders such as women, marginalized groups, cultivators, traders and medicinal plant collectors.

Initially one needs to go through the group think mindset of the JFMC and then device mechanisms for establishing team think instruments to take up targeted activities. A general discussion with the General body of the JFM would help steer administrative and participatory decisions related to development of sustainable harvest levels.

Concept of Team think

The participatory approach realises that eliciting participation of the entire village is not feasible due to constraints of space, time, availability, interests, etc. Thus, village community opts a few representatives for effective implementation. This is a step forward from groupthink to team think. The ideas generated in the group think level need to be translated into field by way of team think. The team members are selected through community workshops, with a clear scope for adding new members to enrich the team with special skills, as and when required. However, the participation of the opted individual into the team has to be again voluntary. Such a team could be called a “Task Team” (TT) and there may be as many TTs as required for different specific tasks at the village level.

Designs for Implementation

Design of local participation results in effective group think and team think for planning and developing the methodology. This is the stage local people have been motivated for the action and they need effective design of implementation. This is to get them into action and derive the expected results over a period of time.

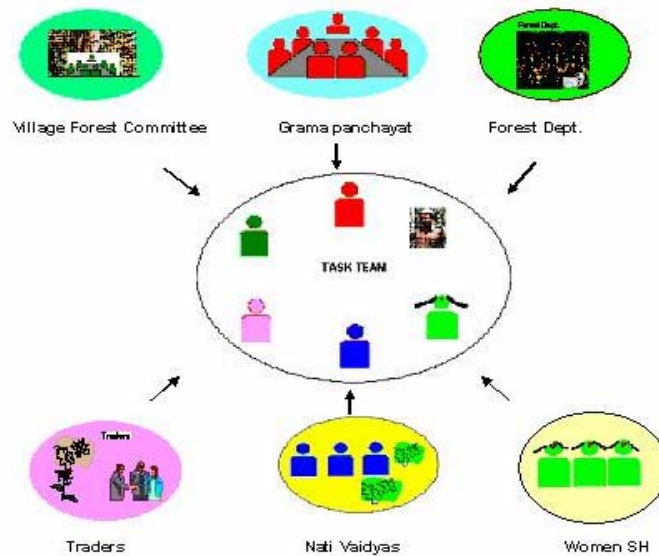
Development of Community Institutions

The essential step under participatory process is building suitable and viable community institutions at village level. These institutions are responsible for resource accounting followed by developing conservation strategy for adaptive management of resources.

Concept of Task Team (TT)

TT approach helps to develop the capacity of the local people to implement the learnings and convert them into practices. So, representatives from various local interest groups should be included in the task team (Fig.1). Such a closely interacting small group is able to perform efficiently and provide feedback to the community as well as seek its guidance. Task team approach is more effective in reducing the negative group dynamics, thereby helping to enhance efficiency.

Fig 1: Constitution of Task Team



TT is a small cohesive group of selected stakeholder representatives who will be directly involved in conducting the study and sharing and building on their knowledge and practices. The different roles for the TT are:

- To provide opportunity to representatives of all stakeholders to participate in the study
- To facilitate application of local and scientific knowledge to the study
- To build the local capacity to implement the study outcomes for the benefit of resource and the community

The listing of stakeholders and eliciting their participation are crucial for setting up an efficient TT. The second step is to establish a common goal for the team that will bind them together for the task ahead. The common goal for different stakeholders is that they all need to be interested in conservation of medicinal plants and sustainable harvesting of the forest products. The steps in the formation of TT are described in Box 1.

Box 1 : Steps in formation of TT and its responsibility

A new participatory institution is established at village level by ensuring gender and equity and multi - stakeholder participation. The basic steps in the formation of TT are:

- Calling general body meetings of JFMC: ensure representation of stakeholders such as NTFP collectors, healers, traders, SHG members, etc.
- Facilitate identification of representatives for TT from each stakeholder group, based on knowledge and skills of individual person.
- Discuss and deliberate with members of all the

stakeholder groups.

- With mutual consultation co-opt the stakeholder representatives for the TT.
- Seek acceptance from the general body to select those representatives for TT.
- Obtain concurrence of the chosen individuals to participate in the study activities.
- Develop resolutions about formation of TT and its responsibility.

Memorandum of Understanding (MoU)

The different institutions participating should have a common understanding for effective operationilisation of study activities, and the terms and conditions should be mutually agreed upon. In order to bring the required transparency to the process, among various stakeholders at village level regarding objectives, design and development of methodology, monitoring of data and preparing decisions of adaptive management, a Memorandum of Understanding with clear roles, responsibilities and benefits to each of the participating institutions is signed.

The MoU authorizes the TT to conduct the study activities in a phased manner as agreed with FRLHT. The terms and conditions mentioned in the MoU indicate the degree of concern and commitment among the involved institutions to work for sustainable management of resources in the region. Some of the guidelines for the preparation of effective and efficient MoU with local community are equity in participation, complete transparency and witness of all the stakeholders through process based MoU.

Institutional participation

Different institutions at grass root to various other levels and are involved in management of natural resources participated and accepted to perform specific roles in the study. The role played by the Forest Department in facilitating the study was vital, as they felt that study is innovative in developing methodology for sustainable management of forests and adoption of such ideas were relevant in ongoing projects such as JFM. The Head of the Forest Department provided permission to implement study at different study sites and instructed fellow officers to extend cooperation. The forest officers at division, range and beat level played a supportive role in constituting the TT at JFMC, identifying the TT members, locating the study areas and intimating neighboring villagers about the study. The various institutions involved in the study and roles to be performed are listed in the Table 2.

Table 2: Institutional participation and its role

<i>Institution</i>	<i>Role</i>
<i>TT</i>	<i>Enumerate the plots, keep records, field analysis, local dissemination</i>
<i>JFMC</i>	<i>Request neighbouring JFMC members/ villagers to co-operate</i>
<i>Forest Department</i>	<i>Facilitate the study, request contractors to regulate harvest by outsiders</i>
<i>Self Help Groups</i>	<i>Promote self-use for healthcare to offset commercial interests</i>
<i>FRLHT</i>	<i>Guide task team for data collection and disseminate study process and findings at the state and national level</i>

Design for capacity building and training

Participatory approach focuses on developing “self sustainable community institutions” by empowering local people. Various capacity building and training programmes have been designed and implemented for different stakeholders involved in the experimentation. The rationale behind designing the capacity building programmes for local community is to reach people of different socio-economic and educational background.

Training for Participatory protocols

Training needs to be provided to Task team members through participatory rural appraisal on participatory protocols. It includes development of social maps, status of medicinal plants, collection and marketing patterns, and local use of medicinal plants. This information helps to identify the status of the resource and develop management strategies for sustainable extraction of such resources. Some of the methods adopted in the study are listed below.

- Stakeholder analysis
- Group meetings
- Focus group discussions
- Semi-structured interviews
- Trend diagrams
- Participatory mapping

Through participatory protocols, it is expected to find out communities knowledge of identification of resources and

nature of extraction. Further, to put the biological and resource management variables into the socio-economic context such as tenure, market demand, infrastructure, policy, etc., it is important to know about these socio-economic factors, so that the protocols and methods developed can be tailored to be useful to the target users.

Training on Biometric protocol

The task teams at both the places got training inputs through posters in biometric principles such as defining the treatments and replications, randomization, sampling, generation of hypotheses and indicators, determination of yield predictors, setting up of experimental plots (design, layout, location and delimitation of sample plots in the field), and enumeration of sample plots. This training set the stage for developing sampling protocol and the treatments. The training was a two way process where both the trainers (FRLHT team) and trainees (Task Team) learnt from each other.

Poster method of training: Poster method is a novel method of developing a series of sequential posters on the experimental methodology. Posters are envisaged as the tools to track the project activities and train people on sampling methods and other methodology aspects. It enables the local community to develop and implement the study. The posters added with field experience can later serve as training tools to other communities. They can assist the TT to act as “trainer group” in other villages for establishing sustainable harvest methodology for non-timber forest products (NTFPs). These posters are in effect “inputs” to methodology development. More than 20 serial posters (in sequence) are prepared to meet different training needs of the local community; first six

posters relate to creating general awareness and motivating local people towards conservation of medicinal plants and the need for design and development of participatory methodology. Posters 7 to 16, deal with various steps of developing the methodology by applying participatory and biometric protocols. The last four posters address the decision-making process and development of adaptive management for sustainable harvest of medicinal plants.

Community workshops: The community workshops need to be organized at frequent intervals to inform the larger group about progress of the study and seek suggestions and larger application of sustainable harvest methodology. In the workshop, participation of different stakeholders such as local political leaders, traditional healers, traders and medicinal plant collectors should be ensured to have the participatory decision to influence the policy.

Design for participatory tools

Design and development of participatory tools equip the local community to implement the study objectives in the field. The development of tools should consider the traditional knowledge and skills for its ease and effective application. The design of participatory tools deals with the design of biometric steps for participatory approach within the scope of experimentation. It needs to define the objectives and study location and species to modify the biometric protocol for local application.

Setting objectives: The overall objective of the study is to “assess, develop and disseminate adaptive management for medicinal plants through participatory and biometric approach”. It includes assessment of, current management practices in order to develop criteria and indicators for

adaptive forest management, factors that promote community conservation and regeneration of resources, traditional and scientific regimes of sustainable harvest of medicinal plants and to develop dissemination strategies to promote community awareness and actions.

Selection of study locations: The criteria for selection of two study sites (Savanadurga and Agumbe) in Karnataka were based on the presence of good community organizations, as participation of local communities in planning and developing sustainable harvest methods is critical, followed by cooperation and collaboration of Forest Department to monitor the study and adopt decisions derived from the study into adaptive management plan. Geographical, ecological and socio-economic conditions were taken into account for wider applicability of the study.

Selection of Species: Species selection is done through participatory discussion, informal community meetings held with different stakeholders such as members of Village Forest Committee, traditional healers, NTFP collectors and traders and SHG members. The criteria to be used for selection of species are:

- Species providing a higher livelihood opportunity to communities, so that the community would take interest in the wise management of these resources.
- Species harvested for different parts to generate methodology can be tried for many similar products elsewhere.
- Species actively harvested at present and with likely increase in trade demand, so that these can be

sustainably harvested before they succumb to enhanced pressure.

- Species that cannot be cultivated and must be only collected from the wild, which necessitates that, their stock and productivity maintained for posterity.
- Species representing various habits, with preference to trees, as trees require long time for recovery from harvest impacts, individually and also their regeneration.
- Endemic species as local population would represent the global population and the status of such species demands immediate attention for recovery.

Development of research agenda

Developing research agenda for participatory approach is crucial, as this needs integration of both participatory and biometric protocols. The factors which contribute to the development of research agenda are “conservation needs” and “extraction of medicinal plant” for various purposes varying from subsistence to commercial. This describes resource needs of the local community to meet livelihood requirements and ecological sustainability of the species in the region. Some of the requirements that need to be considered while designing the research methods are:

- Determine changes in the focal species population over time.
- Determine the effect of harvesting on the focal species population.

- Determine maximum sustainable harvest rate and method.

The different activities undertaken to operationalise the research agenda are given below:

Delimit and stratify the experimental area: Develop maps of the forest area and demarcate the area for the study by adopting stratification. Using the community knowledge divide forest into different strata, based on forest types and local knowledge related to presence of focal species.

Developing experimental treatments: The development of treatments should consider the current methods of harvest as one of the treatments to test whether such practices are affecting the resource status called as BAU (Business As Usual), other treatment must be a harvest method and regime developed by combining the best practices in the traditional knowledge and the scientific knowledge.

Conduct preliminary sampling: A circular plot of 18m radius was selected. Replication of such sampling plots was maintained for each treatment to ensure consistency in the experimentation. In each plot number and size of individuals of the focal species should be enumerated.

Training field workers in sampling and enumeration: Task team members should be trained to create random sample locations, to locate sample points, to delimit sample plots, to count the number of individual plants within each plot, and to make measurements of individual plants.

Set up of experimental plots: Plots must be randomly located across strata and these are marked with paint for long term monitoring. Then allocate treatment randomly and maintain the buffer zone in between plots to avoid the

influence of one plot over the other on germination and regeneration.

Developing plant yield indicators: Quality and yield data collection will depend upon the plant part used. The indicators need to measure in case of specific part/s extracted are given in the Table 3.

Table 3: Plant quality variables and possible predictors

Resource	Quality variable	Predictors
Whole plant	Mass.	Plant size (height, diameter)
Leaves	Leaf number or leaf number in a subset of branches.	Plant size, light level
Buds	Bud number or subset.	Plant size, light level.
Flowers, inflorescences	Inflorescence number or subset.	Plant size.
Fruits/ seeds	Fruit number, quality or subset.	Plant size.
Bark/ wood	Length/girth of useable plant parts.	Plant size.
Roots/rhizomes	Mass of below ground parts.	Size of above ground parts.
Resins/ exudates	Yield of product per time period.	Plant size and health.

Enumeration of experimental plots: The different kinds of data need to be recorded in each plot, such as environmental data includes soil, rainfall and climate, plant data includes girth, height, canopy cover and number of

braches need to be recorded. Apart from this, germination and regeneration status should be monitored over a period of time.

Monitoring harvest: The most important activity to perform for long term is to harvest the produce from each plot as per the treatment designed. Later, record the number and weight of the produce collected. In case of control plot yield will be estimated.

Data analyses and preparation of adaptive management plan: All data collected should analyze and build up relationship with environmental data, tree data with harvest across the treatment and prepare decisions for best harvesting method for adaptive management in the region.

Design for Dissemination

The dissemination programmes are implemented to inform the concerned people about the study, progress and achievements, more importantly to seek suggestion to update the study process. Several innovative dissemination programmes designed and implemented for different stakeholders. Interpersonal and group/mass communication programmes are developed for local community. The Forest Department and other stakeholders communicated through series of meeting such as project Lesion Committee (PCL) meeting, Research Advisory Committee (RAG) meeting and workshops (national and state).

Interpersonal communication: The programmes developed for interpersonal communication is intended to provide the specific and in-depth information for stakeholders directly involved in the study. This is to generate awareness among the local people residing in the

study area about the nature of experimentation, progress and practice of wise ideas derived out of participatory efforts. The programmes developed for the purpose are given below.

- Development of leaflets, series of leaflets developed in vernacular language may be produced to communicate the study ideas to local community and other stakeholders. The various issues targeted for leaflets, which were produced over a period of time and circulated during community meeting and workshop.
- Letters to each Household in the village, unique communication systems have been developed in the study, as an attempt to inform all the households residing in the study jurisdiction about the study progress. Essentially, to seek the suggestion from local community and is provided in the form of a self-addressed and stamped reply letter.

Group and mass communication: This mandates for development of group communication interventions for spreading the participatory approach across the study area. Some of the novel dissemination programmes designed for larger awareness and interaction are given below.

- Exhibitions conducted during special occasions in the local area to exhibit and spread the participatory methodology among large gathering, during which task team members display study posters and educate the public about wise practices to follow, in the region.
- Community and Children march, is an effective way to reach out the people at their doorsteps. The Task team members and school children take out march in the village to create awareness and provide

information on sustainable management of resources in the village.

- Community meetings: Series of meetings conducted at community level for general acceptance of the methods developed in the study. This is to communicate the study ideas to various stakeholders in the village and outside the village to create micro level environment.

Design for assimilation

The development of methodology for sustainable harvesting through participatory experimentation should get general acceptance and applied to all natural resources. This can happen only through assimilation of good practices into management plans. At micro level local people have to practice wise methods during the collection of resources and at macro level policy formulation should attain to develop enabling marketing system to sustain the interest of the local people depend on the resources for livelihood. It is ideal to utilize enabling intuitions and management systems to assimilate the study ideas.

Developing the Community Communication System:
The study developed a novel Community to Community Training programme (CTCT) for training the local community by already trained community. This provides for horizontal spread of study ideas across communities and across resources. The significant feature of CTCT is to develop community not only for action but also to spread the methodology into other areas for wider application. CTCT emphasizes on transfer of knowledge and skills among the people who have similar attitude, socio-economic and education status and other inter personal features. In which

TT members transfer information and skills of developing methodology for sustainable management of medicinal plants to other communities such as members of JFMC, members of Self Help Groups, front line staff of Forest Department and local NGO representatives.

At micro level through micro plan approach: Under JFM programme, village community institutions initiated, micro plan has been prepared for management of forest. Micro plans are village management plans prepared for five years, which describe resources in the village and plans for sustainable management of resources through community participation. The study process and outputs should become part of the micro plan and the methods developed in the study guide the sustainable harvesting of resources.

At macro level through Working plan approach: Forest department prepares working plan for management of forests at division level, for a duration of ten years and assess the resource potential and provide guidelines for resource management. The study has adopted strategies for reaching the forest officers at various levels to incorporate study processes in the preparation of working plan.

Policy brief: Policy formulation at state and central levels need to be influenced by the study methods and outputs. For this, various dissemination programmes planned, viz., national and state level workshops to inform about the study and its significant achievements in developing community institutions for achieving sustainable harvest of medicinal plants.